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Virtual national conference on

RURAL ARCHITECTURE AND REGIONAL PLANNING

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Virtual national conference on

RURAL ARCHITECTURE AND REGIONAL PLANNING

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PREFACE

Indian villages are the portrait of the cultural, political, and socio-economical inheritance. Villages are adaptive to nature. It has been always a sustainable atmosphere in villages; recently it started shifting towards urbanization.

The rapid change in rural development is becoming shapeless, suffocating, and carbon generating. It is losing its original nature-friendly characteristics. Population growth, globalization, and climate change are the creator of the development of society.

Sustainable planning and design are being adopted by most designers and design organizations. The government is also promoting it in various ways like giving subsidies, implementing strict rules, etc. considering the overall scenario, unfortunately, it is keeling around the urban development. There is a lack of efforts towards rural sustainable development. Being a Rural College of Architecture, it is our utmost duty to provide a platform for discussion on these subjects. Therefore, there is a need to identify the potential and address the need for rural development sustainably. There are challenges in educating people and sustainably molding their development with the help of them. Unlike urban development, it needs to be more accommodative and has to go through public participation. Ultimately sustainable rural development tends to make the best use of resources to improve quality of life and economic growth.

Recently Government of India has initiated many projects under sustainable development like smart cities, swatch Bharat, etc. to create an environment of advanced and sustainable practices.

The conference will create a platform for researchers, policymakers, consultants, and designers to exchange thoughts on sustainable rural development. This is an opportunity for participants to understand the concepts of sustainable rural development as well as the model of the future sustainable smart villages. For town planning experts, it is an appropriate platform to share findings and creative concepts to set a standard for future smart villages which will be converted into smart cities eventually after some years.

We are sure that this event will change the view of all participants towards sustainable rural development; also it will emphasize the need for smart villages to create a higher quality of life and a sustainable rural environment.

February, 2022

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Evaluating settlement form and pattern of *Estado da India* (Old Goa), a medieval Portuguese town using guidelines for medieval cities by Morris, A. E. J.

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Abstract: Historic colonial settlements of the medieval period are living representations of our past heterogeneous culture, traditions, heritage, architecture, and social values. It is a responsibility to ensure that future generations have access and connect to this heritage. To achieve this, it is required to study, analyze and understand the importance of our fifteenth and sixteenth-century colonial, medieval towns and compare them with European towns of the same period in terms of social, economic, and political context. During that period, most European nations, Portugal, Spain, Dutch, British, and French, have undergone expansions in mercantile trade, competing with one another and forming colonies in Asia and Africa. These port towns influenced European city design in terms of their medieval town structure adhering to local topography and climate. This paper aims in establishing the form and settlement pattern of Estado da India (Old Goa), a Portuguese colonial medieval town from 1510 CE-1600 CE, the golden period of Old Goa, based on guidelines for medieval cities given by Morris, A. E. J. 1994, in his book History of Urban Form before the Industrial Revolutions. Objectives are to understand the abandoned Capital's form, fabric, and settlement pattern. The method adopted for the study is mainly on the available data in published form backed with the help of maps, plans, drawings, and sketches derived from the Crown, state officials, missionaries, travelers and endorsed by site study. Study broadly classified into archival and field research. The data collected from the archives remain, and the artifacts from the field study, compared with guidelines for medieval cities given by A E J Morris, are analyzed to infer and come to a conclusion for settlement form and pattern of Estado da India (Old Goa) a Portuguese colonial medieval town of the sixteenth century

Keywords: Colonial settlements, Culture, Form, Heritage, and Pattern

Introduction

The impressions of the Portuguese presence are experienced to this day in many parts of the Portuguese occupied world in terms of religion, myth, tradition, language, cuisine, art, architecture, town planning, etc. Before the Portuguese invention of the maritime trade route to the East, trading between Europe and the East happened through the Mediterranean, traversing the Middle East and eventually arriving in India. Arabic and Persian merchants dominated the spice trade from India (Malekandathil 2010). The main economic intention of the Portuguese was to apprehend this trade in their possession and create a monopoly of this trade over Europe. The Portuguese maritime trade route across Cape of Good Hope through the Indian Ocean offered a substitute to manage exchange between Eurasia. At the end of the fifteenth century, the Portuguese Crown planned their overseas

expansion towards the East. In 1498, C.E. assigned Vasco da Gama to establish a maritime navigational route to the East in the Indian Ocean (Mendez-Oliver 2016).

The Portuguese had control, custody, and occupation over many port establishments distributed over the Indian Ocean dispersed. They established several settlements on both the coasts of India. The Portuguese acquired Goa in 1510 CE from Adil Shahs with the determination of permanently positioning their center of control, presence, and dominance in Asia, administering trade over Africa and Southwest Asia. Conquest of the port city of Goa was on the strategy list of the Portuguese; in 1510 CE, Alfonse de Albuquerque outlined a plan of integrating the distributed possessions over the Indian Ocean, creating order among them, and defining a centralized administrative command. Due to Goa's strategic geographical location, suitability for military defense, availability of harbor for trade and commerce, and easy excess to hinterlands, Goa predominated the preference. It emerged at the top compared to other Portuguese establishments. Later it became the Capital *Estado da India,* the seat of the Portuguese Empire in Asia. During a significant period in the sixteenth century, the Portuguese monopolized and controlled the maritime routes to the East, dominated spice trade to Europe, and dictated taxations on other businesses in the Indian Ocean (Mendez-Oliver 2016). This was further strengthened by encouraging trade opportunities within city dwellers, generating wealth due to trading, developing the city, and giving a character to it in terms of urban space design, city form, fabric, and an image of Capital and power center.

Studies of the fifteenth and sixteenth-century medieval towns in Europe have a similar social, economic, and political context. During the period, most European nations, Portugal, Spain, Dutch, British, and French, underwent expansions in mercantile trade, competing with one another, forming colonies in Asia and Africa, creating their domain, and establishing their domain supremacy over one another. The strategically located factories and forts near the ports for convenience, storing and safety of trade goods, supply of food and water, facility of call for ships in distress grew to accommodate many settlers' houses initially as settlements and later on as towns as the intensity of the trade grew over time (Guedes, Lewcock 2012). These port towns influenced European city design in its medieval town structure, adhering to local topography and climate. These towns also became the seat of power, and city design can see the influence. They are also most alike regarding visual details in terms of the same kind of local vernacular buildings designed in the formal gridirons of the planned new towns and the informal uncontrolled layouts of their unplanned contemporaries.

Rise and fall of the city

Estado da India is one such example of political power and religious power together administrating the city as a seat of the Portuguese Empire in Asia for more than 200 years. Development happened over the years with colonial influence over the local geomorphology and social parameters. Trade under the Portuguese generated an enormous amount of wealth, and the surplus was directed towards the urban construction of the town. The Capital was developed to control trade over Europe, Asia, and Africa. Construction activity included architecture for military, administrative, customs, municipality, manufacturing, loading-unloading, godowns, public buildings, hospitals, religious buildings, institutions, residential buildings, infrastructure, etc., creating opportunities for employment to the community (Malekandathil 2010). Like any other medieval city, a city is born, developed, peaked, and finally declined. *Estado da India* also has undergone all these phases during Portuguese rule. The Portuguese maritime and colonial power waned by the end of the sixteenth century. The fortunes of Old Goa began to dwindle. The Capitals decline was accelerated by the activities of the Inquisition, devastating epidemics, attacks by the Marathas, and the Dutch wiping out almost half the population. The town's dramatic rise was followed by an equally precipitous decline beginning in the late sixteenth century. Dr. John Francis Gamelli Careri, who visited the town in1695 C.E., wrote that the prosperous town was reduced to a miserable condition with not more than 20,000. In 1775, the population was reduced to approximately 1,600, and by the year, 1827-population estimates were around 1,066 individuals (Fonseca 2001). Today, the Old City is lost except few heritage structures that include Churches, Convents, Cross, Doorways, Ruins, etc., depicting Cultural Heritage. Old Goa is a World Heritage site and of Tourist importance. The Capital was shifted to Cidade de Goa in 1843.

Background

One of the questions that come to mind is how could one assess or define the impact of medieval European towns over medieval colonial towns? Is there an influence from West to East? Literature study on the question gave clues by different researchers and authors like Morris A.E.J, Spiro Kostof, Kevin Lynch, Christopher Alexander, Arthur B Gallion, Simon Eisner, etc., placing medieval urban form and pattern in their books. The study aims to understand and evaluate the form and the pattern of *Estado da India* (Old Goa), a medieval Portuguese town, using the guidelines of medieval town given by Morris (Morris, A. E. J. 1994), in his book *History of Urban Form before the Industrial Revolutions*. The study's objective is to relate, compare and analyze these guidelines with the remains and artifacts at the site. The methodology used for the analysis is an archival study based mainly on the available data in published form and is additionally backed with the help of maps, plans, drawings, and sketches derived from travelogues, missionaries, and state officials endorsed by the field study. The study began in 1510 CE when the Portuguese captured the city and bordering areas from the Adil Shahs and started giving new dimensions and philosophy to Goa's urban design and town planning. The ending point of the study was the end of the sixteenth century, when the city was at its peak in 1600 CE. The study area includes the Mandovi riverbank on the north as one end, from the river on one side up to the fortification wall built by the Portuguese in the sixteenth century. These features included the hills surrounding the city and the large Lagoa or lagoon, which stretched almost to the southeast portion of the town.

Urban form determinants of shaping medieval towns by Morris A E J

Apart from the strategic location of the towns concerning political, military, and trade convenience, urban planning, and physical growth. As per Morris, from his research and observations, lecture series, and articles compiled as a book, the components of medieval town are categorized into five determinants and are as follows:

1. The fortification walls with their towers and gate

Defenses probably became the most important determinant of urban form. Wall maintained the primary military function of managing solid securities. As the horizontal growth of the town is not a continuous process and takes place in stages, preceded by the construction of a new wall wherein the earlier undefended suburb growth was included surrounding the city considering the need to enclose land for future expansion. As the military significance reduced, the wall subsequently functioned as custom barriers, enabling tolls to be levied on all goods passing through the gates.

2. Streets and related circulation spaces

As per Morris, entire medieval town was a market. Trade and production went on in all the parts in open and closed spaces, public spaces, and private spaces. Streets subsequently were narrow, irregular lanes in organic growth towns, the central circulation leading to the fortification wall gates from the center, and the marketplace had as many linear extensions as connection routes. Therefore, the street facade was a valuable commercial resource, especially near the gates and marketplace, and its continuous development was normal. Later, it became usual for narrow passageways to be formed off the streets, providing access to the new minor street and court development of back gardens. Movement in medieval towns was mainly on foot as wheeled traffic followed later. Transport of goods was by pack-animal. Elements of street paving are seen during the period in medieval towns. Sanitary conditions are closely related to density. Medieval towns had only rudimentary refuse disposal arrangements, and water supply was a continual problem accompanied by diseases and health issues in urban life.

3. Market place, probably with market hall and other commercial buildings

In medieval town markets, two types are common in both planned and organic towns. Firstly market occupies a square at or near the center of the town, and the second is located at the widening of the main street. Paul Zucker (Zucker 1970) outlines inorganic growth towns as a lateral expansion of the main street and squares of the town gate. In a planned town with a gridiron structure, the market

square is usually void within a grid bounded by streets on all four sides. Most squares have market halls, at times of two floors. The market streets are integrated into planned towns, and instances of a town church facing a marketplace are exceptional. In unplanned towns, the market occupied its original location within the village from where the town progressively developed. Commonly the marketplace would be irregular composition, sometimes triangular, many sides, oval, saw-toothed, curved, arbitrary in shape on account of the needs of the surrounding buildings preceded and decided the deposition of open space (Mumford 1968).

4. The Church, usually standing in its own space

The space before the Church – the medieval Parvis, the faithful gather before and after the service; here they listen to occasional outdoor sermons, processions passed, plays were performed, people from out of town left their horses, and stalls of various kinds were set. Parvis was never intended to compete with the market square. As this frequently adjoined the market square, a two-part nucleus is typical of medieval towns, both planned and unplanned.

5. Great mass of general town buildings and related private spaces.

The settlements were defensive and adapted to the morphology of the land, and the purpose was the control of territory. Fortified places were associated with commercial activities along the seashore or the margin of a river, port and commercial activities at sea level, administrative buildings, primary institutions, and most housing on high ground. The best places, usually the top of the hills, were reserved for public buildings and major churches and convents within the fortified city. These buildings gave the town a sense of community. They also played an essential role in organizing urban space. Together with the informal squares associated with them, they became focal points for developing the urban tissue. The gridiron or irregular streets connecting them created a pattern for the settlement.

Examine and equate the determinants of shaping medieval towns with Estado da India related to town form and pattern.

Understanding these principles of Morris, defining urban form and pattern for medieval towns, an attempt is to read, understand, and evaluate these guidelines for Estado da India, also referred to as Old Goa or Ella Goa, a Portuguese colonial, medieval town of the sixteenth century. As mentioned earlier archival data, maps, plans, drawings, sketches, and fieldwork artifacts are used to analyze and validate the principles. Old Goa has a tradition of history, culture, trade, and economics for thousands of years before the advent of the Portuguese. The golden period was the rule of the Kadamba and Vijayanagara Empire when trade at regional and international levels was at its peak due to strategic location in terms of the harbor in the Indian Ocean. This crucial and safe military location that the Portuguese learned and invaded as a power center for their mercantile trade.

Reading Maps, Theories, Understanding, and Analyses concerning Old Goa

Maps are physical documentation of a geographic area and project image of the city. Maps give a clear understanding of what colonial spaces of a town could be and how these spaces function. First representations, images, and maps were made at the end of the 16th century and during the climax of Portuguese political, trade, and commercial prosperity in the Indian Ocean. The city of Goa attained considerable urban development and accommodated an enormous population. Hence, the maps that were made during 1596 are portrayals of established Portuguese governance having explicit knowledge, experience, and background for creating urban spaces. The map creators or composers were colonial representatives generating work that showed elite colonial interest and were made specifically for the colonial government and the Crown. The best-known compilation of maps are from 'Antonio Bocarro's Livro das Plantas de todas as fortalezas, cidades e povoaçoens do Estado da India Oriental' (Book of all the forts, cities, and settlements of the Eastern State of India).This work of making maps was designated by King Filipe III of Portugal in 1632, appointing Bocarro as a chief archivist and official chronicler of the Estado da India. The maps that Bocarro was in charge of

making were directly presented to the Crown on completion and prepared with authenticity. Other producers of maps of this category were also connected to the Crown like Antonio de Maris Carneiro, the chief cosmographer of Portugal in 1631. Consequently, the maps adhere to each other because; they were made by the colonial or the royal governance for their use. Thus, maps communicate straight to their in-house involvement and interpret urban spaces, form, and fabric of the city of Goa.

One of the initially acknowledged maps of the city of Goa was drawn by Jan Huygen van Linschoten A Dutch immigrant who visited Goa and published it in his well-known Itinerario (Linschoten 1997). The map resulted from Linschoten's meticulous findings of his travel to India and during his stopover in Goa as an accountant to the archbishop. This map presents an image of Goa at its pinnacle of Portuguese political, trade, and commercial power in the Indian Ocean. In the typical city maps available during this period, one finds the framework of depicting the urban areas in depth and detail and bypassing the surrounding underdeveloped area untouched or emphasizing surrounding areas by natural features (Santos and Mendiratta 2011). These maps' understanding of urban space consists of relatively close-knit clusters of formerly constructed stone homes, market places, administrative buildings, religious edifices, and cultured landscape open spaces different from the rural/agricultural spaces in the periphery. When one studies the city maps of Goa; one finds that the city spaces are very manicured and detailed and the peripheral countryside is not much mapped

The fortification walls with their towers and gates

Figure 1: Map showing fortification wall with its towers and gate
Source 1: Several maps of this type exist by various authors, which depict the wall, coastline, and the region more generally. (Image from Portugaliae Monumenta Cartographica, vol. 5, attributed to Manuel Godinho de Erédia.). Source 2: In the Shadow of the Cathedral, Brian Christopher Wilson

These maps tell us little about urban form 'Figure 1'; the map does not show a detailed depiction of the city and the specifics of buildings or other urban infrastructure. It marks the location of churches, provides a simple layout of the streets, and marks the spot of the port and quay. Instead, the maps prominently feature the large outer fortification wall constructed between 1566 and finished sometime in the mid-17th century (Wilson *et al.* 2013). In addition, these maps often contain a more accurate depiction of the surrounding coastline and nearby forts. The simple plan of significant streets, the location of fortifications, and the port are all important from a military and economic perspective, arguably the Crown's primary concern. Cottineau De Kloguen suggests that the city was three-fourths of a mile in length, a quarter-mile in breadth, and was already a vibrant and cosmopolitan trading entrepôt attracting merchants at the time of the conquest from across the Indian Ocean and beyond (Kloguen 2008). The original Muslim city contained a strong fort and was surrounded by a fortification wall fronted by a large moat, which Albuquerque rebuilt and strengthened immediately after taking the town (Wilson et al. 2013).

Figure 2: Field study - portion of outer fortification wall at site
Source: Photographs taken at site by the author

Following the establishment of Goa as the capital city of the Estado da India (a term coined by Morques de Pombal in 1758 to demarcate Goa, Daman, Diu, Dadra, and Nagar Haveli), (Wilson et al. 2013). The city overgrew in wealth, population, and size, becoming the seat of the Viceroy, the head of the Catholic orders in Asia, and one of the major trading centers in the region. With the growth in power, prestige, and population of Old Goa, the city quickly expanded beyond the confines of the original fortification wall and moat. Part of the fortification wall was pulled down while some sections fell into ruin. In addition, the portion of the moat surrounding the city was filled with rubble, while structures were built against the remaining sections of the wall (Santos and Mendiratta 2009). In the context of continuing tensions with the surrounding Muslim Sultanates during the early phase of the Portuguese occupation of Goa in the 16th century, associated with the maritime focus of the Portuguese Estado da India. It became necessary to reconsider the land-based defensive situation of Old Goa-defenses that had long outgrown original fortifications built by the Adil Shahs in the city center in 1565 increased the pressure on the Portuguese to strengthen the fortifications by the construction of outer fortification wall shown in 'Figure 2'

Streets and related circulation spaces

Figure 3: Map showing fortification wall, edifices and street pattern

Red Block indicate River Gate to the west and the Fortress Gate to the East

Sourse:Image by António de Mariz Carneiro in 1639 and contained in his Descrição da Fortaleza de Sofala e das mais da Índia.

Figure 4: City pattern and fabric for the layout of the capital city indicating organic and planned grid iron pattern

Red Block indicates Organic / Radial Pattern of City Development as per Topography.Yellow Block indicates Planned / Grid Iron Pattern in Coastal Plains

Source: Source: (à direita) Plantaforma da cidade de Goa – Livro de plantaforma das fortalezas da Índia | Manuel Godinho de Erédia, 1620

Under the Adil shahis, Ella Goa was about 20 ha in area, surrounded by a wall, hemispherical in layout, with towers and a moat, and containing streets, squares, a royal palace, mosques, and temples (Rossa 1997), as befitted the second city of the Bijapur Sultanate. It is believed that the Estado city based itself on the Bijapur one, using its road layout and more significant buildings, destroying existing structures (Wilson 2015) and expanding from the riverbank up into the hills around (Rossa, Mendiratta 2011). On the river were the docks and warehouses, from where two gates opened into the walled city, the River Gate to the west and the Fortress Gate to the East 'Figure 3'. The road through the latter was the *Rua Direita* (Main Road), also known as *Rua dos Leiloes* (Road of Auctions), a busy commercial thoroughfare. The wealthiest merchants, artisans, and other rich folk lived along this road, where one also found the establishments of lapidaries and goldsmiths (Cabral 2001).

Map of Velha Goa by Manuel Godinho de Erédia, 1620, showed that the city's configuration consisted of gridiron pattern and radial pattern following the land topography and slopes, a typical attribute of medieval colonial towns 'Figure 4'. The entire institutional area of the city, and indeed the Estado, lay along the *Rua Direita* and within the Bijapuri wall (Rossa, Mendiratta 2011). The other streets followed a radial pattern and were lined by masonry houses, uniform in the Portuguese manner (Wilson 2015), with a yard behind, sometimes two stories, tiled roofs, oyster shell window panes, and red and white paint (Rossa 1997). There were probably many humbler houses and agricultural spaces within the town (Wilson 2015). With the *Cidade* raised to the status of a town in 1518, it was administered by a municipal council comprising elected members from among the urban and merchant elites, giving them a lot of say in the city's development (Malekandethil 2009).

Market place, probably with market hall and other commercial buildings:

Figure 5: Square and activities associated with the market square
Source: Map of Velha Goa by Jan Huygen van Linschoten first published in 1596 in his Itinerario

A marketplace is a place of commercial activity, either individual, near the Church square, or associated with streets. In the capital city of Goa, the grand bazaar experienced a chaotic move. The streets were frequented with shops selling clothes, silks, cotton, Portuguese velvets, Chinese porcelains, etc. the prices and bargains were affordable to poor people and even the slaves. Some streets of the town sold dresses, furniture, ornaments, and precious stones, goldsmiths, those who collected rents and acted as brokers, chemists and druggists, the saddlers, the shoemakers, the ironmongers, and the blacksmiths (Cabral 2001). Food of all kinds was sold on the streets, and open squares dispersed all around the city and were economical and in plenty. The streets were well paved and maintained. The shops and the residences were two floors built of laterite stone with lime mortar, lime plaster finish, and a sloping roof of handmade country tiles. The general design of shopping spaces was the shopping on the ground floor and residences on the upper floor (Cabral 2001). 'Figure 5' shows the Market Square and activities associated with the market square.

The Church, usually standing in its own space

Figure 6: Showing land use pattern of Old Goa, capital city

1. Dark blue indicates military, trade, and industrial land use
2. Purple indicates administrative and public land use.
3. Red indicates commercial and marketplace land use.
4. Green indicates church square.
5. Blue indicate religious and institutional land use.
6. Yellow areas are streets, residential land use, agriculture, and open spaces

Source: Map of Velha Goa by Jan Huygen van Linschoten first published in 1596 in his Itinerario

The Church Square is an independent space formed in front of the Church, a community space where people assembled for social and religious activity. In the Capital city of Goa, halfway down *Rua Direita*, a lane turned west to the square of the parish church of St. Catarina. This Church, now known as the Se Cathedral, was raised to the status of a Se (cathedral of a bishop) in 1534 when Goa became a bishopric, and then rebuilt (1564–1652) to majestic proportions after it became an archbishopric. Near it was the Franciscan Convent and the Church of Espirito Santo (Holy Spirit), said to be built on the site of a Bijapuri mosque (Rossa, Mendiratta 2011). and the later Archbishop's Palace. To the north were the town hall and the royal tobacco store, both long gone 'Figure 6-4 '.

This church square was named Terreiro do Sabaio (The Square of Adilshah). To its south was the former Bijapuri royal Palace, first occupied by the Viceroy, then housing the office of the Inquisition. A new palace, the Paço dos Vice-Reis (Palace of the Viceroys) or Fortaleza (Fortress), was later built at the north end of the *Rua Direita*, on the site of the old Bijapuri fort. Other institutions edged its square, including the Upper Court of Justice and the later Theatines' convent 'Figure 7.'

Figure 7: Church Square

Source: https://www.thegoavilla.com/goa/distanation/old-goa.html

The great mass of general town buildings and related private spaces

A great re-ordering and rebuilding took place in the town from the 1550s, with the counter-reformation objective of making a grand and visibly Catholic urban landscape. As in European territory, though here with expressions and size never attained anywhere else in the empire, the augmented scale and splendor of the religious architecture was considered an essential means of religious dominance. It is also important to note how it became impossible for any religious congregation or order not to have a house in Goa (Rossa 2011).

Figure 8: Field Study - Building Typologies of Goa during its dominance, structures exist today
Part map showing residences by Linschoten   Archbishop's Palace   Casa da Bula da Cruzada
Source: Photographs by the author during the site survey

Most of the city's monumental buildings came up between 1550 and 1620, many on the hills surrounding the city, an urban layout inspired by Lisbon (Rossa 1997, 2012). Older buildings were rebuilt to monumental proportions. The old city wall was demolished, and the old Fortress Gate was redesigned as a Roman. Triumphal Arch, the Arço dos Vice-Reis in 1597. Albuquerque had ordered the setting up of a hermitage on the hill from where he had commanded the battle against Bijapur ((Rossa, Mendiratta 2011).); this was rebuilt into the Church of Nossa Senhora do Rosário (Our Lady of Rosary), forming the western boundary of the city. Near it came up the Santa Monica Convent (1606, the Estado's only convent for women), the convents of the Augustinians and the Hospitallers of St. John of God, and other church institutions

The town had a color scheme of pastel shades. It was painted with a wash of indigo, brown, yellow ochre, red, etc. Glass was hardly used. In place of glass, polished oyster and kapitz shells, filigree and jalli work were used for windows for the entry of light and for the ladies to see outside

without being exposed to outside. The upper stories had balconies to exchange the air in the humid and warm coastal climate. The houses had open spaces into the backyards with native fruit-bearing trees. The landscape of the streets and the built spaces (buildings) gave a country look to the skyline of the capital city of Goa (Fig 4.1.9).

These capitals, Lisbon and *Estado da India,* were developing during the same period. They had many similarities in their strategic military location, trade and commerce, topography, and religious dominance as medieval cities during that period. As Teixeira convincingly argues, Lisbon was indeed one of the 'ultimate references of (Portuguese) colonial city builders' (Teixeira 1990), and the growth and overarching form of Velha Goa closely resemble that of its colonial metropole, Lisbon.

Conclusion

The above study depicts that all the elements of the urban form of the medieval town are present. The town form consists of the fortification walls with their towers and gates, streets and related circulation spaces, market place with a market and other commercial buildings, A church square, and a great mass of general town buildings and related private spaces. The maps reveal a conceptualization of urban space as an object that consists of a civilized place of ecclesiastical and administrative power symbolically embodied in monumental edifices, formally built stone homes, particular architectural styles, an organized and rational street pattern, and which ultimately took Lisbon as its primary point of reference and socio-spatial model.

Structural remains and a generally high degree of visibility of archaeologically significant remains, including standing architecture, foundations, fortifications, and infrastructure, one can conclude as follows:

There are five significant layers in the urban design of the Capital Town or building uses.

1. Residential use
2. Ecclesiastical / Administrative
3. Defensive / Military
4. Industrial and
5. Agricultural / Wasteland

The urban core of *Estado da India*, defined by the circular path of Adil Shahi fortification walls, contains a concentration of ecclesiastical and administrative space, and it is already somewhat well documented historically, architecturally, and cartographically.

As the 16th century progressed, Goa officially became the capital of the eastern empire. The Crown elevated Goa's status such that all of the privileges, statutes, ordinances and benefices common to Lisbon were applied to its colonial Capital. The historical record suggests that the colonial government modified or rebuilt various existing structures to create a more Portuguese-style urban landscape in conjunction with these political developments. For example, these modifications included rebuilding the former Palace of the Adil Shah turning it into the Palace of the viceroys and, at the end of the century, revamping the portside, Adil Shahi gate into a triumphal arch called the 'Arch of the Viceroys' installed with a large figure of Vasco da Gama and modifications occurred simultaneously with the renovations of personal residences.

As in Lisbon, standardization or reform of new urban infrastructures, gradual uniformity of the architecture employing regulation endowed Goa with a Portuguese-style unity. Lisbon was indeed one of the 'ultimate references of Portuguese colonial city builders,' and the growth and overarching form of *Estado da India* closely resembles that of its colonial metropole, Lisbon.

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CHANGING LANDSCAPE OF VETAL TEKDI, PUNE

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Abstract: Pune is located on the western margin of the Deccan Plateau; partially in the foothills of western ghats and surrounded by hill ranges like Parvati, Katraj, Ram, Taljai, chaturshringi, vetal tekdi and recognised as a green and picturesque urban paradise. It was called the Pensioner's paradise but those days are long gone. The city is currently a flourishing industrial and manufacturing hub, as well as the home of a rising IT industry. Rapid and environmentally insensitive development have given ways to flyovers, high rise buildings and has destroyed city's natural heritage. The hill ranges are densely forested, providing residents with lovely natural surroundings as well as clean, pure air. There are also watersheds, which ensure that water percolates into subsurface aquifers, maintaining the long-term sustainability of our water supply.Vetal tekdi is located in the centre of Pune and attracts a wide range of nature lovers due to its diverse ecological features. Over the last three decades, there has been a shift, the hill environment is under severe threat due to encroachment on hill slopes, dumping of debris, cutting of trees etc that has led to habitat loss over time and is in the need of protection. This paper is aiming to study the ecological landscape of Vetal hill. My study focuses on documenting and analysing changing pattern of the ecological landscape of Vetal hill. The paper presents findings from field observations, interviews and secondary data from newspapers, websites and would throw light on conservation and enhancement of native species and retore ecology.

Keywords: Afforestation, Conservation, Ecological landscape, Pune, Urban Green Spaces, Urbanization

1. Introduction:

Pune, a city in India's Northern Western Ghats, is popularly known as the "City of Hills." It has been famous since historic times due to its climate and natural vegetation. The hills serve as the city's green lungs, acting as an essential oxygen reservoir. It is surrounded by hill ranges like Parvati, Ram Tekdi, Gul Tekdi, Range hills, chaturshringi, Katraj, Taljai, and vetaltekdi. All of these hills contribute to the picturesque attractiveness of Pune's overall environment. These hills are home to many indigenous plant species of medicinal and economic importance. Unfortunately, most of the original natural vegetation has vanished. These hills are under threat due to biotic pressure, encroachment on hills, cutting of trees, dumping of debris, etc. Previously, these hills were rich in floral richness, as Cooke (1903-1908), Phadnis (1925), Razi (1951), and Vartak (1951) all noted (1960). Joshi et al. (1992) provided a comparative description and highlighted species that were missing from Ezekiel's flora (1917-1918). Joshi et al. (1994) and Datar and Ghate (1994) reported on the declining and changing floristic patterns of the vetal and katraj hills (2006).

2. Study Area -Vetal Tekdi:

Vetal Tekdi/ ARAI Hill is situated in the heart of urban Pune with an elevation of 2600 ft, which makes it the highest point in Pune with a panoramic view. Vetal Hill is a part of Bhamburda Van Vihar located on the western side of Pune Municipal Corporation within the city limits. Vetal Tekdi is a notable landmark that can be seen from Pashan, Paud Road, Chattushrungi, and other locationsin the city. The hill complex was originally situated outside the old city boundary lines, but with the rapid growth of Pune over the past six decades, it has been swallowed entirely by the city. The overall area of the complex is 10 square kilometres, which mostly consists of the plateau (hilltop),two peaks of the Vetal temple and the Mhatoba temple, and the adjoining slopes.

The Vetal Hill receives its name from a shrine dedicated to Vetal that sits atop it. The Vetal Tekdi is part of the larger Vetal Hill-Mhatoba Hill complex, which also includes the Mhatoba Tekdi, which is named after the goddess whose temple is located here, the Hanuman Tekdi, which is named after a Hanuman temple, and the Chatushrungi Tekdi, where the Chaturshringi temple is located. A few trees have been kept or planted to provide shade around the shrine. Plumeria, Ficus, Aegle, Mangifera, and Nyctanthus are examples of them.

Figure 1: Vetal Temple at Vetal Tekdi. Source: Sutradhara's Tales: The rustic divinity of Pune's deities of the hills - Hindustan Times

Figure 2: Chaturshringi Devi Hill. Source: Sentinels of Chaturshringi (punemirror.com)

Figure 3:Hanuman Temple. Source: Vetal Tekdi , Facebook https://www.facebook.com/ photo

Figure 4: Map of Vetal Tekdi, Pune

Figure 5: Topographical Section of Hills of Pune.Source: Tanima Shrivastava

Vetal Tekdi with its dense forest, grassland plateau and unique ecosystem, was a volcano 65 million years ago. As a result, the basalt rock found here, known as Deccan basalt, is black. What makes this geology unique is that the compact and vesicular basalt rocks operate as recharge and discharge points, enabling water to flow in and out and build in aquifers, or storage houses,underground.

Dhangars have been visiting Pune for generations as part of their periodic migrations, to western Maharashtra and the Konkan. The lush grass pastures on the hills have served as annual pit stops along the way. Their horses and sheep feed on the lush grass and other vegetation. Though the hill today has social forestry plantations, the original flora consisted of grassland with a few pockets of woodland for grazing animals.

3.   Landscape Pattern

The current vegetation is a combination of dry deciduous and exotic types. Anogeissus-Lannea-Boswellia (Dhavda-Moi-Salai) is the common plant community. Babhul (Acacia nilotica) and Dhaman (Grewia tiliifolia) are two more native tree species. Since the 1970s, a series of tree plantation drives have been held here. Initially, the emphasis was on planting fast-growing exotic/non-native trees like Nilgiri (Eucalyptus sp.), subabhul (Leucaena leucocephala), and giripushp (Gliricidia sepium). There has been a concerted effort to establish native trees since the 1990s. The current vegetation cover is best described as urban woodland or urban forest. Dalbergia melanoxylon (Patangi) is one interesting example of the spread of exotic species. This species was planted in the Pune University region by Britishers. This species was totally absent in other areas of Pune. However, the species has recently been seen to be expanding in and around the Vetal Hill area, and is on the verge of becoming the dominant species there.The presence of certain key indigenous species makes the area significant. Endangered species found here include Jatropha nana (Kirkundi), Cissus woodrowii (Girnul), Mussanda laxa (Bhutakesha), Indoneesiella echioides (Ranchimani), etc.

The communication between E.A. Garland, a divisional forest officer of the Bombay Presidency, and W. Burns, the economic botanist to the Government of Bombay, states that the Bhamburda-Vetal hill was afforested in 1879. There may have been sporadic experiments in teak and sandalwood cultivation, but there are no (pre) records of such works, and based on the existing trees, it does not appear that much has been accomplished by this afforestation.

In 1917, Moses Ezekiel observed that the vegetation on the hill was sparse and xerophytic, i.e., plants suited to dry circumstances. He observed stem succulents (cacti-like plants), deciduous shrubs and trees, grasses, and ephemeral herbs. As Burns noted in 1931, "trees on Bhamburda-Vetal hill are sufficiently widely separated to promote a strong growth of grass between them."

Figure 6: The typical savanna vegetation around Vetal hill (Bhamburda) in 1926. Source: Burns, 1931

The vegetation comprisessmall trees and bushes sparsely scattered across a herbaceous understory, as shown in the photo above.We now know that these are Savannah ecosystems, in which trees and bushes are immersed in a continuous grassy layer and do not create a closed canopy, as opposed to normal forested landscapes.

Boswellia serrata (Salai), Anogeissus latifolia (Dhawada), Lannea coromandelica (Moi/Shimati), Terminalia tomentosa (Ain), Cochlospermum religiosum (Ganeri), and Pterocarpus marsupium(Bija/Bibala) were the most common trees.

In the 1930s and 1940s, the then-principal of ILS, J.R. Ghapure, and renowned botanist Shree H. P. Paranjapye carried out a systematic afforestation effort on the Law College side of the hill.The selection of diverse plants for the afforestation effort was based on soil, climate, rainfall, and other biological considerations. Suitable species were obtained from the Katraj and Sinhgad forests. This plantation was also meticulously guarded against trespassers. As a result, the barren hill has been transformed into a natural park. It serves as an excellent model for how the city's other hills might be similarly reforested.

Figure 7: Exotic Species- Dalberia lanceolaria ssp Paniculata.Source: Vetal Tekdi , Facebook https://www.facebook.com/photo

Figure 8: Albizia lebbeck. Source: Vetal Tekdi , Facebook https://www.facebook.com/photo

Figure 9: Cochlospermum religiosum. Source: Sushma Date, Vetal Tekdi , Facebook https://www.facebook.com/photo

Figure 10: Exotic Specied-Gliricidiasepium (Giripushp), Source: Instagram

The failed efforts of the British to afforest the hills were later replaced by the efforts of the Forest Department. As a result of the Forest Department's monotonous tree planting in 1950, a dense rye of the exotic tree Gliricidia sepium was formed on Vetal Hill by 1964. In the year 1973, there are records of the planting of exotic as well as some native trees by the forest department on the hill.

The British planted trees for the sole purpose of producing timber. In the post-independence period, it was transformed into a nutritious, firewood and fodder plantation. Even after 1970, there seems to be a tendency towards developing parks for forestry exhibitions and the recreation of citizens.
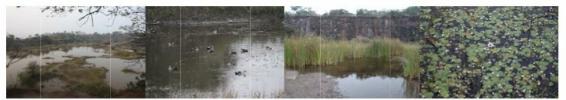
Figure 11: Changing Landscape Pattern of Vetal Tekdi, Pune. Source:Author

Research comparing floristic surveys made for the tekdis between 1901 and 1997 discovered the extinction of 72 native species, the majority of which were tuberous plants like -Dipcadi montanum (Dipkadi), Ceropegia bulbosa (Khachurdi), Habenarialongicalcarata (Sheput-habeamari) and a few deciduous trees like Schrebera swietenioides (Mokha), Garuga pinnata (Kakad), Buchanania lanzan (charoli)

Due to the huge collection of water, the abandoned quarry has created a new ecosystem with related marshy areas that are a shelter for many species of birds, amphibians and plant species that

require such settings for their growth. During the monsoon season, the quarry transforms into a wetland, attracting a variety of aquatic birds.

Figure 12: Abandoned quarry on Vetal Tekdi, Pune.Source: Author

4. Threats:

The region has been exposed to a variety of anthropogenic stressors in recent years. Plantation of exotic species, urban development, tree chopping, and encroachment on hill slopes are a few examples. Various afforestation efforts, either by the Pune Municipal Corporation or the state forest department, have resulted in the emergence of many beautiful and exotic species.

Figure 13: Anthropogenic activities on Vetal Tekdi. Source :www.facebook.com/groups/vetaltekdi

To reduce traffic congestion at Nal Stop Chowk, a new route linking Balbharati and Paud Phata is proposed. The road will go through a roughly two-kilometer area of woodland on Vetal Hill, removing completely matured and grown trees. The greatest of the five major aquifers that supply water to Pune is beneath the Vetal Tekadi-Chatushringi complex. As a result, if a road is built over the aquifer, groundwater levels will be affected. The proposed bypass will introduce traffic pollution, noise, and congestion into the heart of the green space at the foot and lower ridge of the Vetal hill. This is a disastrous project that would ruin one of Pune's few pristine green regions. Several citizen organizations and campaigners have come out against the project. Twelve non-governmental organizations (NGOs) have sent a letter to the PMC opposing the route. A blog and an online petition were launched to halt the road's development. Nagrik Chetana Manch filed a PIL at the Mumbai High Court, and the HC halted the road's development.

The Proposed BB-PP Link Road 2.1 km in length, 30 m width; connecting Paud Road with Senapati Bapat Road

Figure 14: Plan of Pune showing the propose BB-PP Link Road. Source:citizenmatters.in

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Figure 15: Construction activity on Vetal Tekdi. Source:www.mypunepulse.com

PMC halts the construction of a 20-foot-wide road to the top of their part of the tekdi undertaken by MIT, a prominent educational institute in the city. Their stated goal is to provide a) an access route for water to a proposed park at the top and b) an alternate path for their students from Paud Road. The excavation, which took place covertly around Diwali in November 2020, caused irreversible damage to the hill. Residents informed PMC, who visited the site and halted development since required approvals had not been obtained or given. MIT has now filed for authorization and aims to build the road despite strong resistance from local people and citizen organisations from throughout the country.

5. Conclusions:

Historical evidence from the previous several centuries suggests that the hills did, in fact, support such open ecosystems, particularly those species suited to more dry climatic conditions and thin soil cover. During the dry season, dry, deciduous trees drop their leaves, and grasses dry out. The hills will never appear lush and green all year round. That is the system's biological nature! In the rush to green the hills, we will gradually lose vegetation that is essentially characteristic of such landscapes, as well as perhaps other dependent wildlife.Over the previous two decades, the city has lost hill after hill as a result of the development boom. The beauty of the Sahyadri hills that surround Pune defines its geography.Politicians and bureaucrats, as well as the general public, have taken them for granted.Urban green spaces may sustain large biodiversity and are extremely important because they help to mitigate the urban heat island phenomenon, sequester carbon, replenish groundwater, and offer ideal habitat for rare and endemic species. Vetal Hill and its surrounding hills are an example of an urban forest that offers essential ecological services to the city of Pune. Isn't the tekdi worth conserving for these reasons?As citizens, we must critically consider if and how much we wish to intervene and manipulate the vegetation of the hills. We must remember the land's rich ecological and cultural past. Otherwise, the valuable urban forest at the city's centre may be gone to us forever.

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Understanding Sacred Landscape Along River Kukadi Near Nighoj, At Ahmednagar District

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ABSTRACT:

The relation between rivers and temple is very ancient even before the medieval period. Rivers play an important role in the life of the people. Many Hindu rites are carried out on the river banks. The temples on the river banks have brought recognition to the Rivers.Indianrivers have strong mythological belief and they are considered as scared.

Kukadi River the tributary of Ghod River flows through Maharashtra and source of the Ghodriver is at Naneghat. Kukadiriver originates at Kukdeshwar on the Sahyadrimathya near Jeevdhanfort.On the banks of the Kukadi River is the Malganga temple in Ahmednagar district. The place has gained importance as pilgrim site. There is a mythological belief associated with Goddess and river. The River Kukadi has gained importance due to the presence of potholes known as 'Potholes of Nighoj'. This is a geological phenomenon where the pebbles that are carried by the river get locked in the cracks developed in the basalt rock riverbed. These pebbles swirl around due to the water current & form pot shaped cavities in the basalt rock.

There are myths associated with the potholes and due to the mythological, historical and geological importance of this area, it becomes necessary to study the sacred landscapes along the river Kukadi. This paper attempts to understand the concept of sacred landscapes, with the case of Kukadi River and surrounding temples and visitors association with this landscape.

Keywords: Sacred landscape, cultural landscape, River Kukadi, Malganga Goddess, Potholes (Kund), Pilgrim

1   INTRODUCTION

1.1 Background

In India, rivers are not just considered asa source of water but also worshiped as deities. The rivers have been given a divine status in the Hindu mythology. There is a strong bond and association between religious places andthe rivers. Many stories are related with the rivers and the temples on the banks. In the Vedas the holiness of the rivers are described in the form of a poems and shlokas. Many famous temples in India that are located on the river banks and Rivers are considered as sacred together making theplace a sacred landscape. The temple of Goddess Malganga is situated on the banks of River Kukadi, which has the geological formations of potholes. The mythological belief about the formation of potholes and divine faith in goddess attracts number of pilgrims. A number of other temples are seen in its vicinity. This arouses curiosity to understand the relation between Malganga goddess, River Kukadi, potholes (kund), and other temples for making it a sacred landscape.

1.2 Context

Figure1.LocationofIndia,MaharashtrawithAhmednagar District –Parner taluka.

1.3 Aim:

- Tostudytheconceptofsacredlandscapes,KukadiRiver,surroundingtemplesandvisitorsassociationw ith thislandscape.
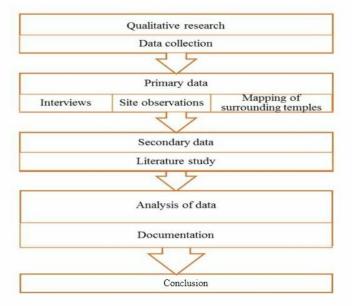
1.4 Objectives:

- Tounderstandtheconceptofsacredlandscape.
- TostudylandscapeofRiverKukadiand Potholes (Kunds).
- Mappingandinventoryofthesurroundingtemplesinthevicinity.
- Tounderstandtheassociationofvisitorsandlocalswiththelandscape.

1.5 Methodology:

- Flowchart

1.6 Methodof datacollection

The qualitative research method is chosen for this paper.Literature study was carried out to understand the concept of sacred landscape, sense of space and conservation initiatives.Interview schedule was carried out to collect data regarding the association of the visitors with place along with Observational and photographic study. Mapping and measure drawing of the temples in the vicinity was done during the site visit. A detail inventory of all the temples is presented the paper.

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1.7 Scopeandlimitations

The scope of study is 2 kilometres radius along River Kukadi.Thefield study is limited to the period of three months from December 2018 to February 2019.

2 LITERATURESTUDY

2.1 Conceptofsacredlandscape

The sacred landscapes are known as "tirtha" in Sanskrit literature and Hindu mythologies. Divinity together with accessibility of pilgrims makes a landscape sacred. A landscape is sacred because humans perceive it as sacred. The role of cosmic mystery and the inclination to find one's own identity is sacred (Rana.P.B.Singh 1995). Sacred landscape is depicted as knowledge of the past and a bond to the future generation.

The power of sacred processes makes the place sacred. Mythological description of these sacred landscapes helps to develop variety of images and myths. This landscape is of faith, belief system and a state of spiritual consciousness (Silverman 1994). As the ceremonial rituals are carried out the place becomes sacred. It is an ordinary place, made extraordinary because of certain ritual acts that are performed there, setting it apart as unique. These landscapes work as communicating systems and have power. It can be expressed as nature, the sky above, the ground beneath, and the horizon binding the two provide the basic frame as theologically expressed: sky the father and earth the mother. The sacral power perceived by human being in history was in fact a realization of nature-spirit. Sacred landscape as system is described as man and his interaction with its form an intricate system - some visible, but many invisible. This system in itself is a part of belief that implies a faith in man as essentially omniscient (Rana.P.B.Singh 1995).

2.2 Attributesofsacredlandscape

Figure 1 Source:Literaturestudyofsacredlandscape

3   SACRED LANDSCAPES ALONG KUKADI RIVER

Water is one of the components of the sacred landscape. It is humble but essential ingredient of life. The role of water is more significant than it appears and is a sacred space in its own right. Thus water is a spiritual source of life – sacred water (Altman. N 2002). In India many rivers have their sources in Himalayas which is considered to be the home of many Deities. In the Hindu scriptures the respect for the rivers is mentioned as the waters flowing from heaven to earth, andtaking a dip in the same will show the path to heaven. A river gains a traditional value and the place becomes devotional. The rites after the death are also done on the river banks.It is a credence that by doing this a personrejoices in heaven and gets rebirth. Riversare considered as care takers, like mothers(Baedekar2009).Thereforetheyactasmagnets for practical   and   celebration purposes.Theriversareultimatesymbolofpuritywhichflowseverywhereintheuniverse.Water becomes sacred when we understanditsqualitytosustainhumans,plantsandanimallife.Waterisconsideredtogivewisdom and inspiration to humans. It alsohas medicinal qualities attached to it. Therelation between people and water is evidentandstrong (NkJaiswal 2012).

3.1 RiverKukadi

Ghod River is located in Pune District, Maharashtra, and western India and a tributary of the Bhima River. It has its origin in the Western Ghats at 1,090 metres (3,580 ft) on the eastern slopes, above sealevel. Before its confluence with Bhima it flows for approximately 200 kilometers in east – southeast direction. Sahyadri Hills are to its northern side. The Ghod Dam is constructed on the river. The Kukadi River which is the eastern tributary of Ghod River, originates in the Western Ghats near Naneghat. The river situated outside Nighoj, near Shirur passesfrom north of Junnar. The Kukadi River flows between Pune and Ahmednagar district.

3.2 Potholes(Kunds)

The   Kukadi   riverbed   is characterizedbypotholes(kunds).TheyarealsoknownasRanjankhalgeatNighoj(Ahmednagargazetteer).Itis believed that Goddess formed the potholeswithherfingernailsoveranight and isknownas Kundamauli.The geological explanation of potholes formationis that they are cylindrical holes drilled intothebedofariverand varyindepthfromcentimeters to meters. In the upper coursewhere the force of the water is more, thepotholesare formed.The load isheavy intheuppercoursewhichistransportedbytraction along the river bed.   When   flowingwaterencountersbedload,itisforcedoveritanddowncutsbehindthebedloadforming swirlingeddiecurrents.Theriverbediseroded by these currents creating small craters.Due to the rotation of the pebbles potholesareformed inthe rockoveraperiodofmany years. Potholes have a smooth interior with a circular form.

3.3 StoryofMalgangaGoddess

In   India   there   are   fifty   one   Shaktipeeth,   ofwhich   three   and   the   half   are   in Maharashtraalone.TheyareMahalaxmiatKolhapur,RenukaofMahurgadh,TuljabhavaniatTuljapur   and   the half is Saptashrungi at Vaniin Nashik. Malganga Goddess is believed to be originallyGoddessParvati and is situated atNighoj,Parnertaluka,inAhmednagardistrict.Shecameintobeingofherownaccord. There is a myth attached to Goddess's settling at Nighoj. Many demons like MadhuKaithabh,Mahishasura,Durgasur, and Dhumraksh began to torture all the Gods and people. Atthat time all the Godswent to Lord Shivaand requested him to destroy all the demonsand thenLordShivaaskedParvatitotakeanincarnation, to destroy the giant   demons   onearth.So,Malgangacametoearthwithher sevensisters.AllthesevensisterswhofoughtwithDhumrakshaandtheplace where he was killed by Malgangaisknown   as   "Dhumnya   Hill"   near

Chincholi.TheysettledatDholavad,Chincholi,Karandi,Darewadi,Belapur,Umbrajafterwinning the fight with demons. To protectthepeopleMalgangaGoddesssettledatNighoj. TemplesofLordShiva, LordGanesh,LordBhiravnathandnumberofothertemples aresituated in the vicinity.

Figure 2.Kukadiriverand Potholes *Source - Sitevisit* Figure3.Kukadiriverand Potholes*Source -Sitevisit*

Figure4.MalgangadeviandPotholealongkukadirive
r*Source–Malgangagraminvikastrust,Nighojbooklet*
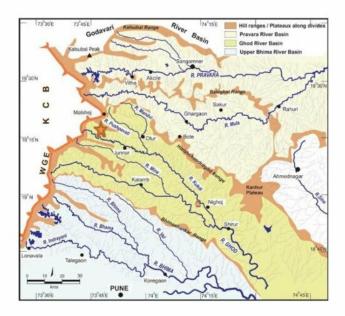
Figure5.Imageshowingtribut aryofGhod River– KukadiRiver.
Source:DeccanPlateauuplift: insightsfrompartsofWesternUpla nds,Maharashtra,India

3.4 Mapshowingthelocation of Malgangatempleand othertemplesinitsvicinity
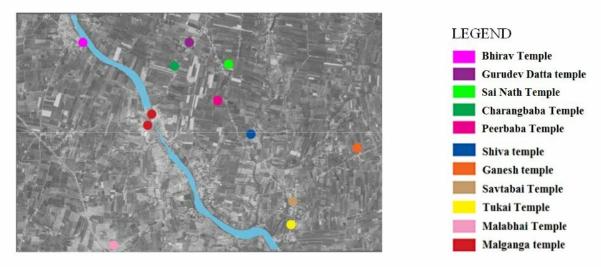
Figure6.GoogleMapshowingthelocationoftheMalganga
TempleandotherTemplesinitsvicinity *Source– Googleearthand sitevisit*

3.5 Pilgrimage

Traveling for visiting the temples is a veryancientformoftourisminIndia.Thisismotivated by a number of reasons,
rangingfromdeeplyreligioustoplaincuriosities.Pilgrimageisasourceofinspirationforunderstandingadeeplyrooted andlastingrelationshipwithMotherEarth(KiranShinde).Thecoreofpilgrimagestudiesmovesaroundthestudy ofsacredplaces(sacred landscape), as sacred journey. It isnecessary to develop a view of pilgrimagenotmerelyasafieldofrelationsoraculturaltraditionbutalsoasarealismofcompetingdiscourseswithth ecosmos(sayit sacred ecology, or sacroecology) (KiranShinde). In modern societies, many peopletraveltosacredsiteswiththepurposeofachievingboth,religiousandrecreationalneeds.
Hence pilgrimage also plays a vital role intransforminglandscapesintoasacredlandscape.
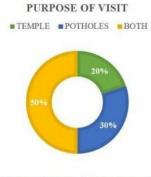
3.6 Findingsoftheinventoryofsurroundingtemples

The temples situated in surrounding are theprotectors of Malganga Goddess, having astrongmythologicalassociation.Thearchitectural characters of these temples aremoreorlessthesame.Thelandscapecharacter of the temple precinct is almost thesame dominated byfarmlands.

3.5 INVENTORY OF TEMPLES IN THE VICINITY

DEITY	DESCRIPTION	SIGNIFICANCE	PHOTO	PLAN (dim in mtrs)
LORD SHIVA	Lord Shiva – the protector, the destroyer (of evil) and regenerator of the universe and all life. Malganga Devi is a incarnation of Goddess of Reunka devi who is Goddess Parvati in origin. Parvati is the wife of the Lord Shiva.	To protect his wife from Demons Lord Shiva settled near the Devi.		
LORD GANESHA	Lord Ganesha is one of the most revered and loved Hindu God. He is also one of the most commonly associated symbols of Hinduism, besides His (Hindu deity) father Shiva.	To protect his parents and to remain close to them.		
LORD BHAIRAV	Lord Bhairav or Bhairon is an incarnation (avatar) of Lord Shiva. Lord Bhairav is widely worshipped by tantriks and yogis to gain various siddhis. Bhairon is regarded as the protector and the kotwal. Bhairav is a fierce form of Shiva. Worship of Lord Bhairon is very useful to win over your enemies and success.	Lord Bhairav is considered as the protector from enemies. The temple is near Malganga Goddess is to protect her from demons as there was fight between demons and Devi.		
GURUDEV DATTA	Gurudev Datta is an avatar of Lord Shiva. Gurudev Datta was a very powerful saint and a talented yogi. Shri Datta is the God known for his teaching and showing correct path. It is also believed that he always help people in difficulties.	To Protect Devi as Lord Datta is avatar of Lord Shiva and also to have his blessings in all forms and his protection for farmlands.		
SAI NATH	Sai Nath, also known as Shirdi Sai Baba, was an Indian spiritual master who is regarded by his devotees as a saint, a fakir, a satguru and an incarnation (avatar) of Lord Shiva and Dattatreya.	To Protect Devi as Sai Nath is avatar of Lord Shiva and also to have his blessings in all forms and his protection for farmlands.		
MALGANGA DEVI	As Malganga Devi is self - originated Goddess worshiped to a large extent in the village. Local people have very strong belief and faith in the Goddess.	Due to belief and faith in Devi local people of village have built many temples of the Devi to have her blessings on the people.		
TUKAI MATA	Tukai Devi is one of the well-known Goddess in India. She is known as "Avatar" of Devi Bhavani who killed "Raktabeej" for well-being of mankind.	Well-being of mankind and protection of fields.		
PEERBABA	Peerbaba is the local deity.	Well-being of mankind and protection of fields.		
CHARANGBABA	Charangbaba is the local deity.	Well-being of mankind and protection of fields.		
SAVATABAI DEVI	Savatabai is the local deity.	Well-being of mankind and protection of fields		

3.7 The association of visitors and villagers with the landscape - findings

To understand this association a questionnaire was formed and interviews of twenty locals and visitors each was taken. The data collected was analyzed and the findings are presented.

PURPOSE OF VISIT

■ TEMPLE ■ POTHOLES ■ BOTH

Purpose of visit - 70% of visitors comes to see Potholes and Malganga Goddess. The 30% who visit the site are mainly for recreation, Photo-shoots, students and researchers.

HISTORY OF MALGANGA DEVI

■ VILLAGERS ■ TOURIST

History of Malganga temple- 80%, villagers are well-versed with the history. They received this information from their ancestors. The 20% visitors had very little information.

INFORMATION ON OTHER TEMPLES IN VICINITY

■ VILLAGERS ■ TOURIST
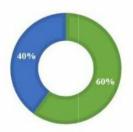
Information on other temples in the vicinity
-
The residents forming 90% knew the significance of other temples thoroughly. Whereas 10% of visitors have meager information about the same.

NAME AND INFORMATION OF THE RIVER

■ VILLAGERS ■ TOURIST

InformationoftheKukadiRiver-Thevillagers- 60% of the total, havecompleteinformationregardingtheriver.Therest40%whoarethevisitorshavegeneralinformation

FORMATION OF POTHOLES
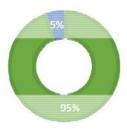
■ VILLAGERS ■ TOURIST

Formation of potholes -80% of the villagers have information on theformation. But there are two theories to it.The first is mythological which is related totheGoddess.Theotheristhegeologicaltheory. The remaining 20% of the visitorsknewfrom the information displayedonthe boards.

ASSOCIATION OF VISITORS AND VILLAGERS WITH THE LANDSCAPE

■ YES ■ NO

Association of visitors and villagers with thelandscape- 95%wereassociatedwiththe Goddess, River and Potholes. 5% have verylittleassociation with the sacred landscape

4 CONCLUSION

<mark>A sacred Landscape is a natural feature of anareaofland,waterandvegetationhavingspecialspiritualsignificancelike immense faith, belief, mythology, history and divinitytopeopleandcommunities.Thepaperrevealstheconceptofsacredlandscapealong the Kukadi</mark>

Pravara Rural College Of Architecture, Loni

River.The potholes thatare formed along the Kukadi River enhancethe importanceoftheriver.The originofthe potholeshastwotheories–Mythologicaland geological. The presence of MalgangaGoddess has rendered the whole landscape asacrednessmakingitintoasacredlandscape.

As the formation of potholes is a geologicalwonder, and are massive in size, theyhavegained a place in Guinness book of worldrecordsin1990.But,thereislackofawarenessandmanagementofexistinglandscape.ItisnecessaryforvisitorstoknowindetailtheinformationoftheGoddess, Potholes and Kukadi River. Thiscanbeachievedthroughdisplayingvideoandinformationboards.Thiswillcreateawarenessforconservationandmanagement.

5   ACKNOWLEDGMENTS

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7 APPENDIX

Somephrase,poemandsomewritingsrelatedto religion,pilgrimageandrivers.

TheSocietyofPilgrimageStudies(India)hasrecentlycategorizedthe themesand Issuesconcerningpilgrimagestudiesunder eleven focal themes (cf. National Geog. Jl.India,vol.40,1994:286),andaSeminarwas alsoheld (January21-23,1995):

PilgrimageStudies:theories,emergingtrends,sourcesofstudies.

ConceptualFrame:Sacralityandspiritualquest,environmental interaction. CosmicPurviewandSacredEcology:Sacredgeometry,cosmicand pilgrimage mandala, archetypalview.

HistoricalOutline:Originandgrowthofsacredscapes,patronageandprocess.

7.7.1.1 TravelGenre:Distance,cost,motivation,circulation,seasonality,densityand mode.Typology and Hierarchy:Sacredscapes-pilgrimage-pilgrims_varieties,networksand linkages.

7.7.1.2 SacredTime:Auspiciousnessandastronomy,calendars,timegeometry.

7.7.1.3 SacredRituals:Ritualizationprocess

_ functions and meanings, festivities,economics,organizations.

7.7.1.4   SacredFunctionaries:Followers,records,   relationship,   multi-religiousperformances,roleand impacts.

Landscapes…can be read, that is, observedand interpreted as representations signs andsymbols-thatencodemeanings.Theyrepresent   cultural   narratives, communicatingcentraltenetsofcultureandwaysoflife(Sinha2006: 4).

Onthebanks of this river of life,
My heart swings and my life swings,
I drown and gulp in the currents
Beyond thereach ofgrand thought
My heart swings and my life swings…
Noonewill staywith youforever,
We will all go down the same pathOldor young. .
Whoarewe?
Where are we from?Wherewillwegoto?
Wedeceiveourselves,Bhabathemadmansays,
Exultinginmomentsoflaughter,tearsandplay.
We'lldrowninendlesswaters
Caughtinthisearthlymandalaofillusionanddesire
Myheart swings andmy spiritswings

BhabaPagla 20th century (Cited in Sen2007:4).

Hindu Mythological Festivals: A boon or curse to nature?

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Abstract:

Hindu festivals in Maharashtra have a strong association with conservation of nature. The preservance, conservation and protection of plants in nature is embedded deep into Hindu rituals, beliefs and festivals.

Festivals associated with plants like Vat- Savitri, Ganesh puja, Dussehra and Holi are key examples of how festivals are deeply associated with nature conservation. If we observe the relationship between seasons and festivals, we understand the key reason for placement of these festivals in Hindu calendar. Some festivals are **'markers of season change'** like Vat-Savitri and Dassehra.

Some festivals function for our Physical and Mental well- being and some for environmental well-being. Mythological stories got associated with these festivals to promote conservation of plants, indirectly helping us live in harmony with nature.

Today due to growing population and urbanization this awareness about the relationship between festivals and nature is diminishing, resulting in damage to nature. This discrepancy or gap in understanding this equation between man and nature should be addressed for our survival.

This paper aims at finding out the issues related to this awareness and also suggesting alternatives which fulfil the same purpose but with nature conservation in mind. Four Hindu festivals Vat- Savitri, Ganesh puja, Dussehra and Holi are selected based on their occurrence in Hindu calendar as per the season and hence they are **'markers of the season'**. Change in season and its effect on plants and human beings is very crucial and so these festivals originated for our holistic well-being.

These four festivals are studied from the point of view of their relation with season and seasonal change effect on our well-being and its awareness today.

Keywords:

Hindu Mythology, Festivals in Maharashtra, Ecology

1. Introduction:

Living in correlation with nature is an inherent part of Indian Hindu culture. Many Hindu festivals in Maharashtra have a deep connection between man, nature and society. The significance of the various indigenous festivals is celebration of Mother Nature and her power.

A festival in which nature is worshipped clearly indicates that we need to conserve nature. Therefore, festivals act as reminders to people to conserve nature and protect natural resources from destruction.

Hindu mythology talks about festivals are directly connected to environment. In these festivals celebration people worship Sun, Moon and nine Planets, Waters collected from the seven rivers, Soil samples collected from seven sources, nine types of food grains, five types of fruits, etc. All these natural elements are worshiped only for getting the blessings from the resources from where these samples have been collected.

The worshiper prays for sustainability of these resources so that he and his family shall get ample Sunlight, Breeze, Water, Material and Food throughout their stay in the premises.

Tree association with festivals has some scientific reasons for their conservation and worshiping.

Festivals—such as the **Vatsavitri, Ganesh Puja, Dassra & Holi** have associations with trees.

Association of trees with festivals was derived through deeply grounded Vedas & Puranas, change in climate, medicinal value & their conservation.

1.1 Need of the Topic:

Nowadays people celebrate festivals in ways that defeat the whole purpose to worship nature. Festivals such as Vat-Pournima, Ganesh Puja, Dassara & Holi are fundamentally linked with Plants and carry the eternal message of protecting and being in harmony with nature.

But the awareness and enthusiasm regarding the importance of nature conservation is very low. Today knowingly or unknowingly we are destructing nature by cutting the trees, branches or leaves in the wake of worshiping them.

1.2 Aim:

To analyze the present scenario, regarding awareness about the relationship between nature and Hindu festivals.

Objective:

- To understand the ecological significance of festivals.
- To understand/evaluate the current scenario with respect to its awareness regarding festival information.
- Give recommendations or suggestions to mitigate the issues identified.

To address aim, this study is undertaken in two parts-

Part 1 -This part deals with understanding the significance through literature, books and interviews.

Part 2 -This part deals with understanding the present scenario through Google questionnaire, news articles and interviews.

1.3 Scope and Limitations:

- The scope of this research includes the study of socio culture, mythological and ecological significance of only 4 festivals in Maharashtra.
- This research also includes the study of only plants associated with festivals.

2. Literature Review:

Book "सण-वार व संस्कार "-Dr.Anjali Joglekar

This book is combination of mythological, religious practices and the science. Author has well explained all these rituals in scientific way considering today's scenario.

This book elaborately describes the festival coming in each month as per Hindu calendar and their association with nature. The importance of trees considering their environmental and medicine significance is also mentioned, which is further discussed in detail in this paper.

Interview with Dr. Anjali Joglekar :

In our Hindu culture Puja and Naivedyam is very important in all festivals. All seasonal items are used in these rituals.

Our Marathi culture is really appreciated because it adheres to science. In the past, society was religious so science has been associated with religion to hold it. But it is our misfortune that we forgot the science and only rituals are remained.

Interview with Dr.Sachin Punekar:

Earlier all family members used to collect Puja leaves from gardens, surrounding areas, farmlands, Riverside plants etc. considering "निसर्ग पर्यटन आणि वर्षा पर्यटन".

But now a days thousands of rare, medicinal and endemic plants of the Western Ghat were cutdown to trade in the city's market during the festival. He mentioned that thousands of flowers, stalks and sometimes the whole plant has been removed from their habitat.

A plant locally called Shami (Prosopis cineraria) is one of the 21 leaves in Ganesh Puja. "But since this plant is found in Rajasthan, a locally available plant Khair (Acacia catechu) is often substituted." Acacia catechu is a shrub that is a habitat for bees, beetles, ants and spiders. All these would be affected by the loss of the plant.

3. Methods and Methodology:

4. Data Collection – Part A

Table 1: Season and associated festivals

मराठी ऋतू	वसंत Vasant	ग्रीष्म Grishma	वर्षा Varsha	शरद Sharad	हेमंत Hemant	शिशिर Shishir
Seasons	Spring	Summer	Monsoon	Autumn	Pre-winter	Winter
Weather	Mild	Weather grows hotter	Rain heavily	Hot weather recedes gradually	Weather becomes colder	Coldest
English Month	February-mid to April-Mid	April- mid to June	June- mid to August	September to October	November-mid to December	January to February mid
मराठी महिने	चैत्र-वैशाख	ज्येष्ठ-आषाढ	श्रावण-भाद्रपद	अश्विन-कार्तिक	मार्गशीर्ष-पौष	माघ-फाल्गुन
मराठी-मुख्य सण	गुढीपाडवा, राम नवमी वसंत पंचमी	वटसावित्री	रक्षाबंधन, गोकुळाष्टमी हरतालिका गणेश पूजा	नवरात्री, दसरा	दिवाळी	मकर संक्रांति, शिवरात्र, होळी

Festivals	Plant Associations	Environmental Significance	Socio-Cultural Significance	Mythological Significance
1.Vat-Savitri Figure No. 1 Vat Savitri Puja	*Botanical Name: Ficus benghalensis* Common Name: Banyan Tree / Vad Native & Evergreen Figure No. 2 Banayan Tree	Banyans are strangler figs. They grow from seeds that land on other trees. The roots they send down smother their hosts and grow into stout, branch-supporting pillars that resemble new tree trunks.	Vatsavitri Puja is a symbol of continuity, ancient wisdom and longevity. Banyan is a religious plant in Indian culture, most commonly worshipped. Vat-Pournima is celebrated in Maharashtra to pray for the longevity and good health of the husband. The life span of Banyan tree is more than 100 years, hence it is called is as 'Akshay Vriksah'.	This festival is celebrated in the honour of Goddess Savitri who rescued her husband's soul from the throws of Yama.
3.Dassara / Vijayadashami Figure No. 3 Apta leaves with Diya	*Botanical Name: Bauhinia Racemosa* Common Name : Apta / Bidi-leaf tree Native & Deciduous Figure No. 4 Apta Leaves *Botanical Name: Prosopsis cineraria* Common Name : Shami Tree Native & Deciduous Figure No. 5 Shami Tree *Botanical Name: Mangifera indica* Common Name : Mango / Amba Native & Deciduous Figure No. 6 Mango Tree	The term 'deciduous tree' refers to a tree that sheds all of its leaves seasonally during the fall months and then enters a cycle of dormancy and finally growing new leaves in early spring. So, we pluck the leaves of all these trees for this festival, the term called "cleaning up of environment" Other important significances of all these trees: 1.Biodiversity conservation 2.Habitat for bird & animals 3.Soil and Water resources conservation 4. Regeneration 5. Compensation for carbon emission	On Dussehra / Vijayadasami people distribute leaves of Apta, or Apati tree leaves. In this ritual, Apta tree leaves symbolically represents gold or Sona. On the eve of Dussehra, multiple ancient historical events occurred, that marked the victory of truth over evil.	God of wealth 'Kubera' himself converted millions of Apta leaves into gold to help an honorable scholar 'Kautsya' to pay 'Guru-Dakshina' (Fees). Kautsya accepted only the ones he needed & the rest were distributed among residents of 'Ayodhya.

Festivals	Plant Associations	Environmental Significance	Socio-Cultural Significance	Mythological Significance
2. Ganesh Puja Figure No. 7 Ganesh Puja	1. Terminalia arjuna (Arjun/ अर्जुन) 2. Sesbania grandiflora (Agati/ हातगा) 3. Achyranthes Aspera (Prickly Chaff Flower/ आघाडा) 4. Nerium Indicum (Oleander/ कण्हेर) 5. Pandanus odoratissimus (Kewda/ केवडा) 6. Jasminum auriculatum (Juhi/ जाई) 7. Punica granatum (Pomegranate/ डाळिंब) 8. Solanum indicum (Indian nightshade/ रानवांगं) 9. Cynodon dactylon (Bermuda grass/ दूर्वा) 10. Cedrus deodara (Deodar/ देवदार) 11. Ocimum sanctum (Holy basil/ तुळस) 12. Datura innoxia (Datura/ धोतरा) 13. Ficus religiosa (Holy Ficus/ पिंपळ) 14. Aegle marmelos (Bel, बेल) 15. Ziziphus mauritiana (Ber, बोर) 16. Origanum majorana (Marjoram, मारवा) 17. Eclipta erecta (False Daisy, माका) 18. Jasminum sambac (मोगरा) 19. Evolvulus alsinoides (विष्णुकांत) 20. Calotropis procera (Rubber bush, रुई) 21. Prosopis spicigera (Khejri tree, शमी)	All these plants have medicinal values. All these are indigenous species, upon which number of insects and animals are directly dependent for their food and shelter.	Historically, the festival has been celebrated since the time of King Shivaji. It was during India's freedom struggle that Lokmanya Tilak changed Ganesh Chaturthi from a private celebration to a grand public festival where people from all castes of the society can come together, pray and be united.	Goddess Parvati create the bay Ganesha with Sandalwood. She asked him to guard the entrance while she takes a bath. When Lord Shiva comes at the entrance, Baby Ganesh stops him from entering and doesn't allow him to pass. Enraged in anger, lord Shiva cut the head of baby Ganesha. After knowing this, Goddess Parvati gets upset & heartbroken. Seeing Goddess Parvati in tears & grief, Lord Shiva promised to bring baby Ganesha back in life. He instructed his follower to find the living creature. They end up finding the head of the baby elephant, and that's how Lord Ganesha came back in life with the new look.

Festivals	Plant Associations	Environmental Significance	Socio-Cultural Significance	Mythological Significance
4. Holi Figure No. 8 Holi Bonfire	Dried Leaves, stems & wood of medicinal & native plants.	Holi is celebrated with arrival of spring. Deciduous trees shed their leaves in winter and summer begins to feel. The wind blows from Mahashivratri and weather starts getting hot. Changes in the climate increases pollution; so, Holi must be planned for this. The burning of dried leaves and wood of medicinal plant and cow dung cakes in many places at same time purifies polluted air.	Holi is the festive day to end and rid oneself of past errors, to end conflicts by meeting others, a day to forget and forgive. People pay or forgive debts, as well as deal anew with those in their lives. Holi also marks the start of spring, an occasion for people to enjoy the changing seasons and make new friends.	Hiranyakashyapu was a powerful demon king who wanted others to worship him like God. But his own son, Prahlad, was an ardent devotee of Lord Vishnu. Enraged by this, he tried to kill Prahlad by different means but could not succeed. Frustrated, he asked his sister 'Holika' (who had a cloak which prevented her from being burnt in fire), to trick Prahlad into entering a bonfire with her. Prahlad willingly entered the bonfire with 'Holika'. And such was the grace of God on Prahlad that the cloak slipped from 'Holika's' shoulder onto Prahlad's. Thus, 'Holika' got burnt to death while Prahlad came out unscathed. The 'Holika' bonfire that is lit on Holika Dahan is the symbolic victory of good over evil.

4. Data Collection – Part B

Present Scenario:

4.1. Google questionnaire survey:

It was important to study and analyse the present scenario, to understand how these festivals are celebrated. For the same, I took a survey of females, of varied age groups through Google questionnaire.

The Analysis of the answers to these questions, led to very interesting findings,

- Question 3: Out of all female group who took the survey, 54% are working women, 13% business women, 24% home maker & 9% are doing some other work.
- Question 4: Out of all the survey, 72% lived in a Residential Apartment and 28% lived in Bungalows. People live in flats have only balconies & terraces for plantation in pots.
- Question 5: Out of all the survey about tree plantation in past one year, 51% planted only 1-2 times, 22% did many times, 7% planted only 3-4 times and 20% never planted trees.
- Question 6:

6.निसर्गाशी किंवा वृक्षाशी निगडीत तुम्ही कोणते सण साजरे करतात?
96 responses

वटसावित्री — 19 (19.8%)
हरतालिका व गणेश चतुर्थी — 36 (37.5%)
दसरा — 41 (42.7%)
होळी — 27 (28.1%)
वरील सर्व — 55 (57.3%)
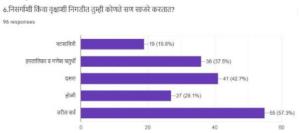
Figure No. 9 Graphics showing percentage

This Survey helped me to know correlation between festivals and nature.

- Question 7: **This Survey helped me to know awareness about festivals its associated plants.**
- Question 8:

8.तुम्ही वटसावित्रीची पूजा कशी करतात?
96 responses

वटवृक्ष जवळ जाऊन
फांदी आणून
बोनसाय झाड आणून
वटवृक्षाचे चित्र काढून
पूजा करतच नाही

36.5%
9.4%
49%
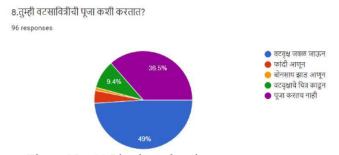
Figure No. 10 Pie chart showing percentage

Only 49% women does VatSavitri Puja near Banyan tree.

- Question 9: Some women said all these trees are not available in proximity so we bring branch of tree.
- Question10: Many women know the mythological significance but very few women know about scientific reasons behind these celebrations.
- Question 11: Other than scientific reasons very few women know about socio-cultural significance.
- Question 12: Out of all 48% celebrate festival as a family ritual, 43% know the Environmental & scientific Significance of celebration.
- Questions 13, 14 & 15: These questions are all about Literacy Campaign for Patri (Leaves) Awareness,
  Only 39% women know about 21 leaves required for Ganesh Puja and only 43% women aware about characteristics of all these Patri.

- Question 16:

16. पूजेला पत्री व फुले कुठून आणता?

96 responses

Figure No. 11 Graphics showing percentage

As the women have very less space for plantation, 53% women brought Patri and flowers from market.

- Questions17 and 18:

17.हे सण साजरे करताना होणारी वृक्षांची नासधूस थांबवावी यासाठी काही उपाय योजना असाव्यात असे आपणास वाटते का?

96 responses
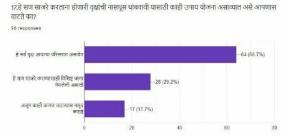
Figure No. 12 Graphics showing percentage

Recommendations as follows:

67% -all these trees should be planted in proximity.

29% - there should be dedicated space for celebration.

Do not pluck or cut flower and leaves more than requirement.

While celebrating festivals our first motto must be nature conservation and we should not destruct the nature.

- Question 19: For Holi bonfire 61% women uses cow dung, 50% use dried leaves & wood. 23% recommended do not celebrate Holi as it increases pollution.
- Question 20:

20. पूजेनंतर आपण त्या पत्रींचे व फुलांचे विघटन कसे करतात?

96 responses
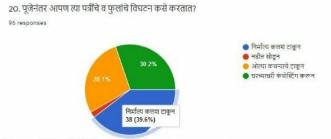
Figure No. 13 Pie chart showing percentage

Only 30% women used composting method for decomposition and 40% use Nirmalya kalash. This Survey helped me to know about environmental awareness.

4.2. Data Collection - News Articles:

"There has been no quantification on the damage as yet. But this is extremely worrying because if seasonal plants are harvested excessively, then pollination and multiplication are affected. These grasses and small plants are vital for soil conservation. There is an urgent need for an awareness drive," said Sunil Limaye, chief conservator of forests (wildlife), Pune Division.

Many who celebrate the festival prefer wild plants and exotic flowers owing to their attractiveness, despite their lack of significance in Puranas. These varieties are sourced from areas like Bhor, Raireshwar, Mulshi, Junnar, Waranda which are rich in bio-diversity.

"People ought to restrict themselves only to easily and extensively available Patris, like the traditional tulsi, bel or durva leaves," said botanist Dr. Shrikant Ingalhalikar.

Even medicinal and threatened species from the Northern Ghats are being affected, which affects insects like butterflies dependent on them, explained Dr. Punekar. (The Hindu APRIL 21, 2016 05:22 IST Ganesh festivities take a toll on rare plants)

पत्री जागृतीसाठी 'साक्षरता मोहीम

(Maharashtra TimesUpdated: 30 Aug 2017, 4:06 am)

Biospheres trying to create Patri Literacy
(ST CORRESPONDENT Published on : 29 Aug, 2017, 11:03 pm)

Greens aghast at sourcing leaves for rituals
(TNN / Sep 15, 2014, 00:42 IST)

Number of Apta trees decrease in city, environmentalist concerned

By Lokmat English Desk | Published: October 24, 2020 06:20 PM

फांद्यांची पूजा नको, नवीन झाड लावा

(Maharashtra TimesUpdated: 27 Jun 2018, 8:15 am)

आपट्याची पाने ओरबाडल्याने विणीच्या हंगामातील फुलपाखरे संकटात, पर्यावरणाचे नुकसान

सकाळ

Mon, November 29, 2021   E-Paper | Download App

Ganesh festivities take a toll on rare plants

(The Hindu PUNE, AUGUST 27, 2014 18:05 IST UPDATED: APRIL 21, 2016 05:22 IST)

5. Key Findings:

From the Google survey and data analysis, the following observations are strongly highlighted,

1. Age group of 50 and above were the only people who had some knowledge and awareness about nature - festival association.

2. Age group falling below 40 had little or no knowledge about this nature- festival association.

3. It also highlighted a stark reality that many plants required for celebrating these festivals, are no more a part of their surroundings. So it will create pressure on forest areas and ultimately forests are getting destructed.

4. Loss of forest results in loss of natural habitat and biodiversity.

6. Conclusion and Recommendations:

Plants and their association with festivals is very interesting topic but the mythological significance is the most accepted factor for conservation of nature.

Also aspects like environmental significance, socio-religious significance, and medicinal significance which need to be study for holistic understanding.

As deliberated in the research paper that "connecting people to nature" has been beautifully weaved into the lives of Maharashtrian people through their festivals, but regrettably remained unnoticed amongst the present day generation.

The above study conclude that,

- A variety of native plants which are used in these festivals should be a part of our surroundings. It will help us creating awareness.
- For achieving this **Landscape Architect** plays a vital role.
  1. We must plant these native trees in open spaces, small- and large-scale gardens, urban level parks which could be developed in sensitive manner considering environmental and socio-cultural aspects. Ultimately results in up-gradation and conservation of natural habitat and also it will decrease the destruction of forests.
  2. We must include all these plants in our plantation palette instead of prototype/monoculture plantation.
- Common people should take the ownership of their premises to sustain the natural resources.
- Such a type of developments will be supporting for conservation of native, endangered and endemic floral and faunal species.
- The public departments like Municipal corporations, Grampanchayat can take this parameter as a basis for their plantation programs which will automatically strengthen the concept of festival celebration along with their conservation.
- Awareness programs must be conducted through exhibitions.
- This nature - festival awareness should be a part of education in the formative years of children.
- Consideration and implementation of the above recommendations will definitely help us in bringing back the biodiversity lost from our cities and also will reconnect us and our future generations with nature. This awareness is of utmost importance to bridge the gap, which is caused due to the modernization.

7. Acknowledgement

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Conservation and Promotion of Rural heritage of historic town Aundh (District-Satara) for Cultural Tourism.

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Abstract: India is known for its heritage, natural and cultural resources in the form of tangible and intangible values. Temples, religion and associated mythology are an essential part of Hindu culture and such concentrations attracted patronage.

In Maharashtra, large number of temple towns or religious centres were settled because of the temple as the focal point and the settlement around. The places like Pandharpur, Aundh, Madurai etc. with temples of goddesses on hill and the settlement at foothill. This paper describes the historic town Aundh and its heritage potential to promote it for cultural tourism.

Aundh is a tirtha kshetra because of Mulpeetha of Shri Yamai Devi temple. The mythological association of the place and its built heritage and cultural, religious significance have shaped an interesting form of a settlement which shows different layers of development through cultural, traditional knowledge systems and flourished due to contribution of patronage. During British rule, Aundh was founded in 1699 by Parshuram Trimbak Pant was declared as a Maratha princely state, in the Deccan States Agency division of the Bombay Presidency.

In the historical layers, the development of Aundh under the patronage had remarkable architectural establishment like Rajwada of patron Shri Pant Pratinidhi, Yamai devi mulapeeth temple on hill and in town, bazzarpeth and museum consists of original paintings of patron and collection of Raja Ravi Verma's original paintings. As it has museum and Yamai Devi temple there is a sudden boost in number of tourists visit per day. It needs to be developed with conserving and restoring its integrity for the society, facing intense urban issues of economic developments, haphazard planning and negligence towards our heritage and cultural values have been documented and analysed in the study. Such towns with significance should be identified and protected as a whole for sustainable cultural heritage.

The documentation and analysis of the city's conditions, followed by policy development and applied conservation interventions that will reveal and maintain Aundh's rural heritage, as well as support to boost-up to become sustainable place for cultural tourism.

Keywords: *Rural heritage, Historic town, Cultural tourism, Promotion*

Introduction:

India is known for its heritage, natural and cultural resources in the form of tangible and intangible values. Temples, religion and associated mythology are an essential part of Hindu culture and such concentrations attracted patronage. A Historic town is a town which has a mythological as well as physical evidences from the past. A Rural heritage is a local architectural style based on the cultural and natural heritage in that region considering the values and traditions.
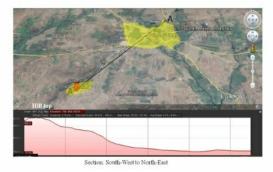
According to United Nation World Tourism Organization, a Cultural Tourism has a positive economic and social impact. A Cultural tourism includes architectural and archaeological treasures, festivals and events, historic / heritage sites/ monuments and landmarks. Museums, religious sites and temples etc. Aundh being a historic town; known for its rural and cultural heritage; can be conserved and promoted for cultural tourism is explored in this paper.

Aundh- Princely state: Aundh is a historic pilgrim town in Khatav Taluka (Satara District) of Maharashtra State, India, which was a Maratha Princely state in (1699–1947). Aundh sansthan's territory was not only at one single place but is expanded in surrounding places of three districts i.e., Satara, Solapur and Vijapur. There are two main water sources, one is from North-West to South -East and other is from North to South. Aundh accommodates total eight villages. The natural slope of the town is towards South direction.

Figure 1 Location map of Aundh

Figure 2 Topography of town

Natural features in the town: The town has hill in the North- West side on which the fortified temple is situated. The town contain five lakes (*Taali)* from which only two lakes are existing at present which are used to circulate water in the town. The town also has old wells called (*aad)* as water sources to fulfil people's daily need. *Odha* flows from the outer boundary of the gaothan area.

Occupation: There were factories and workshops for iron ploughs, water moats, wooden furniture and flour mills. Workshop started by Shri Balasaheb Pant Pratinidhi for stone sculptures and workshop for colour painting. Instruments repairing, Silver, gold, brass casting and coppersmiths were also there which were later on took over by government. In State prison of Aundh, carpets (*satranjya*) were made. There were two printing presses from which, one was under government and used for official printing of papers and gazettes. Jawar, Bajara, tur and sugar cane in some amounts are the main crops. The weekly bazaar in Aundh is on every Tuesday mainly for grains and animals like sheep and goats other than fruits and vegetables, cloths etc. which people get it from the nearby villages to sale.

History and evolution:
Etymology: In mythological stories, Aundh was a dense forest where demon named "Aundhasur" was killed in battle by Devi Shri Yamai. Aundhasur requested Yamai Devi and then later on by his name the village got named as Aundh, which is later on became Aundh Sansthan during Shri Pant Pratinidhi.
Physical history: Mythology: Aundh was a very small village. Maa Jagdamba is known as Yamai, Moklai & Tukaai. In village temples of these three Avtar off Maa Jagdamba are located. There is a plenty hilly area around Aundh. Out of which the temple on the hill where Maa Jagdamba climbed up is known as Mul Peeth (Original Destination). there is also a belief that it has been a residence of Lord Shiva & Parvati. Near Aundh towards North a mountain named as Shri Jotiba Mountain, it is also known as Natha's Place. People have belief that Shri Nath observes Maa Jagdamba from this place. There are many other stories related to Aundh.

Pravara Rural College Of Architecture, Loni

A devil named 'Aundhasur' had his territory of empire in the region called 'Dandakaranya' the same place where Aundh is located. He was very cruel. He killed plenty of Rushi Munies & many animals too. Once upon a time the Rushi in the forest decided to have '*Home Havan*; ceremony for praying god. Aundhasur was very annoyed on this approach of Munies. He started troubling them & breaking the 'Havan' ceremony. He harassed all of them & started killing them. Muni Ambarish approached to Maa Jagdamba prayed her for their protection. Maa Jagdamba with all her skills, weapons & power had a long battle with Aundhasur. It continued for days together. Ultimately Devi killed Aundhasur, by cutting of his head, he accepted his defeat & prayed Maa Jagdamba. As resemblance to this story the head statue of devil Aundhasur is observed exactly in front of Maa Yamai's temple main door in Aundh village. By the name of devil Aundhasur the village has named Aundh. (Gargate,)

Figure 3 Paintings of Battle between Devi and Aundhasur demon

Different historical layers:

The different historical layers can be traced in the village, starting from the references in mythological stories about the village, battle of Devi Yamai and Aundhasur, (Gargate,) references of *Taale (*lake), the temples around of Devi Moklai and Tukai and the village which was settled by Chalukya king during (500A.D-1200A.D.). In 1000A.D – 1150A.D. there are some references of Yadavas from Deogiri who ruled over Aundh. In 16th -17th century Adilshah was ruling on this area.

History of Kulkarni family: The family of the Pant Pratinidhi whose capital was at Aundh was descended from Trimbak Krishna the *Kulkarni* (accountant) of the village of Kinhai in the Koregaon sub-division of Satara. Parshuram Kulkarni is also recognized as the 'Pratham Purush' of 'Pant Pratinidhi' or king of Aundh.

Political history: In 1699 A.D. Aundh was placed as one of the Princely states in Maharashtra.

- The post during the 60's of the last centuries was a member of the Legislative Council of Bombay during the Governorship of Sir Bartle Frere. And finally, after that the Aundh State was merged in 1947.
- In 1690A.D., Rajaram, the youngest son of Shivaji raised Trimbak Parashu-ram Pant, who was in the service of Ramchandrapant Amatya to the rank of *Sardar*. He became a great favourite of Rajaram's and in 1698A.D. was made *pratinidhi* or viceroy.
- In 1699 A.D. his predecessor Timaji Hanmant, who had been taken prisoner by the Mughals, was set free and reappointed Pratinidhi and Parashurampant received the office of Peshwa or prime minister. (Found Princely state of Aundh).
- In 1700 A.D. on the death of Rajaram his widow Tarabai again appointed Parashuram *pratinidhi*.
- Parashuram left his appointment and in 1710 the office of *Pratinidhi* was given to Gagadhar Pralhad.
- On Gangadhar Pralhad's death in same year Parshuram was again restored. But in 1711A.D. the office was again taken from him and given to Narayan Pralhad.
- In 1713 A.D. Parashuram Pant was again restored and the office of *Pratinidhi* was made hereditary in his family.
- Parashuram died in 1717 A.D. and was succeeded by his second son Shrinivas as his eldest son Krishnaji was Pratinidhi of Vishalgad in Kolhapur State. Shrinivas also called as Shripatrao was during all his time Shahu's chief adviser. After his death in 1746 A.D. his younger brother Jagjivan was appointed to his post in the revolution that took place at Satara.
- Till 1754 Karad was capital of princely state and after 1754 AD when Karad got merged in British government the capital was shifted to Aundh.

- From early 18th century till 1806 Parshuram Trimbak was ruling on Aundh. It was stopped in 1806 because of Peshwa rule and again started ruling from 1811 till the time of merging in 1948.
- After the death of Shahu, Jagjivan and his *mutaliq* Yamaji Shivadev sided with Tarabai and plotted against the Peshwa. Consequently, Peshwa deposed him and the post passed on to Bhavanrav, the grandson of Krishnaji. It is unnecessary to follow the line of succession further. Suffice to say that the office of the Pratinidhis of Satara continued to be held in the same line, till after the extinction of Satara *gadi* in 1848, but Shrinivasrav who held the post during the 60's of the last centuries was a member of the Legislative Council of Bombay during the Governorship of Sir Bartle Frere.
- And finally, after that Aundh State was merged in 1948.

Table 1 Shri Pant Pratinidhi's architectural contribution in the development of Princely state Aundh:

PERIOD	PATRON	CONTRIBUTION
1848A.D-1901	Parshuramrao Shiniwas Pantpratinidhi. (Avaliya Thotepant)	More works of temple restorations (Bhagwat, 1846)
1869A.D	Parshuram Pant Pratinidhi	Mulapeeth Shri Yamai Devi Temple fortification restoration work
1882A.D-1901		Mulapeeth Shri Yamai Devi Temple fortification restoration work complete.
1901 AD		Started work of sabhamandap of temple in village below and made Vishalbaug.
1898A.D-1901		Started Shri Yamai highschool and free boarding
1909A.D-1947	Bhavanrao Shriniwas Pantpratinidhi. (Balasaheb)	Completed sabhamandap of temple in village below and installation of paintings in sabhamandap.
		Started Edward the 7th Hospital
1912A.D-1992	Bhavanrao Shriniwas Pantpratinidhi. (Balasaheb)	Established Grampanchayat in Aundh state which was 1st panchayat in India.
		Built 432 steps to the Mulapeeth Temple of Shri Yamai Devi on hill.
1994A.D-1996	Shripatrao Bhagavntrao Pant Pratinidhi.	Restoration of Temple shikhara (Mulapeeth)

Evidences of development of Princely state of Aundh under Shri Pant Pratinidhi:

Figure 4 Mulapeetha hill fortress, Lake (*Taale*), Shri Ram Panchavati

Figure 5 Dam, High School, Government Bungalow

Figure 6 Sabha-mandapa of Yamai Mandir, Library, Mandir

Figure 7 Aundh Lake (*Taale*)

Figure 8 Map of Jahagir

Figure 8 depicts map of old Jahagir awarded to Shri Parshuram Pant by Shri Shahu Maharaj in 1710 A.D

Evolution and different historical layers of the town:
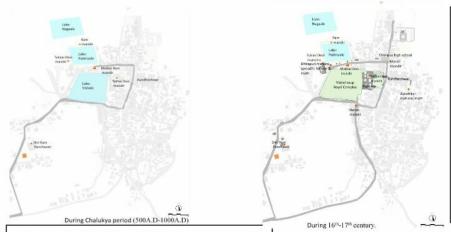
The different historical layers can be traced in the village, starting from the references in mythological stories about the village, battle of Devi Yamai and demon Aundhasur, references of lakes, the temples around of Devi Moklai and Tukai and the settlement from Chalukya period. Then Yadavas of Devgiri when they ruled over Aundh, entry of Aurangajeb in village, Pant Pratinidhi's major contribution in development of Aundh as Sansthan and development during colonial era.

The village was settled by Chalukya king during (500 A.D.- 1200A.D.) The development of historic town was started from the area near three existing lakes from which one lake is now not in existence. These lakes Nagale, Vishale and Padmale were the main water sources for the village These lakes and the temples of Devi Moklai, Tukai are in existence from ancient time.

Earliest references of these places in mythological stories found from Ramayana period.

Location of Aundh town with relation to Yamai Devi temple on hill (Mulapeeth)

In mythological stories during Ramayana
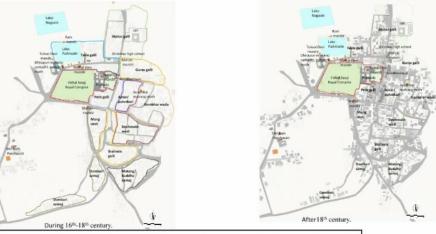
Figure 9 Location of Aundh Town with relation to Yamai Devi temple on hill

During Chalukya period (500A.D-1000A.D)

During 16th-17th century.

After the declaration of Aundh as a princely state in 1699 A.D. the Rajwada and jail was built and the lake Vishale was later on converted into garden called Vishal baug during 16th-17th century by patron Shri Pant Pratinidhi.

The hill fortress Yamai Devi temple and the settlement was formed by Chalukya king.
There are references of existence of three lakes from mythological stories.

During 16th-18th century.

After 18th century.

After 18th century till today the community residing in the town is still living in specific pockets or areas of the town. The lower community or lower caste people are resided at the outer side of the town towards the connecting approach roads.
And the new development also took place in the outer areas of the core historic or gaothan area.

The community was then resided in the town during 16th- 18th century in specific pockets maintaining the hierarchy and was in the service of Shri Yamai Devi and Patron Shri Pant Pratinidhi in Rajwada.

Figure 10 Maps of evolution
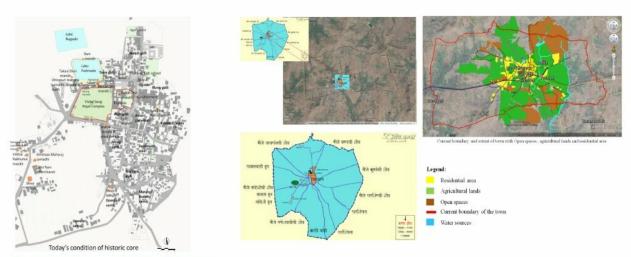
Figure 11 Today's extent of the town
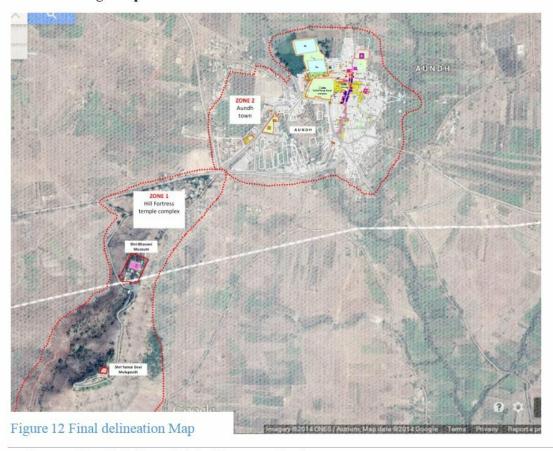
Delineation of the historic town:

Zone 1:

- Mulapeeth Shri Yamai Devi Fortified temple on hill
- Shri Bhavani Museum: State Archaeology protected museum.

Zone 2:

- Aundh historic town
- **Heritage Map:**

Figure 12 Final delineation Map

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- **Heritage Map: Zone 2**
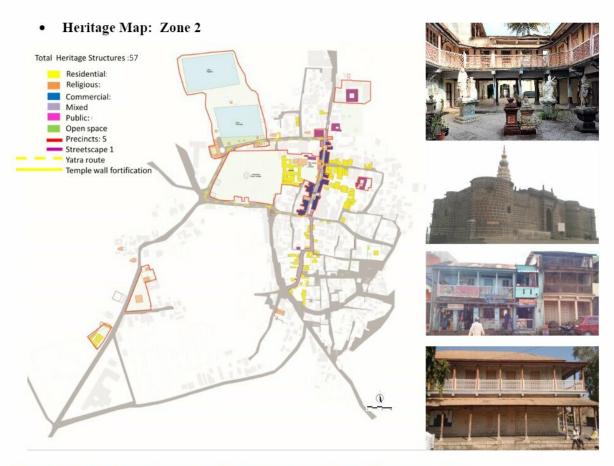
Figure 13 heritage map Zone 2 and Heritage structures from different typology

Heritage Building Typologies in the town:

Residential Typology:
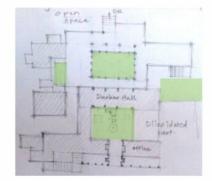
Figure 14 Residences in *'Brahmin Galli'*

Aundh was the capital of Princely state and the town flourished during Maratha period. The traditional communities were settled in the town in service of Shri Yamai Devi and also were in service of Patron Shri Pant Pratinidhi in Rajwada. The town was firstly with the weekly bazar and later on flourished with the permanent bazarpeth at present called as peth galli in front of the temple of Shri Yamai Devi in the town. Different typologies were developed like residential, commercial or mixed, religious and public administrative buildings.

Aundh's patron Shri Pant Pratinidhi built their Rajwada beside Shri Yamai Devi temple in town in front of the bazarpeth street. The Rajwada was built in 1897 A.D. designed with courtyards and garden at the back called Vishal baug which was firstly a lake named Vishale which was later on converted in to garden called Vishal Baug with big shady trees and some medicinal plants,flowering plants and fruit

trees. It is completely a privately owned property of patron currently by Ranisaheb Shri Gayatridevi Pant Pratinidhi.

Figure 15 Image and plan of Rajwada

Rajwada had previously with six number of chawks or courtyards. It was constructed in stone, *Pustaki vita* bricks, wooden columns and lime plaster with typical wada planning of Maratha period, maintaining the hierarchy of the spaces internally and externally. It had a rotating fountain in front of the main entrance of the wada. It had different types of rooms for different activities according to the hierarchy of the spaces.The Rajwada is now in dilapidated condition. Only four courtyards out of six exists in wada facing major structural damages and defects due to water seepage, decay in timber etc.

Religious typology:
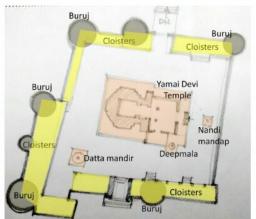
Figure 16 Mulapeeth of '*Shri Yamai devi temple*'

The fortified temple originally built in Chalukya period by Chalukya king and later on restored by Shri Pant Pratinidhi with temple shikhara and fortification.

Figure 17 Plan of Yamai devi temple on hill   Figure 18 Plan of Yamai devi temple in town

Mixed or commercial typology:
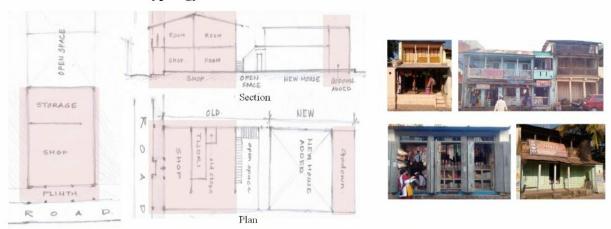
Figure 19 Typical plan and images of commercial and mixed-use typology
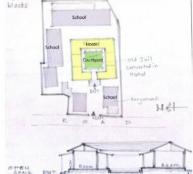
The typical features:

- Shops at front portion and residence at rare side of the plot.
- Linear planning.

The pure commercial unit or the unit transformed from residential to commercial was basically because of the different needs of users, linearly planned in plots with normally single storey or multi-storey with load bearing structure

Public and administrative architecture:

The old jail is built during princely state by patron Shri Pant Pratinidhi which was later on converted in ITI institute and currently running as boy's hostel by private trust.

Figure 20 Shriniwas high school building and plan of old jail converted into Boy's hostel

Aundh Museum: In 1937- 1938 Shri Balasaheb Pant Pratinidhi erected the museum building in stone and started museum with their own paintings and collected items. And also exhibited Paintings of Raja Ravi Verma. The museum is renowned for its exhibition of Indian miniature paintings
It has rich collection of articles of sandalwood and ivory, Indian miniature paintings, Bengali/Western paintings, coeval paintings etc. Strong room consist of very valuable ornaments and diamond collection. This is probably the only museum in India, which has such a large collection.

Figure 21 Shri Bhavani Museum

Strength:

1.Aundh being the Mulapeeth of Adishakti Shri Yamai Devi has a strong religious significance. The small town firstly famous because of this Devi mulapeeth and being the kuladaiwat of major Brahmin families and lateron known as Maratha princely state and patron Shri Pant Pratinidhi till today.

2. Aundh has a museum of rare collection of paintings, sculptures and artefacts which is protected by state level archaeology.

3. Hence as firstly a pilgrim center and then a Maratha princely state, it has strong religious importance and tourist potential.

Weakness:

1.Unnoticed, unidentified and unprotected heritage.

2. Lack of pilgrim and tourist infrastructure.

3. Lack of adequate information and assesment of the heritage in Aundh.

4. Lack of technical and administrative manpower for the development/ to promote it as tourist/ pilgrim tourism center.

SWOT ANALYSIS

Opportunities:

1. Heritage and religious tourism or cultural tourism can boost economy of the town.

2.As the town is still not under developmental pressures like the other princely states of Bhor Phaltan are rapidly developed. Aundh is still low-density small town which can be developed as heritage or pilgrim centre for tourists by employing heritage resources available in town.

Threats:

1. New legislation or bylaws do not cater heritage factor and traditional ways of lifestyle.

2. Physical and cultural degradation and deterioration of the town due to negligence and lack of maintenance hence losing its identity of pilgrim town and princely state of Aundh.

Why to conserve???

- SIGNIFICANCE: The town is known for its hill fortress temple of Shri Yamai Devi Mulapeeth. The temple is very old and Devi Yamai is a kuldaiwat of a large number of Marathi families. The town has history from ancient time and a mythological legend got transformed into built form which is the spine and origin of this settlement.
- IDENTITY OF PRINCELY STATE: Town is still known as 'The Princely state of Aundh' because of its greatness though it was merged in 1948.The state was the icon of Maratha period princely state. The impression of Aundh town as princely state is still remained in people's mind even though it has got merged in 1948.
- TOURISM POTENTIAL: Maximum families or visitors come for religious activities like yatra, rathotsav and also visit to see the hill fortress temple the Mulapeeth of Shri Yamai Devi and Shri Bhavani Museum and old Rajwada i.e., the residence of patron Shri Pant Pratinidhi. The museum is one of the old and protected museums by State department of archaeology contains precious collection of original paintings of Patron Shri Pant Pratinidhi, Artist Raja Ravi Verma, various sculptures, diamonds etc.
- Town has HISTORICAL sites like hill fortress temple, other old mixed style Yadava and Maratha period temples in the town, lakes as exists from the mythological references and old residences.
- INFORMATIVE, ARTISTIC places as Shri Bhavani Museum created from patron Shri Pant Pratinidhi's personal interest and collection of the arts.
- Different ARCHITECTURAL styles in temples from Yadava and Maratha period, typical wada style residential architecture and bazaar street character linear houses depicting Maratha style with traditional materials like stone, lime, timber and bricks. Town also has a vernacular style residential architecture in the town.

- Conservation of the town will be beneficial to increase tourists and for <u>ECONOMY GENERATION</u> and sustainable development of the town as there is outward migration of people in current scenario for jobs.
- The trend is towards new development and constructions on the old places destroying the <u>HISTORICAL IMAGE.</u>

Hence, **the historic town's image must be restored, as Pilgrim centre and Princely state; by conserving its Rural and Cultural heritage to promote it for cultural tourism.**

Conclusion and further study

The Historic town Aundh has strong significance, identity of Princely state, tourism potential, historical sites, informative and artistic places, different architectural styles etc. The Challenges to the Aundh include a lack of integrated conservation and maintenance, environmental pollution and the construction of new developments that encroaches the historic fabric. The revised context specific planning policies would both protect Aundh's historic assets while also supporting the future of its local population.

This documentation and further survey, study and analysis of the town's condition, will help to understand the town, precinct and building level issues to formulate policy framework and applied conservation interventions that will reveal and maintain Aundh's rich rural and cultural heritage, as well as support to boost-up and to become sustainable place for cultural tourism.

As it has a museum, Yamai Devi temple and Rajwada which is currently under restoration work, there is a sudden boost in number of tourists visit per day. It needs to be developed with conserving and restoring its integrity for the society, thus require to conserve the place for its sustainable development. In Aundh there has been constant and drastic erosion of built heritage and our traditional built forms which are constantly getting destroyed and under threat due to lack of maintenance and negligence has been one of the major cause or deterioration of historic fabric. Hence, to overcome these causes it is necessary to form a policyframework and guidelines by establishing a Heritage cell and commity to form the guidelines implementing it through some pilot projects for conservation and promotion for cultural tourism.

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Understanding Nature-Culture Relation in Temple Settings at Konkan, Maharashtra

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Abstract: India has 7571 Km of coastline, about which 720 km of Konkan coastline stretching from Daman to Goa; known as the Heart of Maharashtra. The land established by Lord Parshuram, the 6th incarnation of Vishnu, has diverse religious and cultural traditions that have been passed down from ancient art to temple architecture and sculpture. Traditional art forms that are considered self-sufficient and attractive, as well as pre-trade cultures, are disappearing day by day. As it is unsupported for economic prosperity, temples in Konkan hold a treasure trove of ages in their mysterious nature and are still considered a springboard for various social, religious, and cultural movements that unite society. This topic explores such temples built in sacred natural conditions, considering their religious, mythological, and historical origins. The study also highlights the various temples of Konkan and their relationship to the surrounding natural environment, presents natural settings like temple tanks, sacred groves, and will draw public attention to the preservation of original historical and traditional textiles.

Keywords: natural environment, sacred groves, temple tanks, cultural traditions

1. Introduction:

The piece of land established by Lord Parshuram, the 6th incarnation of Lord Vishnu, has a wide range of religious and cultural background where the construction of temples and the carvings have a legacy with ancient art. There is developing tourism as these temples are attractions for tourists and scholars along with the devotees and hence becoming the worse condition under the name renovation. Losing their original and traditional fabric they are taking shape with a new face. Apart from being self-sufficient and attractive, their traditional art form which is considered as pre-trade culture is becoming vanished day by day.

Like Marathwada-Vidarbha and Khandesh, in the Konkan region also we can see there are so many unique sculptural temples having artistic and vernacular construction techniques with their own characteristics. As if they are not getting any support of economic prosperity temples in Konkan has an unaccountable treasure of many years with a backdrop of mystic splendor of nature and are still considered as a platform for various social, religious, and cultural movements to keep society as a single unit. The house-like structures originated from the imagination of man, the land with natural background, seems that the constructors studied the overall geography of the region with consideration of surrounding environmental factors like water resources, tree cover, as well as the habitat of flora & fauna present there.

In this topic, such temples built in the sacred natural settings will be studied with their religious, mythological, and historical background. The study will also highlight the different temples in Konkan and their relation with the surrounding natural context. Also how Hindu temple architecture evolved vernacularly in the Konkan having a cultural impact on the surrounding. If there are any customs or rituals which are related to the surrounding natural settings.

2. **Study Area:**

The Konkan region is considered as research area because of its natural and cultural atmosphere surrounding the Sahyadri Mountains. There are many beautiful temples which were built in last 200-250 years. They have unique architectural styles with different approaches and distinct sociocultural backgrounds. Various village deities and family deities reside in this area. People in this area have special belief in Shiva and hence many Shiva temples are seen on this piece of land. According to the past studies, most of the temples owns sacred natural resources, primarily water bodies, trees, animal and bird habitats that have s cultural impact on the temple and the environment. Using this as a criterion for research, 10 temples are identified as a cases for the study. Each of these 10 cases represents the entire Konkan region being studied.

Figure 1 - Map showing extent of Study area with the locations of cases to be studied in the Konkan region
Source - https://en.wikipedia.org/wiki/Konkan_division

2.1 Kankeshwar temple, Alibaug

There is a temple in the dense forest of Kankeshwar near the village of Mapgaon, on the northern Konkan coast. It is famous for its cool climate and ancient Shiva Temple. The temple situated at 1,046 feet altitude approached by stairs which are constructed in laterite to keep the temperature maintained even in summer. "Devaachi Payari" seen and Gaimandi with cow statues. This God's footstep was built in the belief that God's footstep was appeared there showing that the temple was built by God's will in his abode. There is also a place dedicated to snakes known as "Nagobacha Tappa".While climbing the steps there is one Shiva temple named Paleshwar temple where one Pushkarni, known as 'Brahma Kund', is seen which is built entirely of laterite stone, with niches in the walls surrounding the Kunda and Maruti temple.

The temple facing towards the west is built in the Hoysala style with two parts: Sabhamandapa and Garbhagriha. The layout of the temples is in the shape of a star. Above Amalaka and Kalasa were built with 28 corners, 22 of which are on the outside and 6 on the inside and are currently missing during reconstruction. This kind of kalasha can also be found in the Limpangaon temple in the Dhule region. The temple deity is considered a summoned deity as it is in the form of a self-employed Shiv Ling represented by a brass penis, mask, and brass umbrella. There is one octagonal stepwell at the back of the temple having a pool circle with having a diameter of about 31 m. Krishna Balaram Temple, Lakshmi Vishnu Temple, a temple built in the Peshwa period. A famous temple festival followed by Mahaprasad and Pradosh Yatra with Kamal Pujan has done in all Shrawan Somwar and on Kartik Purnima Depprajwalan has done. On the days of Tripuri Purnima and Mahashivaratri, a big festival is held in Khankeshwar Devasthan.

Figure 2 - Layout showing spatial planning of Kankeshwar temple
Source- Author

2.2 Shri Rameshwar temple, Chaul

The champavati or Revati region mentioned in the Mahabharata is known in ancient Indian literature by various names such as Timulla, Semulla, Chimolo, Sibor, and Cheul. The chaul village situated in Alibaug has a distinct structure and historical significance. This former city was built around a naval fortress in Portugal India having its capital in Velha Goa. According to the survey done by Italian travelers in 1625, there was a magnificent Shiva temple is located between Portuguese and Islamic rice. This temple is not only the famous Rameshwar temple. As it is an ancient temple on the coast, there are no traces of its foundation or information on the people who built this structure, but it has its own character and historical significance. There are pieces of evidence of renovation found as it was done in the past 200-250 years. In 1769-70 *deepmal* and *Tulsi Vrindavan* were built near the Nandi. The construction work of Nagarkhana was started in 1816 while the pond was repaired in the year 1838.

East facing temple has a simple layout with quadrangular Garbhagriha, and in the center, there is a long, slightly raised Shalunka made of Brass is present. In the center of Shalunka, there is a self-contained Shiv Linga placed in a square pit. The temple has a two-storeyed Sabhamandapa. Temple has a 7.62-meter high dome in summit shape. Except for the main temple building, all subsidiary temples have the influence of Maratha architecture. The main temple building is built in the vernacular style using traditional and locally available laterite stone and timber having a sloping roof. There are Navagrahas seem to be arranged on the platform outside of the temple. This temple complex resides a huge piece of land having three tanks defines the character of the temple precinct. These temple tanks are considered as representatives of 3 elements of nature such as Parjanya *Kund* represents rain, Agni *Kund* represents fire, and air represented by Vayu *Kund*. When it fails to rain in the village, the Parjanya *Kund* is get opened and Lord Indra worshipped to send rain. This tank was opened several times for rain. Festivals like Mahashivratri, Pola, Naagpanchami, and Ganesh Chaturthi are celebrated which envelop the whole village in festive vigour.

Figure 3 - layout showing spatial planning of the temple precinct
Source: https://iescoaomnibus.wordpress.com/2017/07/03/rameshwar-temple-chaul/

Pravara Rural College Of Architecture, Loni
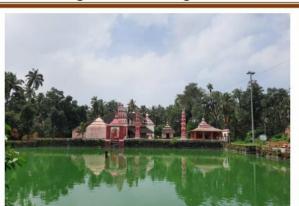
Figure 4 - View of temple from the Pushkarni
Source- Author

2.3 Shri Harihareshwar temple, Alibaug

At the southernmost point of Raigad District, in the ranges of Western Ghats, Shri Kshetra Harihareshwar is located. In the Sahyadri Khanda of Skanda Purana, this pilgrimage site is dscribed as Dakshin Kashi and hence has rich, distinct historical and cultural importance. A tiny hamlet, Harihareshwar temple blessed by Lord Shiva which is nestled among the four holy hills viz., Brahmadri, Harihareshwar, Harshinachal, and Pushpadri.The temple comprise idols of Trimurti; Brahma, Vishnu, and Mahesh in Linga form and also of Goddess Parvati. There are other temples dedicated to God Kalbhairav and Goddess Yogeshwari in the vicinity of the temple precinct. Lord Kalbhairava, heals demons and calms ravenous souls.

The temple was constructed in the 16th Century and was renovated in the 18th Century in the Peshwa reign. During British rule, the temple was largely neglected, but a separate trust was established after independence, which has managed the temple up to now with a good governance framework. The places like Vishnupada, Gayatri Tirtha, Shuklatirtha, Suryatirtha, Vishnutirtha, and Brahmaguha formed a circumambulation path for the Deity of Harihareshwar temple along the coast which is a blend of natural beauty and spiritual uplift of the region.

The temple was formerly constructed in a laterite stone. It is said that there were two big laterite stones present in which both the temples get carved but due to renovations done in Peshwa rule the influence of Maratha Architecture and vernacular style is majorly observed. Both temples have a simple layout consisting of Sabhamandapa and Garbhagriha. Beautiful Dashavtar carvings in wood are seen in the temple. Wood carving is a major feature of temple architecture in Konkan and preserving this age-old tradition is a major challenge in terms of conservation.

Figure 5 - Temple location with its processional route
Source: https://www.googlearth.com/

2.4 Keshavraj temple, Asud, Dapoli

The keshavraj temple is a great place that showcase the enchantment of nature. *Asud baug* is located about 6km away from Dapoli-Harne road near the Camp town Dapoli. The road descends from Dabkewadi. On either side of the trail, there are 400 mm thick gutters and many trees like coconut, pophali, umbar, Mango, Jackfruit, etc. that have existed in the wadi for thousands of years. The *asud*

Figure 6 - Sacred groves at Asud
Source- Author

baug area in Keshavraj is considered one of the best-sacred groves in the surrounding trail as there are various species of trees are found. Various kinds of wild oyster mushrooms and flower plants are also seen. The whole trail of Keshavraj temple goes within the creek and has consists of about 200-250 steps constructed in laterite stone. Along with the sacred forest, there is one prominent feature of the temple that it has backwater which flows throughout the year which makes the environment peaceful and serene.

The architecture of the temple dates back to the Peshwa period. The temple has a large Mandapa followed by Sabhamandapa and Garbhagriha. Constructed with a laterite stone and timber in a simple rectangular layout enhances the purity of the place. The temple complex has a compound wall with a gateway and *Gomukha* at the left corner. All year-round, the fresh and delicious water poured from the *Gomukha*. The south-facing temple has an idol of Lord Vishnu standing in the lamp twilight, bringing the pleasant and fresh air inside the temple which heals and calm the mind. At the left of the temple, there is a temple dedicated to Lord Ganesha. The whole temple area is covered by graveled pavement. In the temple precinct of Keshavraj, the true essence of God lies in solitude, quiet peace, and nature.

2.5 Shri Mallikarjun temple, Shirambe, Sangmeshwar

Swayambhu Shri Dev Mallikarjun, a temple of Lord Shiva, is situated in the middle of a lake in Shirambe village, which is situated on the way to the village of Veer Devpaat. The construction of this temple is said to be 1500 years old. The construction of the pond around the temple is later done in the locally available laterite stone. The temple was constructed with a simple layout comprising of Sabhamandapa and Garbhagriha where Sabhamandapa is constructed using timber columns and remained open from 4 sides. The garbhagriha is totally closed by walls having the ground level slightly below the level of Sabha Mandapa. The deity is placed in Linga form. The temple is designed in such a way that the water level inside the Garbhagriha and the pond outside should remain the same, while the Shiv Linga always stays in the water.

In the immediate vicinity of the temple, there are separate temples of the Village deities named Shri Chandkai Devi and Shri Vardan Devi. It is believed that the poison in the person's body due to a

snake bite is removed here and such practices are practiced in the village to date. The festival of Holi in the last month of the Hindu calendar is held with great enthusiasm where the procession of Palanquin enthroned in the Silver form of Deity along with House-to-House aarti followed by a town fair. Mahashivratri is also celebrated there.

Figure 7 - Location of temple showing its aerial view

Source: https://ratnagiritourism.in/en/temples/mallikarjun-temple/

2.6 Someshwar temple, Rajwadi, Sangmeshwar

Figure 8 - open hot water springs at Someshwar temple, Rajwadi
Source: https://ratnagiritourism.in/en/wonders/hot-water-springs-rajwadi/
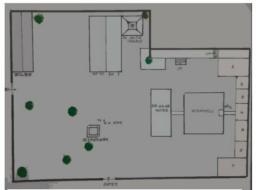
Located on the Mumbai-Goa Highway, near the hot water springs, there is the temple of Someshwar dedicated to Lord Shiva. After descending the steps from hot water springs, the temple was constructed in the traditional Konkani style decorated with wooden carvings.

The temple is comprised of a sabha mandapa and garbhagriha which is said to be almost 1000 years old constructed in the Peshwa period with a simple rectangular layout. The temple is surrounded by stone walls with a 20-22 ft. tall lighthouse. The sculptural structures erected to protect the temple are now crumbling but the original grandeur still remains the same till date. The temple has gained importance due to its two-storeyed Garbhagriha where Lord Shiva in form of Linga is seen in the lower sanctum while the idol of Lord Ganesha is seen in the upper sanctum. This distinct architectural character is one of its kind and can't be found anywhere else till date. There is a Nandi placed in the Sabhamandapa which were also observed worshipping with fragrant flowers and gold. The sculptures seen in the temple are carved in wood which is intertwined rather than fixing with nails. Sharab sculptures are mostly seen on the walls with a distinctive feature that an elephant holding its paws is observed in two places and a turtle is caught in one place. Along with these sculptures, horses are depicted on the doorframes. These statues are common in temples of Gujarat, but this is the only place in Maharashtra. There is also a symbol that is used as a logo for KSRTC buses that depicts that the construction may be done by the Carnatic artisans. Beside the temple, there are famous hot springs of Rajwadi. The water remains at 50-60 degree Celsius throughout the year.

2.7 Sapteshwar temple, Sangmeshwar

The temple near the town of Sangmeshwar in Ratnagiri District was built by Wakataka King during the Shilahar dynasty. The temple structure is contemporary to the Ambabai Temple at Kolhapur and Kalbhairava Temple in Sangmeshwar. The main temple building was formerly built in the black basalt stone and reconstructed using the locally available laterite stone in the past 150 years. The Alaknanda River originates from the hill near the temple, which water comes down dividing into 7 streams and released back into the basin. The lord of seven streams hence the name Sapteshwar. There are 7 rooms seen having 7 channels, connecting each other internally with T-section where the flow of the river is brought. A square pit is made at its meeting point which looks

Figure 9 - Layout showing spatial planning of temple precinct
Source- Author

like a sack with an enclosed drawstring. All these streams come together in a large basin located in the front through Gomukha. This water management system is used since medieval times providing clean and fresh water to the locality. The west-facing Shiva temple appeared with an aisle and large hall. The idol of Lord Ganesha is seen on the temple. Adjacent to the temple there is a small temple of vaijanatha. The trees like Mango, teak, *Ain, Shisav, fanas* make the whole temple area peaceful.

2.8 Shri Marleshwar temple, Maral, Devrukh

The Marleshwar temple dedicated to the god Shiva is situated in the high peak near the village of Maral, about 18 km. from Deorukh. This is a cave temple carved in black basalt stone. There are about 530 steps to reach the temple. There is a Hanuman temple in the vicinity of the temple trail. The waterfall, Dhareshwar, is the main attraction that flows like the Ganges holding the Lord Shiva safe on his head. Lord Shiva is found in the form of Linga possessing a snake around it. And hence the rock cavities of the cave found the non-venomous snakes which didn't harm the devotees till date. There is one stairway leading to the waterfall and the temple of Lord Datta, Shree Gagangiri Maharaj, and the Vetaal

Figure 10 – Rock cut cave temple of Marleshwar Source- Author

temple. A big fair is organized during the Makar Sankranti with 4-5 lakh devotees. On this day, the marriage of Lord Shiva and Goddess Girija is done by meeting the palanquins of both deities on the platform near the waterfall. The surrounding area comprises various trees like *Ain, Mango, Umbar, Bell, Vad, Pimpal* etc. making the temple precinct fresh and airy.

2.9 Vimaleshwar temple, Wada, Sindhudurg

The temple carved in monolithic laterite stone is an excellent example of ancient carvings and dates back to 600-700 AD. The original fabric of the temple remains despite all recent renovations. The temple dedicated to Lord Shiva is surrounded by coconut and beetle nut trees. There are five images and 2 grand sculptures of Elephants are seen at the entrance. The deity in the form of Linga is placed 12ft deep in the Garbhagriha. It is very difficult to reach Shiva Linga inside the cave due to the darkness and the bats. The Kalbhairav temple, Ganpati temple, Nandi mandapa, and Tulsi Vrindavan are found in the temple precinct. The Veerghal is also found in the precinct. The water flowing throughout the year in the rocks around the cave is the main attraction of the temple. This temple is also considered a unique archaeological site in Konkan.

Figure 11 - Cave temple built in laterite stone
Source- Author

2.10 Rajapur Ganga, Rajapur:

Ganga Rajapur is an interesting topic for many researchers. Since ancient times, this place where the Ganges River suddenly appears and begins to flow is considered a geological miracle. There is a road leading from the village Unhale in Rajapur to Ganga Tirtha. There are 14 small man-made reservoirs in Ghata Gangatirthi locally called Kunda, which begin to overflow with the advent of the Ganges River. The Kashi Kunda is seen in front of the main gate, and the main Kunda is located in an open space under the Banyan tree next to Kashi Kunda. Another surprising feature of this natural wonder is that the water smells of Sulphur and that the water temperature varies from pond to pond. Each small or Kunda has a unique name. These reservoirs

Figure 12 - aerial view showing temple precinct
Source: https://ratnagiritourism.in/en/wonders/rajapurachi-ganga/

are called Varun, Hira, Vedika, Narmada, Saraswati, Goda, Yamuna, Krishna, Agni, Chandra, Surya, and Ban Kunda believing that most of the rivers in India originate here. Among them, Kashi-Kunda is the largest. During this time, the Ganga of Rajapur obtains the form of a holy pilgrimage.

3. Conclusions:

All the temples described above have their distinct character and significance. There are many temples built in the Konkan during the ancient period but the evolution is done in the architecture according to the climate and environment of the region plays an important role. These structures seem too closed with people even in the pandemic due to their association with the surrounding natural context. The natural and peaceful environment keeps the mind fresh and positive. The effect of surroundings is not only seen on the temples and their architecture but also seen in the locality.

When it comes to development, everyone prefers modern materials and construction techniques but does not understand their impact on the environment. The sacred groves specially protected for temples and deities consist of many medicinal and herbal plants, but hastily forget their sanctity and importance and begin to cut down trees under the development of roads and infrastructure. These changes in human attitude, the erosion of traditional beliefs and human influence over the years have devastated the sacred forests. The water reservoirs near the temple are used to wash clothes, baths, and many more daily works which disturbs the biodiversity cycle in that area and reduces the holistic nature of it.

This scenario in the rural areas must change in recognition of the importance and purity of these natural sources. So it is necessary to conserve these lands with the help of active participation of residents in the locality which can be achieved by improving living standards as well as providing conservation benefits. This should be done by giving some guidelines and policies which help to

keep such places in their original form without disturbing locality and their age old traditions. These guidelines may be in the form of structural or non-structural for future development.

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Three New Gadhegals from Karvenagar and Dongargaon, District Pune, Maharashtra

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Abstract: The corpus of Ass-curse steles (Gadhegals) is crucial for comprehending Maharashtra's antiquity. These vertical stones slabs having inscriptions are existing evidences of the past. This paper deals with the recent discovery of one Gadhegal at Karvenagar and another pair of Gadhegals at Dongargaon village in Dist. Pune, Maharashtra and the issues faced due to the same during exploration. The objective of this paper is to study the meaning of the sculptural representation on Gadhegals and to understand people's perceptions of the same. However, due to their typology, which includes a visual panel depicting a sexual union between a donkey and a woman, various complications have arisen throughout explorations. This is strongly tied to the local population's current perception of them. The findings from interviews of local people , photographic documentation and visual analysis reveal that these steles are smeared with vermillion, sandal paste, flowers garlands, incense sticks, and possibly rigorous washing as gods or godlike figures. This causes the steles to deteriorate and weather, just as vermillion anointing causes obscuration and/or total loss of the inscription. Ironically, the primary underlying notion of fairness is not lost here, and this can lead to destruction of these steles. Since the local people are not aware of ass curse stones, they are also misinterpreted to be idols of other Hindu gods or Veergals.

Keywords: Gadhegal, ass curse stone, Land Grant Charter, Karvenagar ,Pune, Dongargaon, Madhusanchay Ganpati temple.

1. Introduction :

Pune (18.5204° N, 73.8567° E) is a vast metropolitan city in western Maharashtra, India. It was previously the seat of the Peshwas from Maratha Empire, who ruled from 1674 to 1818. The city was also ruled by the Ahmadnagar Sultanate, the Mughals and the Adil Shahi dynasty. The city boasts of major Maratha architecture built heritage which includes Lal Mahal, the Kasba Ganapati temple and Shaniwar Wada. The city has witnessed Major historical events like the Mughal–Maratha Wars and the Anglo-Maratha Wars.

As per the inscriptions on Copper plates dated 858 and 868 CE , an agricultural settlement called as Punnaka existed by the 9th century at the location of the modern day Pune. The plates suggest that this locality was ruled by the Rashtrakuta dynasty. The Pataleshwar rock-cut temple complex was built during this period. Pune was included in the kingdom under the reign of SeunaYadavas of Devagiri from the 9th century to 1327.

1.1 What is a Gadhegal?

A gadhegal is a three-part stone slab with the sun and moon depicted on the top section, with or without a kalasha. The shilalekha, which is usually the grant of a plot of land and sometimes a house to a benefactor, makes up the middle section. The stone's lowest half justifies its name: it depicts a donkey having a sexual encounter with a woman.

A gadhegal must be viewed in its entirety, as here is where its historical significance rests.The sun and moon represent eternity, while the kalasha represents wealth. The artwork has elicited various interpretations: some believe that anyone who defies the royal command faces the most heinous of punishments: that his mother would be abused by an ass. Others believe it depicts Mother Earth, while the ass (the chariot of Sheetaladevi, the goddess of sickness and plague) represents drought, famine, and destruction that would befall anybody who disobeyed the royal edict. As a result, a gadhegal is an Ass-Curse-Stone.

It is from this third panel that the name of this type of stone marker is derived (gadhe=donkey and gal=stone). According to Prof. AP Jamkhedkar the etymology of the term is gadhe (donkey) and gaal (swear word/term of abuse), i.e. Donkey-curse, VV Mirashi (1977) also uses the same term.

1.2 Significance of study of history of Gadhegals across Maharashtra

These gadhegals are Shilahara era markers because they are essentially land gifts that show the area limits of the dynasties. The Shilaharas, who dominated the coastal districts of Konkan from the mid-tenth to the thirteenth century, were the first entirely Maharashtrian dynasty to do so. Originally, they were feudatories of the Rashtrakutas, who were responsible for the construction of such magnificent structures as the Ellora and Elephanta caves.

On gadhegals, the earliest Marathi inscriptions (in Maharashtra) can be found. These gadhegals also contain a huge quantity of early mediaeval land records and place names. The areas show the dispersion of the Shilahara dynasty's cadet branches, namely the Northern, Southern, and Kolhapur Shilaharas. Marathi is substantially Sanskritised, or Sanskrit is spoken. In Kannada, the word 'gal' means 'stone,' and it is a common phrase for hero-stones (Veergal) and Sati-stones (Satigal), which are believed to have originated in Karnataka but now abundant in Maharashtra as well, and have evolved into a distinct form. With the exception of Gujarat, the gadhegals are only found on the west coast of Maharashtra and Goa.

Sati stones and hero stones are related to gadhegals. In Karnataka, these frequently have inscriptions, but not in Maharashtra. That is how Maharashtra's gadhegals have progressed from their previous incarnations.

SG Tulpule, a renowned Marathi scholar, has identified a gadhegal in Alibaug in the Raigad district as the first such inscription. It is the result of King Keshideva's land donation. Fortunately, it contains a date: *Shaka* 934, which corresponds to 1012 CE, indicating that this gadhegal is exactly 1,000 years old as of today. Another at Diveagar, issued by King Anantadeva, details a land and house donation. It dates from 1137 CE. The Centre for Extra Mural Studies (CEMS) in Mumbai and the India Studies Centre (INSTUCEN) Trust worked together to resurrect this gadhegal, whose origins are unknown. Two more, both damaged, have been discovered in the area.

2. Gadhegalsof Pune

Erandwane was an ancient village on the banks of Mutha river that traces its history back to 10th century. Karvenagar, a highly urbanised area is a part of Erandwanegaothan. The firstgadhegal is

located next inside theMadhusanchay Ganpati temple which is opposite Hutatma Major TathawadeUdyaan in Karvenagar, Pune (Figure 1). The first gadhegal has been transmogrified into an icon of Ganesha sitting on his vahan- the mouse and has been installed alongside the idol of Madhusanchay Ganpati (Figure 2).

The second & third gadhegals are located next to the *Talathikaryalay* (Government administrative office) which is 100-150 metre away from the main bus stop of Dongargaon (Figure 3,4). Dongargaon is a small village on the banks of Bhima river near the Perne junction of Pune -Nagar highway. This village is famous for the *BolhaiMata* temple. These gadhegals provide a clear acumen of the social life of this territory during ancient times and they have put an expositive light on the people's cognitive processes. They are indicators of the 'continuity of sanctity' even after the original aim has been forgotten or lost through the passage of time.These three Gadhegals are a part of the tangible heritage of Pune which convey stories of the past.

Figure 1: Madhusanchay Ganpati temple, Karvenagar, Pune

Figure 2: Gadhegal at Madhusanchay Ganpati temple.

2.1 Gadhegal at Karvenagar

The author came to know about the gadhegal at Karvenagar through a newspaper article. The author visited the site on 12th October 2021. It is a bit different from the most commonly seen types. The top panel has a circular sculpture carved on it which looks like a kalas(Figure 2). The central panel has a carving of Chandra-surya. A visual image of a woman being sexually harassed by a donkey appears in the third panel. The image is inset and in medium relief. On her haunches, the woman is pictured with her hands splayed downwards. She has no additional apparent decorations, jewellery or ornaments on her body. The donkey's four legs are folded over the woman's back, his hind legs on a little projection behind her knees, and its muzzle on the back of her neck. It is a tall stone stele with a triangular apex. The stele is covered in vermillion paste. The eyes of the deity have been painted in white colour on the kalas at the topmost panel. Due to the position of the moon , just below the kalas, local residents have misinterpreted it to be the trunk of Ganesha. The real meaning of this stele has obliterated by thick smearing of vermilion powder used for rituals. The donkey looks more like mouse (locally called mushak) while the woman was completely caked over by coloured powder and the man looked

more like the elephant god. The donkey has been painted in white colour to highlight it as against the rest of the elements on the stele. It has been recently been embedded in cement. The residents of Erandwanegaothan (village) have been workshipping this stele assuming that it has a sculpture of the elephant God -Ganesh sitting on his vahan- the mouse. Some of them also assumed that it is a veergal/ herostone (stones inscribed by 10th century rulers in praise of heroes) or a 'satigal' (stones from the same period dedicated to widows of such heroes)

2.2 Gadhegal at Dongargaon

The Gadhegals of Dongargaon were brought to the notice of the authors by a local villager named Mr. Mangesh Gawade. He had come across various online references to gadhegalsbeing recorded by the first author and he contacted the same via Facebook with detailsof the locations of the Gadhegals at his village, i.e. Dongargaon. A pair of Gadhegals were found near the Administrative office of Dongargaon (Figure 3,4). The crown of the first Gadhegal is slanted due to weathering. The top panel consists of a surya-chandra carving. The central panel has inscriptions which are not readable due to weathering. The bottom panel shows a donkey with an erect phallus having sexual intercourse with a woman who is bending on her knees. The second Gadhegal is majorly weathered (Figure 4)Only the surya-chandra carving can be seen on the top panel . Rest of it is difficult to read.

Figure 3&4 : Pair of Gadhegals at Dongargaon , Haveli Taluka, Pune

Source: Mangesh Gawade

3. Conclusions:

Gadhegals, also known as Ass curse stones, have been found in Maharashtra (Wirkud 2013, Khandekar 2013, Mokashi 2014, and Dalal 2015). They are basically charters for land grants. The image of a woman being sexually abused by a donkey that appears on them makes them stand out. They are significant historical indicators of land usage, polity, socio-economic issues, and socio-religious organisation. They were usually placed at the boundaries of villages by kings to notify the punishment that will be given for violation of strict laws. They were usually placed next to temples with a visual message stating that if anyone tries to misuse the donations given to the temple, the lady of the house shall be sexually abused by a person who is as unintelligent as a donkey.

The appropriation of a land grant stele for a deity and its subsequent transmogrification is another fascinating detail discovered here (perhaps for the first time). This clearly demonstrates the importance of association through the object's continued holiness, which leads to its future adoration after the original function has been forgotten. The idea behind carving such stones was to create a fear in minds of people about committing offences such as theft , corruption, spying, violating other rules.

When found in the premises of Temples or other sacred places, the human mind, struggling to understand these steles (and unaware of their original purpose), assimilates them into their pantheon by colouring them saffron or changing their identity to either a Ganesha statue or a veergal. When asking the locals for an explanation for the presence of the sculptural panel, it's noteworthy to observe that the idea of judgement in the form of punishment is not lost in their explanations and opinions.

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"NAADBRAMH"

'Soundscape of a Temple precinct'

Case – Temples of Ahmednagar, Maharashtra

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ABSTRACT:

Looking at the temple precinct, it is observed that along with the temple structure, many elements around the temple create the unique temple environment, such as the physiographic location of the temple, the surrounding nature, etc. Any temple precinct is comprised of the temple and many other elements, tangible and intangible, which contribute to the temple environment. These elements are both natural and man-made.

This paper will seek to understand the role of soundscape in the making of temple environment.

A soundscape is defined as the collection of sounds that emanate from a landscape. The sounds made in temples like Aarti, Bhajan, Mantrapath, Ghantanaad, and other sounds of instruments. Along with these sounds, the sound of flowing water, the sound of birds and animals, rustling wind, and trees also contribute in the soundscape of the temple precinct.

चैतन्यं सर्व भूतानां विवृतं जगदात्मना।

नाद् ब्रम्ह तदानंदं अद्वितीयम् उपस्महें ।।

(Chaitanyam Sarv bhutanam vivruth jadaatmanna, naadbramh tadanadam advitiam upasmhe, From: Upanishad)
The above shlok means that the cosmic power in the form of chaitanya is in all living beings, and one of the links between these two is sound, which makes life begin and cosmic power unique.

Sound is an inherent quality of any landscape. It is also an integral part of any temple precinct. It plays a very important role in the making of the temple environment.

This study emphasises the key role of sound naturally or manmade in the temple precinct. This study is done by analysing the soundscape of six temples situated in Ahmednagar district. The selection criteria was the same era in which they were built and also different physiographic locations.

This paper focuses on understanding the role of soundscape, in the selected temple cases of Ahmednagar. The result of the study emphasis the key role of soundscape in a temple precinct, as an integral element of a temple environment.

1. INTRODUCTION:

ॐ सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः।

सर्वे भद्राणि पश्यन्तु मा कश्चिद्दुःखभाग्भवेत ।।

(Om Sarve bhavantu shukhinaah sarve santu niramayah,
sarve bhadrani pashchantu maa kashchid dhukhabagbhvet)

Meaning: May all sentient beings are at peace, may no one suffer from illness, May all see what is auspicious, and may no one suffer. *(Source: Shanti mantra, ved)*

If we look at the structure & architecture of temples, we can see that the temples are huge source of energy & they are designed to store energy. For example, the temples usually appears to have been built of a stone or wood, mantras are recited in temple, various instruments are played, vibrations of all these hit the body of the person in the temple complex mores intensely by reflecting the stone or wood.

The location of the temple is usually on the bank of river, stream, or water body, this is because in Hinduism there is method of concentrating on sound, & if sound of water flowing in the temple area is heard, it automatically helps to concentrate by paying attention to sound. Sounds are a perpetual and dynamic property of all landscapes.

Sensory gardens are designed to provide opportunities to stimulate the senses, both individually and in combination, in ways that users may not usually encounter. As a form of Landscape Design, they may act as therapeutic design to help in the care of people with various reasons. A sensory garden is a self-contained area that allows visitors to enjoy a wide variety of sensory experiences.

When we consider above point, we realize that Hindu temples have been working on these five senses for long time & the temples have been designed in that way. The structural order followed by nature, also adopted in the construction of Hindu temples, was to depict the ultimate truth. *(Symbolism in Hindu Temple Architecture and Fractal Geometry - 'Thought Behind Form' Tanisha Dutta1, Vinayak S. Adane2)*

Sounds are a perpetual and dynamic property of all landscapes. The sounds of vocalizing and stridulating animals and the sounds of running water and rustling wind emanate from natural landscapes. In contrast, are dominated by human-produced sounds radiating from a variety of sources, such as people gathering areas, loudspeakers, vehicular actions, and the friction of tires rotating on pavement (Barber et al. 2010). Nature's sounds have been inextricably linked to environmental quality. Because sound is a fundamental property of nature and because it can be drastically affected by a variety of human activities, it is indeed surprising that sound has not become a more universally appreciated measure of a coupled natural–human system (Liu et al. 2007).

The purpose of this article is to present a new field of study called soundscape of temple precinct, emphasizing the characteristics of sounds and their spatial-temporal patterns as they emerge from temple precinct. We believe that soundscape patterns shares considerable parallels with landscape temple precinct. (Forman and Godron 1981, Urban et al. 1987, Turner 1989, Turner et al. 2001, Farina 2006) because processes occurring within temple precincts can be tightly linked to and reflected in patterns of sounds in temple precincts.

This study has been done to understand how soundscape contributes in enhancement of the temple environment by a comparative analysis of 6 temples in Ahmednagar.

1.1 Sound:

Definition of Sound: According to modern science "Sound" is vibration, where there is vibration there is a sound, conversely to produce sound the vibrations corresponding to it must be created.

In Sanskrit, the sound is called "Naad Bramh", because in the Vedas, Naad means sound is used for meditation, and since meditation gives Bramh (Spiritual Enlightment), the sound is called "Naad Brahma". In India, there is a method of meditation (concentration) based on different sounds, with this concept in mind, there must have been a method of Aarti, Mantrochar, and Bhajan in the temples at

certain times to achieve concentration, and knowingly & unknowingly this has definitely affected the mental health of the visitors. Hindu temples go beyond just being the visual results of a mathematical process with interesting properties, but touch us deeper, like all sensory objects.

1.2 What is Soundscape? :

The term "soundscape" has been used by a variety of disciplines to describe the relationship between a landscape and the composition of its sound. This work addressed how the sounds of the built environment enhanced people's perception of space and their relationship to the activities occurring within sites. As a result, the first mention of soundscapes appears in urban planning literature. Schafer (1977) recognized that sounds are ecological properties of landscapes, referring to soundscapes as "the acoustical His primary interest was in characterizing natural sounds that could be used to compose music. Krause (1987) later attempted to describe the complex arrangement of biological sounds and other ambient sounds occurring at a site, and introduced the terms "Biophony" to describe the composition of sounds created by organisms and "Geophony" to describe nonbiological ambient sounds of wind, rain, thunder, and so on. We extend this taxonomy of sounds to include "Anthrophony"—those caused by humans. Soundscape thus can be described by our working definition as all sounds, those of biophony, geophony, and anthrophony, emanating from a given landscape to create unique acoustical patterns across temple cases. Characteristics of an area that reflect natural processes."*(Soundscape Ecology: The Science of Sound in the Landscape Bryan C. Pijanowski, Luis J. Villanueva-Rivera, Sarah L. Dumyahn, Almo Farina, Bernie L. Krause, Brian M. Napoletano, Stuart H. Gage, and Nadia Pieretti)*

1.3 Science of Sound in temples mechanics:

Temple architecture what's there inside, just a stone? Let us forget there is a god inside the temple structure, we will see the science behind it, if we look at the temple structure deep inside the sanctum sanatorium all we can find is stone, some people think that why this much decoration to a dumb stone? What's there in it? Why worship this stone as a god? The answer is there is science behind it, this rock is made up of metals and minerals, if we go to a valley and shut something; what does rock do, it will create an echo. It's in an open place – The sound travels hit rock and throwback sound this phenomenon called as an echo & this phenomenon is scientifically proved. Depending upon how loud you send sound waves accordingly rock will throw back an echo. That's why we get 2-3 times sound at different intervals visually it cannot be seen but we can hear it, this happens in open space; imagine if we do this in closed wall structure what would be the amount of echo, obviously much more than the open space. Let's get inside the temple we can see shivling or idol a statue made up of a rock & its place in a sanctum sanatorium i.e. closed wall structure with a pyramid or dome-like structure on top with the tip pointing to the sky, now people send sounds to the rock in form of mantra, Aarti this is not just for the present it is been practicing thousands of years they are sending sounds to a rock continuously right from morning to night every day. We all know sound has a form & it is scientifically proved that water, fire, particles respond to sound it's an incredible experiment.

In Ayurveda we noticed that 72% of our body is water, 12% earth, 6% is air, 4% is fire and 6% is space don't you think these elements this sound has an impact on our system. Everything in the cosmos responds to the sound that is why yogi, saint in our culture said sound is the basis of existence i.e. NAADBRAMH. Inside the sanctum sanatorium of the temple structure, people chant mantra what happens is sound will touch the stone (Shivling or idol) and bounce back into different directions because its closed wall structure sound has to pass out through the main door & whoever standing is standing in front of the door will be completely socked with that energy. What impact of this energy has on the human system for that, the kind of Parasynthetic difference is getting that is anonymous then we understand that this sound engineered in such way that the rhythm of chant will go inside our

parasynthetic nervous system & will put into a deep state of mind within 3-5 minutes, it is clear science. All these things are done in most temples without knowing, why they are doing this, there are many misconceptions regarding this & this is one of the reasons why temples end up with influence. There is no one who talks about the science behind it, why sound, why rock so they call this rock as god & when you chant for the god their idea is to benefit human beings living in the area, its free mental and physical health service

Modern science is still in its infancy compared to the science of temple architecture. Now, these temples are in the attack we have to think seriously about its science. *(Source:Temple Mechanics vs modern science, Strings)*

1.4 Need of study:

Looking at the present condition of the temples, it can be seen that in the original structure of the temples, many changes have taken place or deliberate changes in the style of temple architecture. Therefore, the environment of the temples is very much affected. Sound is an integral part of the temple environment and is also less researched. So by studying and understanding the soundscape of a temple precinct, we can establish its role in the making of the temple environment.

1.5 Research question:

How does the soundscape as a sensory element in temples precinct bring enhancement of temple environment?

1.6 Objectives:

- To analyses the physiographic location of the temple complex from the point of view of the soundscape.
- Understanding the different sounds of a particular place.
- Understanding the spatial characters contributing to the acoustics/soundscape of a place.
- To identify the different sources of sound both natural and manmade.
- To study the temple complex architecture from an acoustic point of view.
- To identify different elements which are related to soundscape.

1.7 Area of Study:

Cases of six temples in the Ahmednagar district were generally built in 1300-1400s. These six temples are Vrudheshwar temple (Pathardi), Sidheshwar temple (Parner), Shukleshwar temple (Bhingar), Rameshwar temple (Dongargan sita), Gorakshnath temple (Manjarsumba), Nurshima temple (Bhatodi Pargaon). These significant temples are situated in different physiographic locations.

1.8 Scope of the Study:

The cases of temples considered for this study which are located physiographic locations of Ahmednagar. While studying the environment of the temple, only soundscape has been considered for this research.

1.9 Limitation:

The subject in general isvery vast, so I would like to narrow down my research onto 6 cases of temple complex in Ahmednagar which are mentioned above. The study shall include overview of Sound in temple premises, and its impacts on temple environment. Only sound element will be studied in detail and no other form of temple element will be a part of discussion. Time duration of 12 weeks, post covid time so less people and temple activities.

2. METHODOLOGY:

Methodology for research is followed consisted of:

2.1 Literature study:
- Various books, Upanishad & Hindu literature to study what is sound & temple environment.
- The study & reading of various research papers & lectures on sound, to study the science of soundscape in temple precinct.

2.2 Field work:
- Survey
- Documentation of temple precinct, study of architecture and construction methods of temple structures.

2.3 Data collection:
- Data collection by the interviews of people who visited to selected temples & people living in that area, their experiences about sounds in temple precinct, current conditions.
- Identification of physiographic locations, elements of temple precinct & other activities in temple precincts.

2.4 Analysis:
- Identifying the role of soundscape that contributes a temple environment.

2.5 Conclusion:
By Analyzing soundscape in temple precinct, we understand its role in making ideal temple precinct.

3. WHAT PRODUCES SOUND IN THE TEMPLE PRECINCT ENVIRONMENT?

The temple precinct environment genenrally contains sound with considerably different spectal and temporal properties from those produced by geophysical condictions, living beings on site. Temple precinct lanscape are saturated with signals that carry little or no ientential information and regarded as a unwanted noise by many people. Most of natural sound occure at low acoustic frequency and create kind environment in landscape.

The geophysical environment produces a variety of in situ, such sounds are wind, rain, running water & rustling of trees. Geophony varies seasonally & diurnally. Sound produced by birds animals, grazing and other living organisms could contribute significantly to the soundscape.

- ✓ Geophonic Sound: Sound produced by wind, running water, rustling of trees, rain, etc.
- ✓ Biophonic Sound: Sound produced by birds, animals, insects, etc.
- ✓ Anthrophonic Sound: Sound produced by people activities on site, other instrumental sound, noise, vehicular activities, etc.

3.1 Rhythm of Nature:

The sounds of nature contain numerous rhythms or cycles. Many recognized temporal cycles of communication occur in environment; the most well studied being those of birds, animals, and insects. Collectively, we refer to these periodic acoustic patterns as "the rhythms of nature." This circadian pattern of singing in birds, the timing of which is largely affected by weather and climatic conditions, strongly correlates with sunrise and sunset. ."*(Soundscape Ecology: The Science of Sound in the Landscape.)*
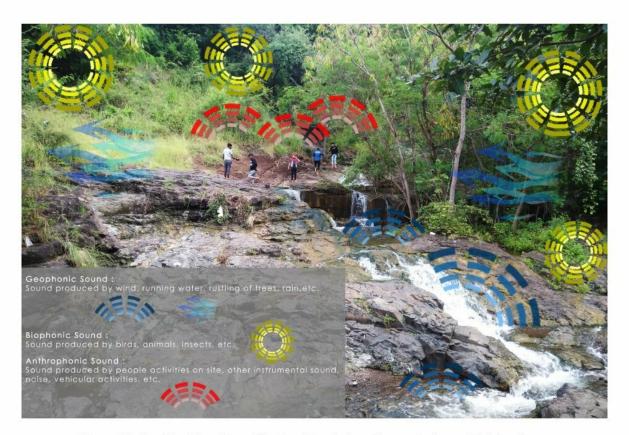
Figure 01: Vrudhha River Waterfall, Ghatshirash, Sound transmission model in landscape

4.   CASE STUDY FOR TEMPLE PRECINCT SOUNDSCAPE:

We present six case studies of temple precincts that illustrate various aspects of soundscape in temple precinct environment. The reason for taking these case studies is that it is possible to find out how soundscape affects the temple precinct at different locations.

4.1 Vrudheshwar Temple, Ghatshirash, Pathardi:

Vrudheshwar temple is located in Ghatshirash village in Pathardi taluka. Vrudheshwar is the source of Vrudhha River. Since the temple is ancient and well known in the surrounding region, a large number of visitors visit the Vrudheshwar temple to see the surrounding nature and to know the spiritual importance of the place. The temple precinct is in a deep valley and there are old devrais, trees, and different medicinal plants in the area. Since the temple is in a forest area, the area is inhabited by birds and wild animals.

Mahashivratri, Shravni somvar is the time of pilgrimage fare to the temple. The rest of every Monday and Ekadshi, Pradosh are the days when a large number of visitors come here.

Figure 02: Vrudheshwar temple,Ghatshirash, Pathardi, Ahmednagar

Pravara Rural College Of Architecture, Loni

Figure 03: Geographic Location of Vrudheshwar Temple

Figure 04: Vrudheshwar temple & Ghatshirash Valley section showing

Sound transmission model in temple precinct

4.2 Sidheshwar Temple, Parner:

Sidheshwar temple is located at sidheshwarwadi in Parner. Sidheshwar temple is the Samadhi Mandir of 'Parashar Rushi'. The present name "Parner" became popular for the city after the Parashar rushi. Many temples were restored during the Yadav period, in that one of the important temples is the Sidheshwar temple. Since the temple is placed in the valley, ancient and well known in the parner region, a large number of visitors visit the Sidheshwar temple to see the surrounding nature. At the backside of the temple, there is a waterfall and holly kund.

Mahashivratri, Shravni somvar is the time of pilgrimage fare to the temple. The rest of every Monday and Ekadshi, Pradosh are the days when a large number of visitors come here.

Figure 05: Sidheshwar temple,sidheshwarwadi, Parner, Ahmednagar

Figure 06: Geographic Location of Sidheshwar Temple

Figure 07: Sidheshwar temple & Valley section showing Sound transmission model in temple precinct

4.3 Rameshwar Temple, Dongargan Sita, Ahmednagar:

Rameshwar temple is located in a dense forest and natural valley at Dongargan village in Ahmednagar. Dongergan has a beautiful little ravine called the 'Happy Valley. Since the temple is ancient and well known in the surrounding region, a large number of visitors visit the Rameshwar temple to see the surrounding nature and to know the spiritual importance of the place. This is the temple from the time of Ramayana. The temple precinct is in a happy valley and there are old trees and different medicinal plants in the area. Since the temple is in a forest area, the area is inhabited by birds and wild animals. There are 3 waterfalls & sapta kund surrounding of the temple.

Mahashivratri, Shravni somvar and Ramnavmi is the time of pilgrimage fare to the temple. The rest of every Monday and Ekadshi, Pradosh are the days when a large number of visitors come here.

Figure 08: Rameshwar temple, Dongargan Sita, Ahmednagar

Figure 09: Geographic Location of Rameshwar Temple

Figure 11: Rameshwar temple & Happy Valley section

showing Sound transmission model in temple precinct

4.4 Shukleshwar Temple, Bhingar, Ahmednagar:

Shukleshwar temple is located at Bhingar in Ahmednagar. Shukleshwar temple is the Sadhana Mandir of 'Shukracharya Rushi'. This is the temple from the time of Ramayana. Shukleshwar temple is inhabited with residential area, so the temple is always crowded. There are large numbers of tamarind trees in the temple area, so the large avifauna observed here. There is an ancient Barav (step well) on the side of temple.

Mahashivratri, Shravni somvar, Ramnavmi, Dattajayanti is the time of pilgrimage fare to the temple. The rest of every Monday and Ekadshi, Pradosh are the days when a large number of visitors come here.

Figure 12: Shukleshwar temple, Dongargan Sita, Ahmednagar

Figure 13: Geographic Location of Shukleshwar Temple

Figure 14: Shukleshwar temple section showing Sound transmission model in temple precinct

4.5 Gorakshnath Temple, Manjarsumba, Ahmednagar:

Gorakshnath temple is famous in the Region as Gorakshnathgad. It is situated at manjarsumba near dongargan in Ahmednagar district. The temple is located on the hilltop of the garbhagiri mountain range. Many plants like gugle, umber, khair, pachunda are found in the temple area. Since the mountain range is in a forest area, the area is inhabited by birds and wild animals. Since the temple is on the hilltop the wind speed is high. There is a gaushala near the temple precinct.

Dharmanath Bij, Gorakshnath Prakkatdin, Mahashivratri, Shravni somvar, Dattajayanti is the time of pilgrimage fare to the temple. The rest of every Monday and Ekadshi, Pradosh are the days when a large number of visitors come here.

Figure 15: Gorakshnath temple, Manjarsumba, Ahmednagar

Figure 16: Geographic Location of Gorakshnath Temple

Figure 17: Gorakshnathgad section showing Sound transmission model in temple precinct

4.5 Nurshimha Temple,Bhatodi pargaon:

Nurshimha temple is a temple situated on the bank of river mehekari, in Bhatodi paragon. This temple was renovated by Shajaji Raje Bhosle's elder brother Sharif Raje Bhosle. Since the temple is on the bank of the river there is a constant breeze in the temple area. The temple area is surrounded by natural scenic beauty. Due to the embankment on the river, the constant sound of flowing water can be heard in the temple area. There is a primary school in the temple area.

Nurshimha Jayanti, Ashadhi Ekadashi, Dattajayanti is the time of pilgrimage fare to the temple. The rest of every Wednesday& Ekadshi are the days when a large number of visitors come here.

Figure 18: Nurshimha temple, Bhatodi pargaon, Ahmednagar

Figure 19: Geographic Location of Nurshimha Temple

Figure 20: Nurshimh temple & Mehekari river section

showing Sound transmission model in temple precinct
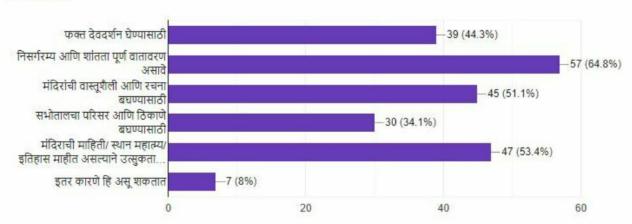
5. SURVEY FOR CASE STUDY:

An Online Google survey is conducted preparing a questionnaire between 16th Nov 2021 to 20th Nov 2021. The main purpose of this survey is to understand the types of Soundscape which are formed in the temple precinct. 88 respondents responded to the survey.

Simple questions in Marathi are asked in questionnaire starting basic information of visitor like name, email & the village/City of visitor. The data of this survey mentioned below.

मंदिरांना भेट देण्यासाठी जाताना तुम्ही सामान्यतः काय विचार करून जात ?

88 responses

फक्त देवदर्शन घेण्यासाठी	39 (44.3%)
निसर्गरम्य आणि शांतता पूर्ण वातावरण असावे	57 (64.8%)
मंदिरांची वास्तूशैली आणि रचना बघण्यासाठी	45 (51.1%)
सभोतालचा परिसर आणि ठिकाणे बघण्यासाठी	30 (34.1%)
मंदिराची माहिती/ स्थान महात्म्य/ इतिहास माहीत असल्याने उत्सुकता...	47 (53.4%)
इतर कारणे हि असू शकतात	7 (8%)
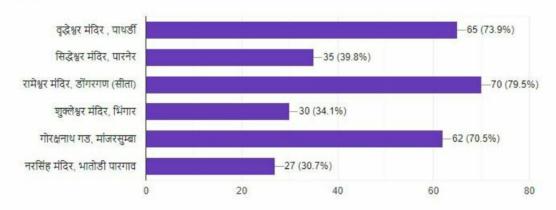
Usually on visiting temples most of people think of scenic enviroment.

अहमदनगर जिल्ह्यातील खालील पैकी कुठल्या मंदिरांना तुम्ही भेट दिली आहे.?

88 responses

वृद्धेश्वर मंदिर , पाथर्डी	65 (73.9%)
सिद्धेश्वर मंदिर, पारनेर	35 (39.8%)
रामेश्वर मंदिर, डोंगरगण (सीता)	70 (79.5%)
शुक्लेश्वर मंदिर, भिंगार	30 (34.1%)
गोरक्षनाथ गड, मांजरसुम्बा	62 (70.5%)
नरसिंह मंदिर, भातोडी पारगाव	27 (30.7%)
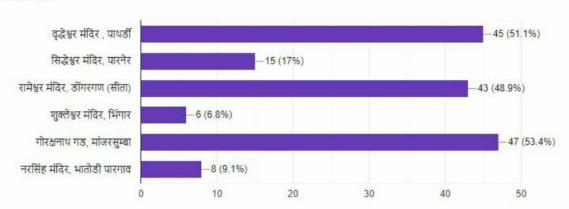
Out of six temples in Ahmednagar selected for case study Vrudheshwar Temple (Pathardi), Rameshwar Temple (Dongargan), Gorakshnath Temple (Manjarsumba) are the most visited temple.

भेट दिलेल्या मंदिरापैकी तुम्हाला सर्वात जास्त आवडलेल्या २ ठिकाणांना नोंद करा

88 responses

वृद्धेश्वर मंदिर , पाथर्डी	45 (51.1%)
सिद्धेश्वर मंदिर, पारनेर	15 (17%)
रामेश्वर मंदिर, डोंगरगण (सीता)	43 (48.9%)
शुक्लेश्वर मंदिर, भिंगार	6 (6.8%)
गोरक्षनाथ गड, मांजरसुम्बा	47 (53.4%)
नरसिंह मंदिर, भातोडी पारगाव	8 (9.1%)
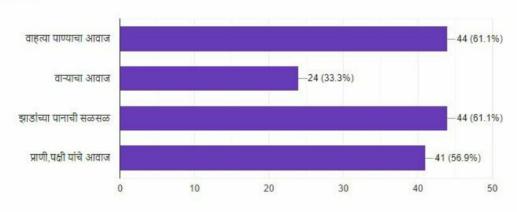
Due to the scenic environment of the gorakshnath temple is most polpular temple in selected case studies.
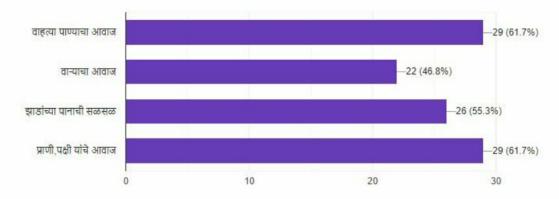
वृद्धेश्वर मंदिरा मध्ये नैसर्गिकरित्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

72 responses

वाहत्या पाण्याचा आवाज	44 (61.1%)
वाऱ्याचा आवाज	24 (33.3%)
झाडांच्या पानाची सळसळ	44 (61.1%)
प्राणी,पक्षी यांचे आवाज	41 (56.9%)

सिद्धेश्वर, पारनेर मंदिरा मध्ये नैसर्गिकरित्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

47 responses
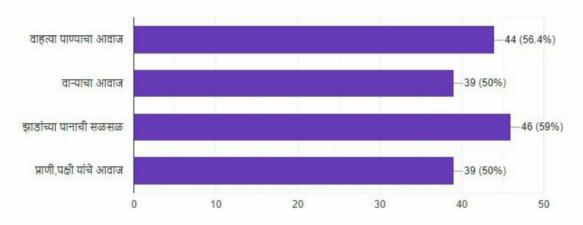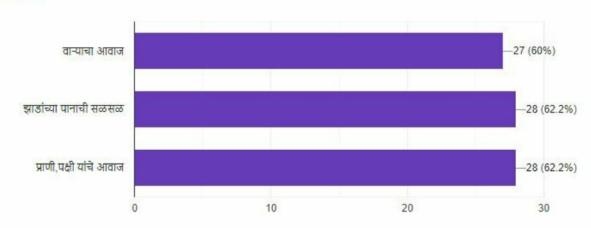
रामेश्वर, डोंगरगण (सीता) मंदिरा मध्ये नैसर्गिकरित्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

78 responses
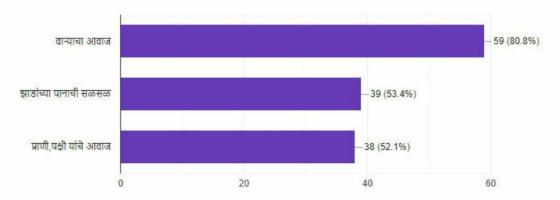
शुक्लेश्वर, भिंगार मंदिरा मध्ये नैसर्गिकरित्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

45 responses
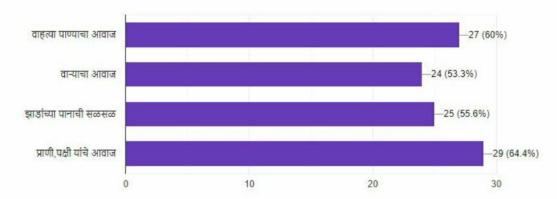
गोरक्षनाथ गड, मांजरसुम्बा मंदिरा मध्ये नैसर्गिकिरत्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

73 responses
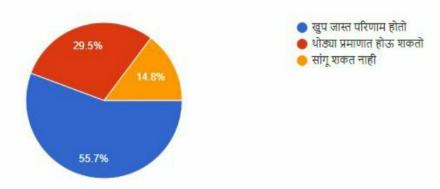
नरसिंह मंदिर, भातोडी पारगाव मध्ये नैसर्गिकिरत्या झालेल्या कोणत्या आवाजाकडे तुमचे लक्ष जाते ?

45 responses

All bargraphs showed above record the sounds that occure in the temple precinct casestudies.
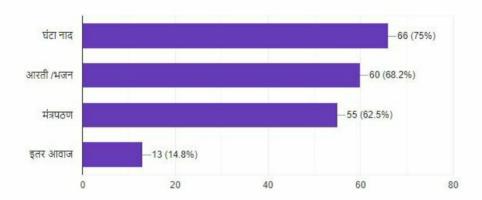
मंदिराचे ठिकाण आणि वास्तूरचना याचा मंदिरातील आवाजाच्या तीव्रतेवर किती परिणाम होतो ?

88 responses

- खुप जास्त परिणाम होतो
- थोड्या प्रमाणात होऊ शकतो
- सांगू शकत नाही

60% of the people think that the geographic location and architecture of temple affects the soundscape of temple precinct.

मंदिर परिसरात कोण-कोणते आवाज जाणीवपूर्वक लक्षदेवून ऐकता ?

88 responses

घंटा नाद	66 (75%)
आरती /भजन	60 (68.2%)
मंत्रपठण	55 (62.5%)
इतर आवाज	13 (14.8%)
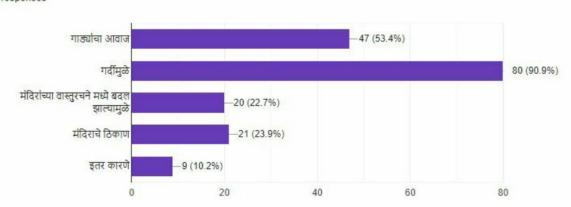
The Ghantanaad(Sound of bells), Mantarpathan,Arti,Bhjan are the sounds in soundscape are conciously heard in the temple precincts.

मंदिर परिसरात कशामुळे गोंगाट होतो?

88 responses

गाड्यांचा आवाज	47 (53.4%)
गर्दीमुळे	80 (90.9%)
मंदिरांच्या वास्तुरचने मध्ये बदल झाल्यामुळे	20 (22.7%)
मंदिराचे ठिकाण	21 (23.9%)
इतर कारणे	9 (10.2%)
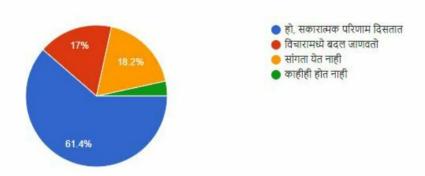
Due to the crowd in the temple area,Vehicular Activities, Modifications in temple Structure/Architecture there is noise in the temple precinct.

मंदिरात नमूद केलेल्या आवाजाचा मंदिराला भेट देणाऱ्या लोकांच्या मनावर परिणाम होतो का ?

88 responses

- हो, सकारात्मक परिणाम दिसतात
- विचारामध्ये बदल जाणवतो
- सांगता येत नाही
- काहीही होत नाही

62% of people think that the sounds in temple precinct have positive effect on people's mind.

6. CASE STUDIES MATRIX :

Table 01: Data Collection and Analysis of Temple Precincts

DATA COLLECTION					
Analysis of Temples Precinct					
	Vrudheshwar Temple	**Sidheshwar Temple**	**Rameshwar Temple**	**Shukleshwar Temple**	**Gorakshnath Temple**	**Nurshimha Temple**
Deity	Shiv	Shiv	Shiv	Shiv	Nathpanthi Gorakshnath	vishnu Awtar
Spritual faith	Growing Shivlinga	Samadhi Of Parashar Rushi	Shivling established by lord Rama	Sadhna place of Shukracharya	Garbhagiri Parvat	Swayambhu Nurshimha Temple
context	Village: Ghatshirash, Tal : Pathardi, Dist : A'nagar 40kms from A'nagar City	Village : Parner, Tal : Parner, Dist : A'nagar 40kms from A'nagar city	Village : Dongargoan (Sita), Tal : A'nagar, Dist: A'nagar 18 kms from A'nagar City	Village : Bhingar, Tal : A'nagar, Dist: A'nagar 08 kms from A'nagar City	Village : Manjarsumba, Tal : A'nagar, Dist: A'nagar 24 kms from A'nagar City	Village : Bhatodi Pargaon Tal : A'nagar, Dist: A'nagar 19 kms from A'nagar City
History	. It is said that Shivling grows on Mahashivaratri. . King Ramdevrai offered a large brass bell to the temple in the eleventh century. . This temple was renovated by Punyashlok Ahilyabai Holkar.	. "Parashar" came here for his Tapasya and hence the name "Parner". . Parashar had a child named Maharshi Vyas who wrote the Hindu Epic Mahabharata. . Siddheshwar Temple is built 1000 years old. . Traces of sidheshwar temple go back to the Chalukya-Yadav period.	. Dongergan is famous for Rameshwar (Mahadev) Temple. . It is said that the village have been created by Lord Ram Chandra while he was on a way to Lanka and Devi Sita bathed in this water tank.	. This is the temple from the time of Ramayana. . Sadashasvabhau was fighting to fight the battle of Pannapat. In remembrance of this incident, the temple of Shukleshwar was redeveloped. . In 1757, Nijam of Hyderabad visited kila of the city and built a statue of Belbhandar in front of the temple at Shukleshwar.	. This mountain range has a special significance in the Nath Sampradai. . It is mentioned in the Puranas that Gorakshanath made Garbhagiri mountain of gold.	. The Narasimha temple was established around 1300-1400. . The temple was founded by a pradhan named Kanho Narso who was in the shahi darbar. . The replica of this temple is in Narsimpal area of Pakistan. . Chhatrapati Shivaji Raje's uncle Sharif Raje Bhosale is famous for his incidents of ganimikava.His Samadhi is in this area.
Running Authority	Vrudheshwar Dewasthan Trust		Grampanchayat Dongargaon/ Dnyeshyog ahram	Shukleshwar Dewasthan Trust	Gorakshnath Dewasthan Trust	Grampanchyat Bhatodi Pargaon
Daily Footfall	150-200	50-100	150-200	200-250	300-400	50-100
Footfall During Yatra	10,000-30,000 (MahaShivratri.3rd Shravni Somvar)	5,000-10,000 (MahaShivratri.)	10,000-20,000 (MahaShivratri.3rd Shravni Somvar)	10,000-15,000 (MahaShivratri.3rd Shravni Somvar)	25,000-35,000 (MahaShivratri,3rd Shravni Somvar)	5,000-10,000
Google Earth image						
Physiographic location	Placed in Valley	Placed in Valley	Placed in Valley	Placed in city	Placed on Hill top	Place on River side Area
Photo of Temple						
Fortification Wall	⬤				⬤	⬤
Material of construction	Basalt Stone	Basalt Stone	Basalt Stone	Basalt Stone	Basalt Stone, Concrete	Basalt Stone Sabhamandap Wood
Temple precinct Elements	Nandi mandap,Sabhamandap with dome, Closed Gurbhgrah with dome, fortification wall	Nandi mandap,Sabhamandap with dome, Closed gurbhgrah	Open Sabhamandap, Closed Garbhgrah with dome	Nandi mandap,Sabhamandap with dome, Closed gurbhgrah, Surrounded with Small Temples	Sabhamandap,Garbhagrah with pradakshina path	Open Sabhamandap, Mandap, garbhgrahWith Dome, Fortification wall, Deepmaal
Modifications	Work is underaway to remove old fortification wall & build a new fortification wall in sandstone.	The kalasha of Sabhamandap is newly constructed in concrete. Some of temple elements are not in good condition.	The old Sabhamandap was closed and in Basalt Stone. The newly Sabhamandap is in concrete and open. Baragates have been installed in new Sabha Mandap.	The roof of the auditouriamhas been removed and concrete slab has been cast. Paver blocks are placed in temple sourounding area.	–	Paver blocks are placed in temple sourounding area.
Tree Avenue	There are large number of old baniyan,tamarind,Piple, bel, Audumber trees in the temple area.	Chafa,tamarind, bel and some flowering trees are found in the temple area.	Large canopy trees like tamarind, Baniyan, Shevri, Chafa are in the temple area.	There are large number of very old tamarind trees in the temple area.	There are large number of very old tamarind,gugul,Pachunda trees in the temple area.	There are 7-8 trees like raintree in the temple area.but there are trees near river slop.
Density Of Vegitation (Rate between 1-5)	4	3	3.5	3	2.5	2
Water Stream/Kund	Exact Backside of temple there is Vrudha River stream	Exact backside of temple there is Valley Waterfall & there is kund next to temple	There is a water stream but it is a little far from from the temple, and there is a kund next to temple.	village : Bhingar, Tal : A'nagar, Dist: A'nagar 08 kms from A'nagar City	–	Exact Backside of temple there is mehekari river
Intencity Of sound Due to Wind (Rate betwwen 1-5)	4	3.5	3.5	3	1.5	3
Sources of Sound						
1. Sound Of Wind	As the temple is in the deep valley,the wind is less inetnse but whistling of wind can be heard.	As the temple is in the valley,the wind is less inetnse but low sound of wind can be heard.	The temple is in the valley but the area around the temple is open so no special sound of wind can be heard.	The temple is in an open space, hence there is no special sound of wind.	Since the temple is on the hill top, the wind speed is always high, so the noise of the wind speed is always heard	The temple is by the river side, can feel the wind breeze, so the calm sound of the wind can heard sometimes
2. Tree Rustling sound (Rate 1-5)	4	3	3.5	3	2.5	2
3. Flowing water sound (Rate1-5)	5	4	1	–	–	2
4. Birds chirping sound (Rate1-5)	4	4	3	3.5	4.5	3

Animal + Sound related to that (Rate 1-5)	farming activities are done as there is fertile land near temple. The villagers come to valley to graze their animals, so can hear animal voices. As it is forest area the sound of foxes, wild dogs, deers, Peacocks Canbe heard some times (Rate - 4)	on the slope of valley villagers come graze their animal (Rate - 3)	As it is forest area the sound of foxes, wild dogs, deers, Peacocks Canbe heard some times (Rate - 2)	Farming Activities (Rate - 2.5)	temple sansthan have goushala in complex , there is sound of catties. The sounds of other wild animals can beheard sometimes (Rate - 4)	Farming Activities (Rate - 1.5)
Manmade Sounds	Due to the small crowds, the noise of the people in the temple complex is less noticeable & more Attention is paid towards natural environment	The temple is little far from the city so that the hustle and bustle is less. So the temple premises are usually calm.	As the temple premises are open, attention is drawn to the hustle and bustle in the temple premises.at time of arti or other activities there is noise of people voices.	The temple is close to the city , there is constant flow of people.	People see this place as a tourist spot, so feel the visitors flow & hustle and bustle, so the peace in temple area Is reduced.	The temple complex is fortifide and flow of visitors is less hence temple premises is quiet.
Vehicular / Road Side Sound (Rate 1-5)	The temple is far from main road and parking facility is also far from temple premises, the vehicular sound is not usually heard (Rate -1)	The temple is far from main road and city, the vehicular sound is not usually heard (Rate -1.5)	To reach the temple, has to go down by foot & due tu beautiful natural environment the vehicular sound is not usually heard (Rate -1.5)	The temple is close to Main road and city, vehicular sound can be heard. (Rate -3)	the temple is on top of the hill and the parking facility is below the temple so small amout of vehicular sound can be heard in temple area. (Rate -2.5)	small amount of vehicular sound (Rate -1.5)
Abhishek & Arti Time Sound	JalAbhishek(5:30 Am), Arti(7am,12noon,) (Rate -3)	JalAbhishek(6:30 Am), Arti(12noon,6pm) (Rate -2)	JalAbhishek(5Am), Arti(7am, 7pm) (Rate -3.5)	Abhishek(6.30Am), Arti(7pm) (Rate -4)	Abhishek(5Am), Arti(12noon,6pm) (Rate -5)	Abhishek(7 Am), Arti(12noon) (Rate -2)
Ghanta / Nagara / Other (Rate 1-5)	3	2	3	3.5	4	2
Bhajan / Loudspeaker Sound	–	–	3	4	5	–

7. SUMMARY OF CASE STUDIES:

The above case studies illustrate various ways that data can be collected, analysed, and interpreted. These case studies highlight many of the research themes described in the paper.

During these case studies, we realise that the geographical and physiographic location of the temple precinct is the main reason for the creation of the temple precinct environment and because of that the creation of soundscape in the temple feels favorable. The location of the temple determines the intensity of the sound in the temple precinct. The Geophonic and Biophonic sound in the temple precinct creates a calm environment in the temple precinct. Antrophonic sounds like Arti, Mantrapathan, Bhajan, other instrumental music are the main pillars of the temple precinct environment, but the crowds in the temple and hustle-bustle in surroundings cause disturbance in Antrophonic sounds.

when we visited the temples, we realise that the original architecture of the temple structure is got modified and there is a lack of some scientific point of view or planning behind it and due to this the environment of the temple precinct was adverse effects.
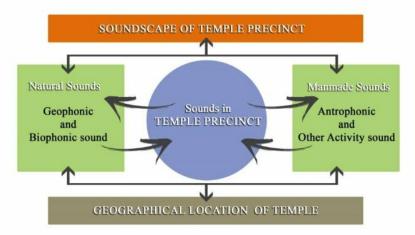
Figure 21: Framework of soundscape in temple precinct

It is said that Indian architectural techniques and engineering are an advanced science and temple architecture is an important link between society and science techniques. Therefore, it is our responsibility as Indian citizens to consciously preserve these temples.

8. CONCLUSION:

The study of temple precinct soundscape can yield valuable information about the dynamics of variety of landscapes and temple architecture. The theories about the interplay of geographical and natural patterns and processes occurring within temple precincts are integral part of temple environment; we believe that the soundscape of temple precinct can enhance our understanding how visitors and other manmade sound affect the temple environment.

Indeed we are at critical juncture in our history & there is need for transformative approach that helps us to more thoroughly elucidate how manmade activities affect our culture and history.

While studying the temple area, we studied the sound as a sensory element in temple precinct. From the 6 temples we have chosen for this study, it is clear that the Soundscape in the temple precinct affects the environment of the temple precinct. The surrounding nature, the Geographic and physiographic location of the temple affects the intensity of the Soundscape in the temple area. Due to the natural sounds, the atmosphere in the temple precinct remains good. We also observed that everyone should value natural soundscape as it does other aspect of nature.

Soundscape of temple precinct represents the importance of science behind temple architecture, culture and history of temple architecture. During this study it was noticed that the modifications takes place from local authorities in temple precincts without any consideration of architecture, surroundings and other factors and it seems to have affected the environment of the temple. Therefore, when repairing a temple conserving or while constructing new temple structure it is necessary to verify things with the soundscape point of view.

Among the selected temples Gorakshnath temple, Vrudheshwar temple, Rameshwar temple are favorite places but now due to the crowds of visitors there is a lot of noise.

9. AKNOWLEDGEMENT:

10. LIST OF TABLES&FIGURES:

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Stotra mantrache vidnyan (Swami Savitanand)
Gururbramha Gururvishnu (Swami Savitanand)
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5. Ecology of Sound: The Sonic Order of Urban Space.
6. Temple Mechanics vs. modern science, Strings

To Outline the "Cultural Landscape" of the Krishna River in Maharashtra and emphasize the need for planning Conservation Strategies for the same so as to conserve associated "Rural Heritage" at a Regional Scale.

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Abstract : Rivers have always been important to people. The World's first great civilizations arose in the fertile flood plains of the mighty rivers like the Nile, the Indus, the Tigris and Euphrates and the Huang He. Rivers remain important today. In fact, settlements and built aspects along river banks are usually the oldest parts of any rural or urban setup anywhere across the world. The River Krishna, which originates in the Western Ghats in Mahabaleshwar in Maharashtra and ends in Bay of Bengal through Andhra Pradesh is one of the major Rivers that make up the river system in India. This river has tremendous religious and cultural significance in Maharashtra. Satara and Sangli districts have several Ghats and Temples built on Krishna River banks, most of which are located in rural settlements along the river banks like Menawali, Mahuli, Limb, Govegaon, Dhom, Vaduth, Targaon, Bhuinj, Mardhe, Ozarde and many more. Most of these Ghats and Temples were built during the 18th Century Peshwa Period and strongly reflect the Architectural Characteristics of that period. These Ghats and Temple complexes transformed the Krishna River banks into religious sites through combination of Architecture and Landscape. They became a place for social and cultural interaction. The Ghats were not only used for religious purpose but also catered to the daily water related activities of the people. These Temples and Ghats together constitute the Cultural Landscape of the Krishna River and each Ghat and Temple built on the banks of Krishna River during the 18th Century Peshwa Period constitutes the Rural Heritage of that particular settlement. These Heritage structures which are a testimony to the 18th century landuse, in terms of interface between the settlement and the River are rapidly succumbing to deterioration due to Natural and Man-made factors. This research is an attempt to identify and document all the Temples and Ghats built on the Krishna River banks during the 18th century Peshwa period so as to create a base map on which further detailed studies can be undertaken. This research also explains and emphasizes the need for formation of a technical conservation council at a Regional level subsequent to enlisting and analysing the threats to these rural heritage structures which form a part of the "Cultural Landscape" of the Krishna River in Maharashtra.

Keywords: Cultural Landscape, Krishna River, Ghats and Temples, 18th Century Maharashtra, Rural Heritage

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1. Introduction :

Water is of special significance in Hinduism, not only for its life-sustaining properties, but also because of its use in rituals and because of the stress given to cleanliness. Bathing also has religious significance, especially in rivers considered sacred.

The prosperity and power of any settlement during a given period is evident in the Architecture that shaped during that period. Architecture is one of the languages through which we perceive the culture and society of a particular era.

As each new dynasty came to power, kings/emperors wanted to emphasize their moral right to be rulers. Constructing places of worship provided rulers with the chance to proclaim their close relationship with God, especially important in an age of rapid political change. Hence we find that religious architecture received patronage from various sources and for varied reasons which resulted in an abundance of temples taking shape through each era. The 18th century Maratha period was not much different.

This research is an attempt to co-relate and understand these two vital elements of the Hindu culture, the "River" and the "Temple" together with the Ghats and to emphasize the significance of River Krishna as a Natural and cultural resource during 18th century Maharashtra. It is also an attempt to trace the construction of Ghats and Temples in settlements along the Krishna River during the 18th century Maratha Rule which today have become an inseparable part of People's life and culture and thus constitute an important part of Rural Heritage which needs to be conserved and Maintained.

2. The Krishna River :

India is known as the land of rivers. There are Seven major rivers (Indus, Brahmaputra, Narmada, Tapi, Godavari, Krishna and Mahanadi) along with their numerous tributaries that make up the river system of India. Towns sprung up on the banks of these rivers and rose to great importance and sanctity.

The Krishna River, the lifeline of Maharashtra, Karnataka and Andhra Pradesh, has witnessed many a civilization thrive and dissipate along its course. The Peshva and other Maratha feudators favoured the Krishna river banks for their temple sites.

The most important aspect of the Middle Phase temples were the ghats or flights of steps that connected the temples to the river. The building of ghats was just as auspicious as the sponsoring of a temple and attracted wide patronage.

It was not long before the Krishna River banks were transformed into religious sites, where temples and ghats were built within the thick groves of trees and embankments. The ghats gave the temple complexes a character of liveliness and divine grace through the combination of architecture and landscape. They were used for religious rituals as well as for daily bathing, cleaning and drinking water. Soon they became a place for social and cultural interactions.

3. The Maratha & Peshwa Patronage to Temples

Hindu architectural patronage had started to emerge from the rich Maratha families serving in the l6th-l7th century Deccani courts of the Adil Shah and the Nizam Shah.

Though limited, these were the earliest efforts of the Marathas to build temples under Islamic rule. By the middle of the 17th century, i.e. in the early days of the independence struggle, the Marathas were too busy with warfare, and the unsettled political conditions left them little time or resources for leisurely pursuits such as art or architecture.

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On gaining elementary presence in their country, the earliest of the architectural pursuits were directed to the repair and restoration of Yadava temples that were desecrated, vandalised or fallen into ruin.

A major change in Maratha politics took place when the last chhatrapati Shahu retired from active politics to settle in Satara. He entrusted the administration of the State to the Peshva and placed important Maratha leaders in charge of distant parts of the kingdom.

The families of the Peshva, Holkars, Sindias along with the other patrons built temples in Pune, Nasik, Toke, Satara and elsewhere in Maharashtra. The Bhonsales embarked on a temple building activity in Nagpur that developed into a tradition of its own.

PATRONAGE TO
TEMPLES

Uniting the divided
and disintegrated
Hindus

Statement of   Gaining   Punyakarma –
Personal Status   Political   Good deeds for
and Charity   mileage   afterlife
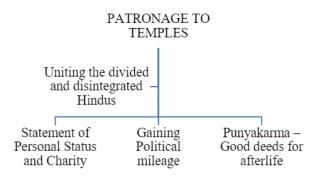
Figure 1 : Reasons for Patronage to Temples during the 18th Century

4. Temple Architecture of the Maratha & Peshwa Style :

A typical temple complex consists of a paved courtyard enclosed by a walls forming a cloister of cells on its inner sides. The enclosing walls later developed narrow terraces/corridors on their roof level that are reached through a flight of steps built within the walls. Some later examples have more than one gateway to the temple complex, facing different directions.

A drum house or a nagarkhana is placed over these entrances where music was played during daily rituals or auspicious hours.

But It is observed that the Temples built along the river banks have a wide range of variety in terms of Scale, planning and ornamentation.Also most of the River Side temples do not have an enclosure and sit comfortably on the River Banks.

An important and unique feature of these temples built along the river banks, is that they have immaculately constructed sweeping flight of stone steps that connect these Temples to the River. These steps, known as ghats, were used for religious rituals.

Galleries or open arcades forming intermediate terraces appeared within the flights of ghats and provided partially sheltered spaces. Visually appealing, the ghats soon developed in to an impressive and essential feature of river side Maratha and Peshwa temples. They still continue to be a popular platform for social life in Maharashtrian villages.

Figure 2 : Temples & Ghats at Menawali

Figure 3 : Temples and Ghats at Mahuli
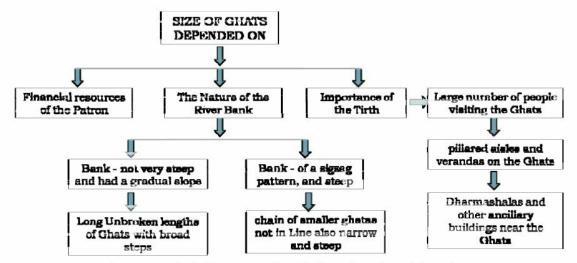
Figure 4 : Criteria for construction of Ghats along the Krishna River

5.   Typical Features of Maratha / Peshwa Style Temples :

In order to identify from the numerous temples along the Krishna River and justify that the temples mapped in this research are infact of the Maratha / Peshwa style, it is important to understand and recognise the typical features of these temples. The plan composition, pillar style and shikhara style of typical Maratha / Peshwa temples is given below. To begin with, these details are used as a thumb rule to identify and Map the Temples of this period along the Kishna River.
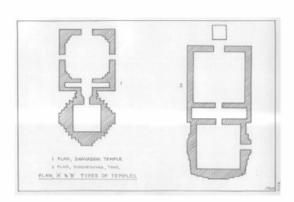
Figure 5 : Typical Plan types A & B
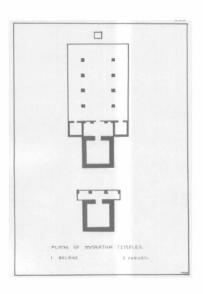
Figure 6 : Typical Plan Types C & D
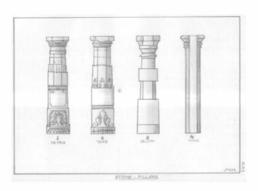
Figure 7 : Typical Column Details
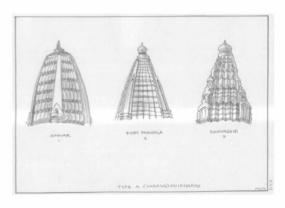
Figure 8 : Type A Shikharas (Vesara Influence)
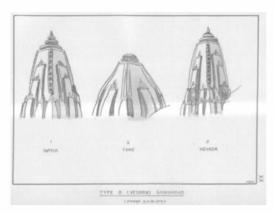
Figure 9 : Type B Shikharas (Nagara Influence)

Figure 10 :Type C Shikharas (Islamic Influence)

6.   Mapping Maratha / Peshwa Style Temples along the Krishna River in Maharashtra :

MAPPING 18TH CENTURY TEMPLES ALONG KRISHNA RIVER BANKS

Mapping 18th Century Religious Structures along Krishna River

1. Krishnabai Temple at Jor
2. Lakshmi Narsimha Temple Dhom
3. Meneshwar Temple at menawali
4. Vishnu Temple, Menawali
5. Umamaheshwar Temple at Wai
6. Maha Ganapati Temple, Wai
7. Kashi Vishveshwar Temple, Wai
8. Mahalakshmi Temple, Wai
9. Vishnu Temple, Wai
10. Soneshwar Shiv Mandir Ozarde
11. Shree Mahalakshmi Temple Bhuinj
12. Ganapati Temple Mardhe
13. Lakshmi Narayan Temple, Limb
14. Shiv Mandir, Limb
15. Vitthal Rukmini Temple, Limb
16. Koteshwar Mandir Gove
17. Shakuntaleshwar Temple, Waduth
18. vishveshwar Temple at Mahuli
19. Rameshwar Temple, Mahuli
20. Sangameshwar Temple, Mahuli
21. Mahadev Mandir Jaitapur
22. Siddheshwar Mandir Tasgaon
23. Shivnath Temple Angapur
24. Tarkeshwar Temple Targaon
25. Krishnabai Mandir Karad
26. Ratneshwar Mandir karad
27. Pashupatinath Temple Bichud
28. Rameshwar Temple Sangli
29. Ganapati Temple Sangli   47

Figure 11 : List of Identified Maratha / Peshwa Style Temples along Krishna River in Maharashtra

MAPPING 18TH CENTURY TEMPLES ALONG KRISHNA RIVER BANKS

Figure 12 : Mapping Identified Temples along the Banks of the Krishna River

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Table 1 : Details of Temples identified and Documented in this Research

Sr No	Temple	Date / Time Period	Patronage	Diety	Components of Plan	Materials of Construction	Current Conditions
1	Krishnabai Temple at Jor	Ancient Temple renovated during the maratha period	Parshurarn Narayan Angal sponsored restorations of the temple	Krishna Mai	Garbha Gruha and C shaped Ardha Mandap with a kund in the center	Basalt stone mortar less masonry	Poor - in need of conservation
2	Lakshmi Narsimha Temple Dhom	1780 AD	Mahadev Shivram a Poona moneylender	Narsimha	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
3	Meneshwar Temple at menawali	1768 AD	Nana Phadnavis	Meneshwar - Lord Shiva	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
4	Umamaheshwar Temple at Wai	1784 AD	Gangadhar Raaste	Lord Shiva	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
5	Ganga rameshwar Temple at Wai	1780 AD	Gangadhar Raaste	Lord Shiva	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
6	Maha Ganapati Temple, Wai	1762 AD	Ganpatrao Bhikaji Raaste	Lord Ganesh	Garbha Gruha and Sabha Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
7	Kashi Vishveshwar Temple, Wai	1757 AD	Anandrav Bhikaji Raaste	Lord Shiva	Garbha Gruha, Sabha mandap, nandi mandap and cloistered	Basalt Stone and bricks with lime mortar and lime stucco	Good

				bounday wall with an entrance gate		
8	Soneshwar Shiv Mandir Ozarde	18th Century	unknown	Lord Shiva	Gabha Gruha, Ardha Mandap & 2 Nandi Mandaps	Basalt Stone and bricks with lime mortar and lime stucco	Good
9	Shree Mahalakshmi Temple Bhuinj	17th Century	Bhosale Family	Shree Mahalak shmi	Garbha Gruha, Sabha Mandap and Deep Stambha	Basalt Stone and bricks with lime mortar and lime stucco	Good
10	Ganapati Temple Mardhe	18th Century	Unknown	Lord Ganesh	Garbha Gruha	Basalt Stone and bricks with lime mortar and lime stucco	Good
11	Vishnu Lakhmi Temple, Limb	18th Century	Sardar Apte	Vishnu Lakshmi	Garbha Gruha, Archa Mandap, Sabha Mandap, Garuda Mandap, Fortificati on Wall	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conserv ation
12	Shiv Mandir, Limb	18th Century	Thakur Family	Lord Shiva	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conserv ation
13	Vitthal Rukmini Temple, Limb	18th Century	Kulkarni Family	Vitthal Rukmini	Garbha Gruha, Antaral, Sabha Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conserv ation
14	Koteshwar Mandir Gove	18th Century	Unknown	Lord Shiva	Gabha Gruha, Ardha Mandap, Nandi Mandap, Gateway	Basalt Stone and bricks with lime mortar and lime stucco	Fair

				with Nagarkhana		
15	Shakuntaleshwar Temple, Waduth	18th Century	Unknown	Lord Shiva	Gabha Gruha, Ardha Mandap, Nandi Mandap, Fortification wall with Gateway	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conservation
16	Mahadev Mandir Jaitapur	18th Century	Unknown	Lord Shiva	Garbha Gruha, Ardha mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
17	Shivnath Temple Angapur	18th Century	Unknown	Lord Shiva	Gabha Gruha, Ardha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Good
18	Tarkeshwar Temple Targaon	18th Century	Unknown	Lord Shiva	Gabha Gruha, Sabha Mandap & Nandi Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conservation
19	Ratneshwar Mandir karad	18th Century	Unknown	Lord Shiva	Gabha Gruha, Sabha Mandap	Basalt Stone and bricks with lime mortar and lime stucco	fair
20	Krishnabai Mandir Karad	18th Century	Unknown	Krishna Mai	Gabha Gruha, Ardha Mandap	Basalt Stone and bricks with lime mortar and lime stucco	Poor - in need of conservation

7. Conclusion :

In Maharashtra Krishna River is lined by throughout its length by 'ghats'. Many temples were built on these Ghats. Shortly after its origin Krishna river banks are beautified by Menawali ghat built on the river in 1780 during Peshwa rule. Today the place is a popular location for shooting Bollywood films.

From Menawali to Sangli town which once was capital of Sangli a small princely state the river is dotted with similar ghat varying in sizes. Mythology tells that this region was once inhabited by Rama

and Seeta during their exile. Maharashtra's spiritual and mythological fabric is intimately woven with the early flows of Krishna and its tributaries like Koyna, Venna, Panchganga. Especially confluences of these tributaries with Krishna are marked by several small places of spiritual significance.

While general direction for Krishna' flow in Maharashtra is southward, there is only once when the Krishna travels Northwards for a very short length. That is at Pasarni village near Wai. This area is commemorated with the name 'Uttar Vahini' (North flow).

There is not much variation in the Architectural character of the temples mapped in the study region. All temples seem to have been constructed during the 18th century peshwa period.

The plan composition mostly comprises of Garbha Gruha and Ardha mandap or Garbha Gruha and Sabha mandap. The emples with sabha mandap tend to have a Neo yadava style shikhara which indicates that these temples must have been constructed prior to the other temples chronologically.

Almost 90 % of the temples within the study area have the typical peshwa style shikhara constructed out of bricks with lime stucco mouldings. The intricacy of the stucco works and the Stepped levels of the shikhara vary from temple to temple but the forms and elements of the of the basic shikhara composition always remain the same.

The walls of the temple are basalt stone masonry upto the roof level beyond which the vaulted or domed roof is constructed out of bricks. The basic roofing of bricks is then given artistic form through lime stucco moulding.

All temples have ghats leading down to the river. The nature of these ghats vary according to the topography and the temple structure.

8. Significance and Need for Conservation :

The Ghat and Temples documented in this research bear an exceptional testimony to the culture and lifestyle of the Peshwa period of the 18th century. The Ghat and Temple precincts are a mosaic that neatly piece together various aspects of 18th century cultural life, expanding our understanding of that period. They also give us an insight into the materials, construction techniques and technology prevalent during that period.

The Ghat and temples are a unique example of landuse in terms of interface between the settlement and The River (Water Body) and it's connection with the core residential fabric of the city. The Ghat and temples are very significant because the area is sucumbing to rapid urbanisation and a vanishing architectural and socio-cultural structure that links us to the bygone Peshwa era. Unless preserved, we will soon lose this precious link to the past.

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DEVELOPMENT OF DADO ORNAMENTATION IN MUGHAL ARCHITECTURE.

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Abstract: Development of dado ornamentation, this research is aiming to do the study of evolution of dado ornamentation in the era of various emperors. Research is Mainly focused on descriptive and historical approach that is based on studies of Mughal architecture as it evolved under succession of emperors beginning with Babur, Akbar, Jahangir, Shah Jahan and then Aurangzeb Objective of study are to understand, from which period dado ornamentation start, which changes happened in ornamentation in 15th to 17th century, analyzes the changes and synthesis the evolution of dado ornamentation in the aspects of motifs, material, form, color. By studying the various structures in the era of above emperors, we achieve the proposed objective. case study method is use for research. We can synthesize the difference between dado ornamentation by studding different monuments. From the case study it is conclude that, transformation of ornamentation from Babur to Aurangzeb period is with free-flowing to geometric forms. Material changes from stone, black marble to white marble. The research has truism, historical, cultural, educational and aesthetical values.

Key words- dado ornamentation, emperors, evolution, culture, art.

Introduction:

- Mughal decorative art of dado ornamentation is one of the remarkable features of Mughal architecture that display their artistic sense into form of beautiful design blended into vibrant colours and mosaics. this particular ornamentation starts in during Babur period up to the Aurangzeb period.
- Curiosity and interest develop while study about Taj mahal decorative carving, to know the how Mughal time artist carved beautiful ornamentation with the detailing?
- Research is Mainly focused on descriptive and historical approach that is based on studies of Mughal architecture as it evolved under succession of emperors beginning with Babur, Akbar, Jahangir, Shah Jahan and then Aurangzeb.
- In earlier research paper, researcher research only about materials and colours and not about forms.
- Research is help for tourist to getting knowledge about the dado ornamentation and employment for the local people in tourist spot as a guide.

Aim: To study the Evolution of dado ornamentation in the era of various emperors.

Obectives:

1. To understand, what is dado ornamentation?
2. From which period dado ornamentation start.
3. Study the changes happened in ornamentation in 15th to 17h century by the study of different monuments in that particular period.
4. Analyses the changes and synthesis the evolution of dado ornamentation.

Scope:

- Purpose of study is to diagnosis how dado ornamentation changes according to emperor.
- Some monuments like Kabul Bagh Mosque, Humayun's palace, red fort, Akbar tomb Sikandar, Taj mahal, Badshah mosque etc. are studying.
- Material, uses according to emperors, forms of ornamentation, are studying while research.
- Delhi, Lahore, Agra, Fatehpur Sikri etc. are geographical places include in research.

Limitations:

Limitation of research is ,How Dado ornamentation changes according to philosophy of emperors? Is not going to cover in research

1. Find examples
2. Do the case study
3. Analyses the required topic

Methodology:

studying the various structures

Case study method is use for research.

Analyse the case study

Need of the topic:

Earlier researcher had not thought about the use of dado ornamentation in various ways, various purposes. data does not include information about the how various emperor use it accordingly.

The research is useful for tourist, for architects and artist for their innovative work, when people know the importance of this ornamentation, they conserve it.

S r. no	Mughal emperor	Famous building(mosque)	material	color	Dominated elements	Forms	Motifs	Inferences	observation
1	Babur 1504-1530	Kabul Bagh at Punjab,	Red sand stone, brick and stucoo plaster	Mon ochrom atic red	use on gate	Simple forms are use	Babur use dado only for decorative purpose	Da do ornam entatio n just introd uce at the Babur period, so it is rarely use	Generally dado ornamentatio use for highlighting the specific element of monuments .
2	Humay un 1530-1556	Humayun's place at Delhi called Din Panah. Mosque at fatehbad in the hisar district	Red sand stone, brick and plaster	Mon ochrom atic red	Use on domes	Geometri cal forms were use	Humayu ns use geometrical forms only for asthatical purpose and highlight the feature	Hi mayun s use dado rarely or at specifi c space of monu ments	

No.	Ruler / Period	Monument	Material	Colour	Use on building	Ornament / Shape	Dado purpose	Dado description
3	Akbar 1556-1605	Jama masjid	Red sand stone	Monochromatic red	use on gate	Use of geometrical as well as floral forms	Akbar use dado for asthetial purpose as well as show their culture and values.	Akbar is impresess by the dado. so, he extensively use dado in his period
4	Jahangir 1605-1627	Patthar mosque	White marble	Poly chromatic (multicolor with the use of stones) white	use on domes and gate	Use of organic shape	Use of organic shapic to depict their religion and cultural value	jahangir pramote the art of dado use it creatively
5	Shah Jahan 1627-1658	pearl Mosque Lahore.	White marble	Poly chromatic multicolor with use of stone	Use on profile of building	Use of organic shape	jahangir use organic shape for asthatic purpose and make symbols showing islamis culture.	Shah jahan is very impress by the dado ornamentation he use dado in every monuments which is built by him. By the dado use he shows the equality in every religion by using symbols

| 6 | Aur angzeb 165 8-1707 | Badshah Mosque Lahore | Red sand stone brick and plaster | Monoch romatic red | Use in all parts of monuments | Use of floral shapes extensively | Aurangzeb use floral shape for mosque to depict hindu as well as islamic culture and also for asthetic | Aurangzeb use dado but he is not impress by the dado like above em perors. therefore, after aurangzb dado ornamentation we can not see. |

Conclusion:

- Transformation of dado ornamentation from Babur to Aurangzeb period is with free-flowing floral forms to geometric forms.
- Material changes from stone, black marble to white marble.
- Every emperor tries to magnified dado ornamentation according to their necessity and choices with the addition of previous stage of dado ornamentation.

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Innovative Ideas for using vernacular building materials in rural area: A case of Maharashtra

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Abstract: The recent increase in the modern construction in rural areas is an effect of rural-urban migration for employment, education, etc. The new generation is getting attracted towards the aesthetics of the built environment of the cities which they are trying to depict in rural areas leaving behind the tradition of using vernacular building materials and technologies of Maharashtra. The challenges posed by this situation about the vernacular building materials, techniques, and technologies are vanishing fast without any effort made to document it. Vernacular architecture aims and structures the most integrated architectural form in communion with the environment resulting in a complex balance between material, shape, and natural context. It could become an extremely useful model of inspiration for the present. The paper mainly focuses on suggesting the solutions on how the various vernacular materials can be used effectively in terms of technology to satisfy the needs of climate, social sustainability, and durability. The aim of the paper is to study the different vernacular building materials and evolving ideas in the present rural settlement of Maharashtra. The objectives of the paper are, to study the current practices in the use of materials and techniques, to study and identify the different vernacular building materials with respect to climatic conditions, terrain, durability and to identify the local materials which can be effectively used in buildings as a sustainable material. The methods used are, case studies in order to understand locally available construction materials and techniques, secondary data collection from literature review, studying different materials and technologies for obtaining effective solutions in rural areas. The limitation and scope of the study are focused on residential buildings only. To provide sustainable alternatives to conventional building technology is the desired outcome of the study.

Keywords: Sustainable, traditional material, rural architecture.

Introduction:

Today in the era of globalization, the advancements in the field of Science and Technology have boosted people's mentality to migrate towards urban settlements for the betterment of their lifestyle. This migration results in the trend of modernization in architecture as well as planning in rural areas. As a result, vernacular built form and traditional techniques are disappearing from the new generation's mind. This urbanization results in a bad impact on the environment and increases unsustainability and climatic havoc. So, it is a necessity of hour to revert towards vernacular materials in an innovative way to increase sustainability. As per International Organization for Standardization (ISO)15392 sustainability means, *"the present needs without compromising the ability of future generation to meet their own needs and vernacular architecture can be defined as a type of local or regional construction, using traditional materials and resources from the area where the building is located."*One thing is obvious that our desire to achieve new heights continuously forces us to explore. But innovation is not always about creating new technologies and materials. It needs to evolve what we already have in existence but artistically.

Maharashtra is a state in the western and central peninsular region of India occupying a substantial portion of the Deccan Plateau with the second-most populous state in India. Maharashtra is divided into five regions namely Vidarbha, Marathwada, Desh, Khandesh, and Konkan. It has three distinct seasons, Summer (March-May), rainy(June – September), and winter (October - February). The

temperature rises from 22 to 43 ^{0}C. The variations in the region are due to climatic conditions, terrain, and geographical location.

Figure 1: Map of Maharashtra showing regions

Source: https://www.caleidoscope.in/art-culture/marathi-region

The paper focuses on innovative ideas to use vernacular building materials in rural areas from two regions of Maharashtra i.e., Konkanand Vidarbha for the ease, scope of the study, and their popularity in the state with their local materials namely Bamboo, mud, and stone respectively.

1. Traditional ways of using vernacular materials:

1.1. Vidarbha Region: Gondia

Timber framing

Roofing: Taylor tiles

Stone plinth

Roofing: Mangalore Tile

Mud Walls

Timber Post

Figure 2: Traditional dwelling depicting materials of Gondia

Source: https://www.archinomy.com/case-studies/vernacular-architecture-of-gondia-maharashtra-india/

The Gondia district of Maharashtra has witnessed a large number of rulers and the rule of the Gond tribe. Each brought a new form of architecture with them. Over time, the traditional dwellings of this place, influenced by many disparate cultures, became typical for the region.

1.1.1. Planning: The Gondia Havelis were traditionally multi-tiered structures ranging from one to three storeys. The structures were generally pyramidal with a sloping roof to ease the flow of rainwater down from rooftops. The houses usually had huge open verandahs or a large front courtyard for public gatherings. The entire structural layout was laid around a central space.

Figure 3: Typical Layout of dwelling

Source:https://www.archinomy.com/case-studies/vernacular-architecture-of-gondia-maharashtra-india/

1.1.2. Building Materials and techniques:

- Due to the lack of effective transportation in the olden days, only local materials were used for buildings and facades.
- The supporting framework was done in teak wood, which was readily available as shown in Figure 2.
- For construction quarrying stones, grey granite was used, mainly as a plinth.
- The walls were developed in rural style with a mixture of mud, straw, and cow dung.
- The walls are coloured with lime mixed with indigo, to give a light blue colour as shown in Figure 2.
- The tiles used on the roof are burnt clay tiles as shown in Figure 2.
- The construction techniques which are used are conventional in nature due to the usage of vernacular materials

1.2. KonkanRegion: Murud, Dist. Dapoli

The architecture of the Konkan is not monumental or iconic instead it is mostly influenced by the climate, land topography, and social and cultural values of the region.Each of these houses has its own touch, its unique combination of color, customized space allotment.

Figure 4: Traditional dwelling depicting materials of Konkan

Source: https://www.youtube.com

1.2.1.Planning: The climate, physiography and the daily chores in the household divide the Konkani house into five parts: *Angan- Padvi- Otti- Majghar- Kitchen- Mala*. The sloping terrain provides the facility of creating different terraces which can be earmarked for different outdoor activities.The Konkani lifestyle is exceptionally extroverted and doesn't need an open to sky courtyard but rather well protected, dry, cool room. This gives comfort and a feeling of being well protected. The geometry of the house plan is based on square modules.
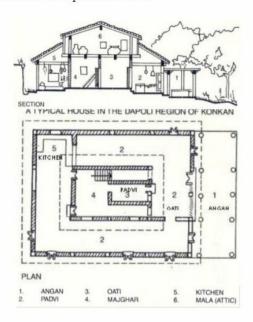
Figure 5: Typical Plan and section

Source: https://www.ripublication.com/irph/ijert_spl17/ijertv10n1spl_04.pdf

1.2.2. Building Materials and Techniques
- The most common material which was used for walls is laterite stone due to the climatic condition of the coastal area as shown in Figure 4.
- During summer *Angan* is covered with temporary roofing in the form of interwoven coconut leaves supported on bamboo posts which can be dismantled as per climatic needs.
- Simple conventional stone masonry techniques are used to build walls and roofing is carried out with timber framing.

2. Study of Properties and technologies

2.1. Mud

2.1.1. Properties
- **Availability** - Mud is found in abundance almost all over Maharashtra. This attribute makes it cheaper than any other conventional building material.
- **Energy consumption** – As it is easily available with lesser use of energy-consuming construction equipment, mud directly reduces energy consumption.
- **Malleable**
- **Insulation** - Mud is an insulation material that prevents external heat from entering inside the building while maintaining a cool environment inside.

2.1.2.Technology: Different types of construction technologies and techniques are-

- **Adobe** – Adobe is a combination of clay and sand, blended with water. Adobe mud squares are well seasoned, low cost, and widely accessible.
- **Rammed Earth Construction** – The technique involves compacting a damp mixture of soil and organic binders or stabilizers into the formwork. The mixture is compacted in batches until the desired height. The method results in beautiful and monolithic wall surfaces.

2.2. Laterite Stone
2.2.1. Properties
- **Appearance** - Laterites are residual sedimentary rocks with a reddish or brownish colour.
- **Porosity** - High degree of porosity. The porosity is due to the in situ weathering of parent rocks.
- Laterite has the peculiar property of being soft when newly quarried and could be cut easily but being hard and compact on exposure to the air.
- **Availability** - Locally available in the Konkan region of Maharashtra

2.2.2. Technology: Traditional way of dressing laterite stone is used by stacking the stones in a staggered manner with mortar in between.

2.3. Bamboo

2.3.1. Properties

- **Tensile strength**: It has higher tensile strength because its fibers run axially.
- **Fire Resistance**: It has a high capacity to resist fire due to the presence of a high value of silicate acid and water.
- **Elasticity**: It is widely preferred in earthquake-prone regions due to its elastic features.
- **Availability:** It is locally available hence it is economical.
- **Weight of bamboo**: Bamboos due to their low weight are easily displaced or installed making it very easier for transportation and construction.

2.3.2. Technology: For bamboo to be used as a building material, it must be worked on to create the desired shape, bend and length to be used for structural or other purposes. By splitting, shaping, and bending, it can be used in different works.

3. Innovative ideas for using vernacular materials
Construction materials have always been one of the most essential elements in architecture. Every construction material has its different qualities and so is the process of its application. During ancient times, people only used natural building materials such as stone, mud/earth, wood, etc. However, with the growing population and the need for better efficiency, one should start using energy-intensive, eco-friendly construction materials and techniques. These energy-intensive techniques have now brought us to a point where we need to reconsider our choices in building materials. Creativity and innovation are among the influencing factors of designer ideation, building appearance, and building materials(Idi and Khaidzir, 2015). Hence it is necessary to revive our choices and look back towards vernacular materials innovatively.

3.1. Mud
Mud has been the most essential building material since the dawn of man but as the technology got advanced, Reinforced Cement Concrete Construction started overpowering the traditional techniques and materials. Mud is a material that can be worked out in many ways to achieve architectural and structural outcomes. Mud as a building material not only provides the structural but also provides aesthetic value.
The organic form which is always a valuable addition to aesthetics can be possible in mud construction. By using mud bricks or blocks we can construct curved walls or facades using a rat-trap

bond. This will add in aesthetics as well as innovation of the material as in the case example of The Brick house in rural areas of Mumbai by Istudio(Figure 6 and 7).

Figure 6: Rat-trap bond for curved wall   **Figure 7: The brick House, Wada**
Source: https://thinkmatter.in/2015/01/13/brick-house-istudio-architecture/

The new techniques such as making Ground plus two structures using mud with some mild steel in it, brick jalis, arches are made using mud blocks which provides low cost and eco-friendly technologies. Different forms in the walls can be done using bricks and with aesthetic factors keeping in mind the natural color and texture of it, which gives beautiful exposed interior walls. Another way to construct a mud wall is by the rammed earth method. The mixture of mud, sand, clay with some percentage of lime when compressed into wooden boxes can be used for wall construction. This combination of vernacular materials creates several waves and patterns on the walls which gives everlasting experience as shown in Figure 8.
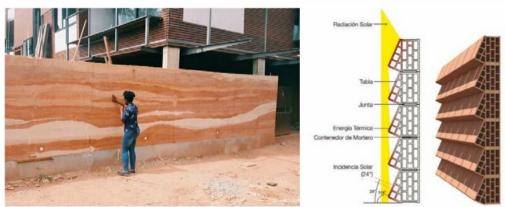
Figure 8: Rammed Earth WallFigure 9: Mud bricks of various forms for wall construction
Source: https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a1072-10-innovative-construction-materials-used-around-the-world/

The mud bricks can be made in unusual shapes which majorly block the sun and its hollow pores add air movement. This method adds to thermal comfort as well as aesthetic look to the facade and can be used in forming several shapes and patterns on wall exteriors as shown in Figure 9. This will promote a step to revive vernacular materials in rural areas.

3.2. Laterite Stone
The use of laterite stone in a Konkani style can be best modified and explored to achieve innovative built form. Though laterite stone offers simple wall construction its appearance and small-small details will add to the desired form. Different forms of the building are made using different rotation angles of laterite stone. Some elements like columns design can be designed by twisting the stone courses resulting in innovation rather than boring straight edges.

The idea of stone corbelling can add value addition and weather shedding when used over window chajjas. The arch and domes form to the structure can also be possible in this type of stone construction. Zig-zag stone cornices on the facade also contribute to aesthetic value and attraction as in the case example of The Krupachaya Farmhouse in rural areas of Pune(Figure10).

Figure 10: The Krupachaya Farmhouse, Kule Tq Mulshi
Source: https://www.archdaily.com/867664/krupachaya-farmhouse-q-design

3.3.Bamboo

Bamboo has long been used in architecture, but in recent years, it has been increasingly used to supplement other materials. Bamboo can be used innovatively in various ways. As it is flexible we can create numerous profiles or forms by exploring bending, curving, and somewhere flattening it. Various kinds of joinery will help to achieve this. Bamboo represents a range of styles, forms, and sense a variety of purposes. In conjunction with the roofing if we use bamboo for wall construction, then it will be adding to the aesthetic also as shown in Figure 11.
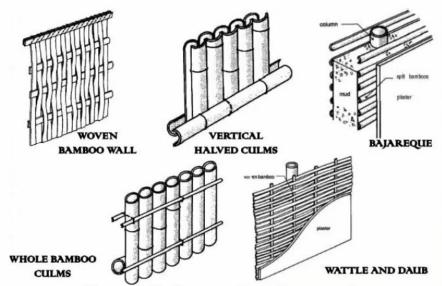
Figure 11: Various ways for wall construction
Source: https://theconstructor.org/building/bamboo-as-a-building-material-uses-advantages/14838/

Different forms are made using the different junctions of the bamboos, especially free-flowing forms. The different techniques used in modern days are bamboo-tee and plug in bolt connection as shown in Figure 13. Various arrangements lead to attraction in wall construction.

Figure 12: The Bamboo House in Mumbai   Figure 13: Bamboo-tee and plug-in bolt
Source: https://bambus.rwth-aachen.de/eng/reports/connect/bolt/bolt.html

Nowadays, glass is very extensively used for building aesthetics. If wood is treated with sodium hydroxide and other chemicals, it results in translucent wood. It better transmits light with high durability. It reduces thermal radiation and eliminates glare.

Conclusion:

Innovative ideas for using vernacular building materials open up insights and choices for designers to produce more varied and creative work. This study came to the conclusion that the use of vernacular building materials form architectural trend in a more sustainable way and economical. It is beneficial to use vernacular materials in an innovative way to ensure the balance between meeting the modern needs of mankind and protecting the interests of future generations at the same time contributing towards environmental comfort, affordability as well as sustainability. This innovation not only revives the local tradition but also reverts to the vernacular built fabric. The use of these sustainable vernacular materials not only minimizes transport costs, carbon emissions, and material costs but also offers aesthetic value in a better view. As it is the need of an hour of today in rural areas to look back towards local vernacular materials, the architects and designers need to brainstorm their minds to propose innovative ideas for the betterment of people's lives and to change their attraction towards concrete jungles.

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Architecture as Nuclei of Social Systems: Past and Future.

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Abstract: 'Gadhi' structures- the fortified strongholds of farming and warrior families in rural settings, memorials and temples are seen scattered around Solapur region. Using observation, documentation and architectural analysis of structures as the foremost research method and the history books as secondary sources the paper explores some examples of such buildings to comment upon the localization of building elements responding to rural life-style. Based on data collected over last decade about scattered historical structures and precincts in villages of Solapur district, this paper comments about the loss of value in rural life leading to negligence, ignorance and final deterioration of historically important, functionally efficient, simple yet elegant structures. Pertinent observations are made about the disjoint between the current rural social life, economy and culture and the traditional planning and architectural wisdom apparent through the residue of historic buildings. Patronage, availability of skilled craftsmen and materials at local level and local needs shaped the particular local flavour of regional styles. Ancient temples in this region were also restored in 18th and 19th centuries through patronage from important families while some were built anew. These structures anchored the rural settlement firmly in the surrounding countryside and even created an identity for the settlement. The families associated with it earned fame, respect and power through their patronage of cultural festivals played out in the physical setting created by prominent architecture. The paper looks at the history of the patron families and the villages which developed around the architecture and the reasons for the current sorry state of these structures. It argues that the connection between rural social system and residual historic architecture must be reformed for a better future of these buildings and the rural settlements.

Keywords: Solapur region, 18th and 19th century, Gadhi Architecure, Historic Architecture. Nuclei of social systems.

1. Introduction :

India is a country with diverse geo-climatic regions which were central to the development of varied cultural and architectural traditions over its long history of civilization. In addition there were many outsiders who travelled, attacked, and conquered the parts of the Indian land at various phases in history. These foreigners brought their language, culture and the way of living with them which were assimilated by the local culture in due course of time. On this background we can see that there are some concepts, philosophies, cultural and architectural traditions which have a presence at pan-Indian level while some of them developed distinct identities in distinct cultural regions distinguishing themselves from the greater traditions. These little traditions impart the distinct regional flavour to the culture- architecture of a certain region. It is important to record these regional nuances for posterity and also for their educational value.

This paper attempts to document and analyze the rural architectural prototypes and their role as the nuclei of the rural settlement from a socio-cultural as well as historical perspective to comment upon their relationship. It hypothesizes about the value of this relationship to the well- being of the social system of the time and argues that the disintegration of the balance is reflected in the changed relationship between the architecture and the rest of the settlement.

2.   Relevance of the study

Numerous beautiful and historically important structures of various types, sizes and purposes are existing all around the countryside which were in use until late 20th century. With the increased speed of rural to urban migration due to several economic and developmental reasons, many of these structures are neglected, dilapidated, encroached upon or turned into garbage bins. Moreover they are no more useful or important to the rural community due to fast changing socio-cultural practices. However these stuctures are the only objectified residues of certain historic phases of the region, repositories of traditionally developed construction and design practices which were not only specific to the local culture but also environmentally appropriate and sustainable. The conservation and adaptive reuse of these structures is a great necessity and this paper shall be a step towards mobilizing such efforts.

3.   Background and context

Maharashtra, the western state of India is a land of great antiquity. The great Sahyadri ranges on west forming a narrow coastal area to the Arabian Sea, the Satpuda range on north, the Balaghat ranges in the center and a vast plane between these popularly known as the Deccan Plateu interspersed with valleys of major rivers such as Godavari, Bheema and Krishna all emerging from the folds of Sahyadri have created a land of great geo-climatic and cultural variety. The civilization thrived here since chalcolithic times (1800-1200 BC) (Sankalia et al, 1971). Numerous dynasties bestowed the land with great cultural and architectural assets. The Mouryas, Satvahanas, Rashtrakutas, Vakatakas, Shilaharas, Chalukyas and Yadavas were indigenous dynasties after which there were Islamic rulers of foreign origin. Many of the rulers and their nobles were great patrons of art, architecture and cultural activities. Mahanubhavas, Natha, Siddha, Datta and Vaishnav, Veershaiva and Sufi cults provided the religious backbone to the society (Oturkar et al, 1977). In the valley of Bheema the Varkari cult thrived through centers such as Pandharpur, Alandi, Dehu through the annual cycles of pilgrimage and associated rituals and encompassed the entire Marathi speaking region. The Marathi culture developed on this background irrespective of events on the political front. Eventually the political events also influenced the socio-cultural realm.

Agriculture was the major occupation of the people who lived in villages until the late 19th century and their architectural needs were few. In late 19th and early 20th century exploitative colonial state policies and local industrialization led to destruction of rural small scale industries and migration of rural artisans to towns, cities and mega cities. The migration continued even in 20th century for reasons such as famines, irrigation problems, lack of employment, slow development and so on. Notable architecture such as forts, temples, protective walls and gates, step-wells and ghats was constructed in rural areas in the glorious phase of indigenous dynasties upto 13th century, which continued with reduced zeal even during rule of islamic dynasties. Instead of temples, mosques and tombs were built and there were considerable stylistic changes. The residential structures such as wada and gadhi and utilitarian structures such as step-wells, rest houses etc assimilated the stylistic influence of Islamic archtecture and continued to evolve as centuries progressed. Indigenous Maratha dynasty was established in 17th century and expanded its operations in 18th century to cover the major part of the Indian sub-continent.

Marathas evolved an unique architectural style by combining the local Deccan Islamic style with north indian influences. It revived forts, restored and expanded temples and town walls and newly built many forts and temples, wadas and gadhis, memorials and utilitarian structures. In this phase rural architecture acquired the elements of Maratha architecture. While percolating to rural level many decorative elements were reduced in view of budgetary constraints and availability of skilled craftsmen. The minimal, starkly simple forms of utilitarian architecure such as step wells, wada and gadhis anchored the rural settlement around them. This paper presents two such cases to comment upon their central role in the rural community.

4. Research Focus

It is important that the socio-historic role of rural architecture is understood before any attempts of conservation are made. This shall enable us to place them in the physical as well as cultural context.

4.1 Research Questions

What was the importance of notable architectural specimens in a certain rural settlement, as seen from its location and practices of use.

What was the contribution of notable rural architecture to the settlement in terms of social and cultural practices and perception? What is the current state and role of such architecture in the rural settlement.

4.2 Aim

To understand and assess the importance of historic rural architecture and comment upon the possibility and practicality of its conservation.

4.3 Objectives

To identify, document the examples of historic architecture of private residential types.

To understand the social, cultural role of the examples in their respective rural settlement.

To understand the economic and political setting in which the architecture was created and existed during its life.

To understand why and how the architecture lost or maintained its connect with the community.

To identify the pattern or the lack of it in the relationship between the community and the architecture and to suggest measures to conserve the buildings.

4.4 Scope and limitations

This research is limited to historic structures in rural settings in Solapur district. It only considers private residential architecture of eminent rural officials. It is based on data collected over last decade in various visits which were not specifically made for this study. The study is limited to making some observations about architectural value, socio-cultural practices and the change in them and uses only qualitative methods.

5. Literature review

Step wells were built on the basaltic plains of deccan, the present day Maharashtra by all the historic dynasties of Vakatakas; Rashtrakutas and Chalukyas. They generally built the wells in Circular, square and octagonal shapes (Jamkhedkar, 2002). More recently during Maratha rule in 18th century, water related architecture was again given great attention. Under the peshvas elaborate water supply schemes were designed and executed especially in Pune. Under ground network of stone- built canals and terracotta pipes brought in water from the rain water collection tanks on the outskirts of the town and supplied it to a series of water storage tanks above the ground (Mate, 2008). Historian A S Pathak describes the range of water structures built since ancient times till 18th century in his work 'Traditional Water Management and Water Architecture of Maharashtra (2017). However he discusses only a few important examples of step-well variety. Many of the step-wells were multi-storied and sometimes even surrounded by pavilions, colonnades and chambers.

Wadas were not only residences of elite families, but it was also a form which evolved in response to local climatic and socio-economic context. It was most appropriate for the cultural practices and social norms, security needs and available sites and budgets. In addition it offered various kinds of spaces for users of different age, gender, social status and economic class. During various times of the day and the year, it offered climatic comfort. It was adaptable to all resource conditions and could be enlarged in horizontal and vertical directions as required. The local materials, techniques, arts and crafts were used in construction of wadas giving it a distinct local flavour (Dengle, 1998; Gupta, 2013; Sahasrabudhe, 2017). The exemplary examples of wadas, gadhis, ghats and temples were built by members of Peshva royal family and their nobles during entire 18th and early 19th centuries which provided inspiration to more such buildings by wealthy merchants and bankers in smaller towns and pilgrim places all over Maharashtra. Patronage was thus very important for construction of good architecture (Sahasrabudhe, 2017). Along the way the construction techniques such as four point arches, vaults and shallow domes and onion domes were picked up and assimilated from deccan islamic sultanate architecture (Pratinidhi, 2019).

The historic structures in the rural areas of solapur district are from all the historic era discussed above, but the secular and utilitarian architecture which is still existing in good shape is from the Maratha era i e 18th and 19th centuries. Apparently the design and construction practices of Maratha era continued unabated even in colonial tiime till third quarter of 20th century in smaller towns and villages. However extant scholarly literature has scarce mentions or discussions of these structures. The relationship between architectural production and the rural settlement has not been discussed at all. This paper attempts to address the gap.

During Maratha era (mid 17th to early 19th century) the region of Solapur contributed many warriors, nobles and courtiers. They were gifted land parcels by the rulers (watan or jagir). (Deshmukh, 2009). This was a time of relative political stability and accumulation of wealth owing to Maratha army's winning forays in North India as well as inrease in agricultural production. As a consequence great deal of building activity seems to have taken place A number of courtyard houses of large scale -Wada in urban context and fortified compounds holding different buildings- Gadhi in rural context were built, whose remnants are still existing in the surrounds of Solapur (Gajare, 2016). Many step wells, town walls, town gates were also built around this time in almost all towns and notable villages of the region. Some historic temples of Chalukya and Yadava era were restored while some temples were newly built.

6. Theoretical framework

All around the world the interest in historic architecture and cultural landscapes was renewed in last few decades of 20th century owing to the threat posed by the forces of homogeneity caused by urbanization and globalization processes. The UNESCO (United Nations Educational, Scientific and Cultural Organization) prepares and updates the list of world heritage sites acknowledging the universal human values and endeavour, art and craft, architecture and the cultural traditions along with sites of natural beauty and value. (https://whc.unesco.org). International organizations such as ICOMOS have framed guidelines and policies/ strategies for protection and conservation of architecture, precincts, and cities of historic importance.

It's widely accepted that notable architecture of any form and type affects human life and values in many tangible and intangible ways. It contributes to the identity of a place, shapes settlement characteristics and provides impetus to socio-cultural transformations (Colak, 2019). The site specific design responses are repeated in similar situations, inspire thematic explorations and variations and over the time get accumulated in a body of knowledge, practices and responses which can be sometimes termed as 'style'. The style in turn contributes to specific identity of the type of architecture and binds it with a region- era- producer- people. Since architecture has longer life than people, it often remains as an object symbolizing certain era and becomes the repository of knowledge about design and construction practices, way of life, socio-cultural norms, and economic conditions of

certain people in a certain era. This line of thought accords importance to local variations of a regional style. Within this framework here is an attempt to comment upon the role of architecture in rural settlements of Solapur region.

Another point to consider is the meaning and temporality of the word 'rural'. Many towns which were important historically have now fallen back to the rural status due to various reasons. In precolonial time there were no great differences between towns and villages. There were only a few great cities, which were royal capitals of reigning dynasties. With change of political regime many cities lost their purpose of existence and were fast relegated to secondary even tertiary status, while new transport linkages and establishment of industries pushed some other towns on the fast track of development. Thus something that was urban in 18th century is probably semi-urban or rural according to contemporary standards.

7. Notable architecture in rural settlements: Surrounds of Solapur
7.1 Deshpande Gadhi at Dhotri

Deshpande Gadhi at dhotri, about 10 km from Solapur town, some 6 kms from the highway leading to Hyderabad- NH 65, is a major ladmark in the small village. 'Deshpande'and 'Deshmukh' were important village officials often supervising and collecting revenue for a bunch of many surrounding villages and having an administrative seat at a convenient place. Their earnings were substantial, in terms of grain, land parcels and currency (Gajare, 2016). The gadhi was probably constructed in 18th century to supervise the large farmlands spread around, which may have encouraged small farmers to settle nearby and begin the settlement.

E- Village Entrance Gate

T- Temple

W- Well
1- Forecourt
2- First Enclosure
3- Second Enclosure
4- Service Enclosure

Y- Yard/Garden
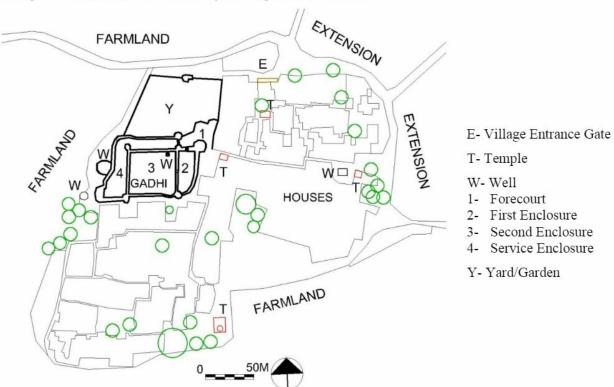
Figure 1: Dhotri Village Layout showing the relationship between Gadhi and village.

(Source: Map developed by the author based on Google Earth images and field observations)

The settlement has grown on east and south of the Gadhi, while farmlands abut on west and north (Figure 1). Post-independence the village has grown on North-east in more formal grid-iron pattern. The older settlement however has an organic form sub- divided into blocks of various occupational communities. The houses maintain sufficient distance from the gadhi wall to let pass a

pair of bullock carts. Major lanes in the village also have the same width. Smaller lanes however are not so wide or straight. The majority of houses are also built in stone, have courtyard wada form and have only single floor. Very few buildings have upper floors (Figure 6 & 7).

The bastions of the gadhi are 2-3 floors high and the enclosure walls are equally tall. The gadhi can be seen from everywhere in the village and also from the surrounding farmlands at about 200 m distance (Figure 3, 4 & 5). The village gate is clearly constructed in late 19th century (Figure 2). The Shahabad stone used in it was available in Solapur only in the last decades of 19th century when it could be transported from Shahabad Wadi through railway wagons.

Figure 2: Entrance Arch to Dhotri village (probably early 20th century)

Figure 3: Deshpande Gadhi from west (Backside), probably 18th century

Figure 4: First Gate, Deshpande Gadhi, Dhotri

Figure 5: The village deity temple right next to the Gadhi bastion. (2, 3, 4, 5- Source: Author)

Figure 6: The relationship of the houses and the Gadhi Enclosure wall

Figure 7: A lane in the village. (6&7-Source: Ar Shveta Kothavale)

Structures except the gadhi enclosure walls have not survived. The Family probably migrated to Solapur in late 19th century. Dhotrikar Deshpande were renowned bankers and money lenders in town till mid- 20th century. The family built wadas, bungalows and chawls in town. The gadhi may have been neglected during the time. The fate of the family after 1950 is not known. The gadhi is now sold to Hotgi Brihanmath, a Veershaiva religious organization, who may protect and conserve the walls for some more decades. However the villagers do not have everyday relations with the Gadhi anymore. Only a swami of a minor order worships the Shivalinga on a semi-covered platform in the first enclosure.

7.2 Deshmukh Gadhi at Malkavathe

The other such Gadhi is situated at Malkavathe in South Solapur taluka of Solapur District, about 15 km from Mandrup, on Solapur- Vijapura Highway NH 52. The Deshmukh family once owned about a thousand acre farmland in surrounding 40 villages. Their administrative seat was at Malkavathe in the form of a large Fortress- like Gadhi. It was equipped with 4 bastions, 3 enclosure walls, 3 major courtyards, horse and cattle stables, servants' quarters and owner's residential wada. Probably built in late 18th century the structure has an imposing presence in the settlement. Located near the junction of arterial road joining with town and smaller roads to nearby villages, it has open spaces on front and side, after which the villagers' single storied houses are arranged (Figure 8 and 9). The village deities' temples are located nearby. An ancient 12th century Shiva temple nearby indicates the strong Shaivite leanings of the people and the antiquity of the village, which was perhaps the reason for selecting this village for construction of gadhi.

M- Math (20th century)
T- Temple
W- Well
1   First Court
2   Second Court
3   Third Court
A Associate Houses
Y- Yard/Garden
O- Officials' Houses
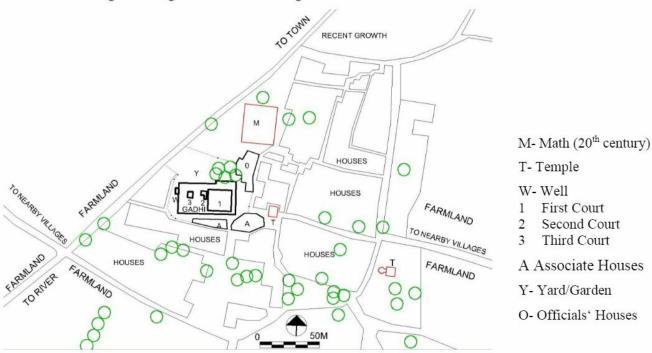
Figure 8: Malkavathe Village Layout showing the relationship between Gadhi and village.

(Source: Map developed by the author based on Google Earth images and field observations)

The gadhi was clearly constructed in late 18th century as any colonial influences are conspicuously absent in the original construction. However some additions such as part first floor around second court and a modern bathroom with European fittings on west side were added probably in early 20th century. The extant remains of the structure are sufficient to give a fair idea about the original grandeur of spaces (Figure 10- 15). The treasury room is hidden in one of the bastions, the puja room can be accessed from office court. The kitchen offers the view of the office court and

external court through a hidden window which enabled the matriarch of the family control household and estate affairs together. The associates and officials working for the estate were housed in the vicinity of the fortress. A large yard around the structure enabled training of cattle and horses. The construction of the Gadhi was strong enough to withstand robbers' raids. Small apertures in the enclosure walls enabled use of firearms for defence.

Figure 9: Deshmukh Gadhi from North West. (Source: Author)

Figure 10: First Gate   **Figure 11: Second enclosure, second gate seen from outer court**
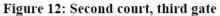
Figure 12: Second court, third gate   **Figure 13: Woodwork detail**

Figure 14: Kitchen Court   **Figure 15: Third court, with holy basil platform**

(Source: Author and Ar Shveta Kothawale)

8. Observations

8.1 Architectural features

The hierarchical nature of the social and political system generated the form with multiple enclosures where privacy, practices of purity and gender segregation could be maintained. The grand scale of enclosure walls and courtyards within was necessary for underlining the importance of the reigning officials, as well as allow grain storage, supplementary farming tasks and cattle sheds on large scale. The spaces were large and flexible enough to accommodate needs of expanding family, additions and alterations within original structural framework. The architectural features of both these examples such as four point arches, bastions, thick specially prepared mud enclosure walls with both side lining of basalt stone in lime mortar, hidden chambers, wells and tanks, residential spaces arranged around courtyards, very stark and minimal exteriors indicate the response to spatial needs, security needs and social- cultural needs. These features continued the tradition of construction practices at the same time innovated to fulfil special needs. The woodwork in Malkavathe gadhi is more elaborate and refined than that found in town wada houses indicating the wealth and importance of these rural seats of governance, and the continuity of traditional craftsmanship without colonial time simplification.

8.2 Relation with the settlement

Though the relationship of the Gadhi and the settlement was symbiotic, the gadhi owner family was responsible for safety and subsistence of the villagers. In return they commanded respect, priority and obedience. The cultural festivals were sponsored by the reigning family which usually began and ended in the Gadhi Yards (Gajare, 2016). The relation is well exemplified in the physical form of the village, where the Gadhi has a major presence and the village orients itself towards the gadhi. On the other hand the gadhi can be approached through the village and also directly from the access road, showing that affairs of the gadhi were conducted independently of the village.

9. Conclusion

Both these cases are representatives of dozens of large sized residences and mansions strewn around the villages in Solapur District. In both these cases it can be clearly seen that the village

developed only because the Gadhi was built. The landlords built these imposing structures so that they could supervise their farmlands, store the agriculture produce and keep the wealth generated through it in safe custody. Both these families were upper caste families in 18th century social system. They may have had political connections or engagements in their families' past history which elevated them to the important position as landlords, however they did not directly engage in any political activities since 19th century.

There is great difference in the Gadhi building and other houses and temples of the village in terms of area, size, form, technology and material expression. The village layout is also oriented towards the gadhi clearly showing the hierarchical relationship and the central position of the building in the settlement. The structure was symbolic of the social, cultural, economic and political power of the patriarch of the family, rather the architecture was the expression of that power and in turn helped to consolidate it. The villagers were totally dependent on the Gadhi and its owners for their subsistence and security and were probably employed in the Gadhi, or the farmlands or provided various supplementary services in their traditional roles. Thus the notable architecture of Gadhi was the nucleus of the village and anchored the rural settlement in the vast landscape of farmlands and wilderness. Many such important structures were historically developed prompted by the social, political and occupational structure of the medieval society, which patronised and carried forward the traditional wisdom of building design and construction.

The imposing form and architectural spaces of these structures are artistic, efficient and climate friendly. They have lasted for about 300 years and are now crumbling without creating environmental problems. They show our ancestors' deep understanding of the local climate, local materials, local cultural ethos and the patron's needs. The design response is so wonderful that no modern structure can ever hope to compare with them on all these counts. The form itself is adaptable to any resource condition and any site context. The structures are repositories of knowledge about sustainable construction techniques as well as minimalist design efficiency. Though situated in rural area, the structures employed all the advanced design and construction techniques of the time. They are standing long after the urban structures of similar antiquity have long gone. The study of these structures is important to understand the social structures, way of life and the construction practices of the medieval Maharashtrian rural society.

10. The way ahead

Both these gadhis were occupied until mid- 20th century, after which due to various reasons they remained vacant and unused. The farm-land ceiling acts and family divisions removed the need for such gadhi structures. Presently the owners of the Gadhi do not occupy important social position in respective villages and the Gadhi structures are fast deteriorating. Still their imposing physical form commands respect and prompts nostalgia in the elderly villagers. For the children and youth, the Gadhi is a storehouse of novelty and wonder. Many stories are imagined and told, but no one knows the real history. Almost no authentic sources of information exist. Dhotri gadhi has been bought by a religious organization while last descendent of the Deshmukh family in his late seventies can't do much for the upkeep of Malkavathe gadhi due to his economic conditions.

Ideally, these Gadhis need to be restored and adapted for reuse. They can again become relevant for the rural settlement as pubic institutions or as economic generators through agro- tourism inititatives. The funds and initiative needed for this kind of a vision can be raised through public-private joint ventures. Though we currently do not have any models for this, we need to generate them soon. Architects, architectural institutions and heritage NGOs can play important role in documenting the rural structures and developing sustainable models for their conservation.

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The Impact Of Lockdown On The Movement Of Disabled People In Rural Region- Akole Taluka

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Abstract: The study aims to analyze the effects of lockdown on physically challenged people for accessing public-built structures and the study is particularly in the Akole Taluka of A.Nagar district under Maharashtra to find the challenges for current architectural practice in the ground reality of that rural region. The objectives of the study are to investigate the various types of public-built structures that were open in lockdown as emergency services, analyze them, identify which were physically accessible for disabled people, identify which architectural elements are required within the built spaces based on their disability consideration factor, and analyze how barrier-free accessible built environment play's a major role in an individual's life. The methodology of this research is conducted through primary data is collected through a live case study, observations, and secondary data is collected through literature review. The study does not include mental, intellectual, multiple disability information and does not include data rather than emergency services that were opened in lockdown. The study concluded that the emergency services were not physically accessible to everyone in the first wave of lockdown, that lockdown had affected physically challenged people on their physical as well as mental health, and they face lots of challenges regarding accessibility, it causes that they are lagging behind and struggling due to a lack of access to services. This research is helping to implement architecture elements in design and to be useful for physically challenged people, for disability law enforcement officers, for strengthening PWD's law, architects, decision-makers, and local people who do not think about a universal approach.

Key Words: Covid-19, Accessibility, Barriers, Physically disabled, Rural Context.

Introduction: At the moment of a Covid pandemic physically challenged people are face difficulty related to accessing the services, which causes their discomfort, inconvenience and it is affecting their physical as well as mental health. In lockdown situations, all individuals were faced a lot of difficulties related to their daily activities, but the people most affected were disabled. Vaccination is the need of every individual in this situation and it is the right of every individual to get vaccinated. But the question arises can every person get a vaccine without struggling to get in? This question is motivated to find out the truth. India went into a lockdown on March 25, 2020, to combat the spread of COVID 19 infections and reduce the pressure on healthcare systems. Lockdown was required in those circumstances, but it affected every individual's life very badly. The people with disabilities in that situation were facing several types of difficulties, the most important was related to the accessibility of built spaces. It was not only the lockdown that caused them to face access-related issues but otherwise, also they have the same problems for accessing the services that they always need to rely on others. But because of the rule that we called social distancing people are not ready to come across and help them. This situation helps us to realize that these people needed architectural building elements within the built spaces. This research will help to implement architecture elements in design and help to make strengthen the law of enforcement.

Aim: To analyze the effects of lockdown on physically challenged people for accessing public-built structures.

Objectives:
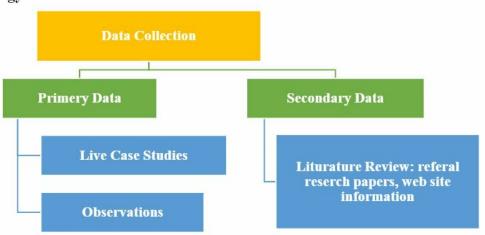
1. To investigate the various types of public-built structures that were open in lockdown as emergency services.
2. To analyze them and identify which were physically accessible for disabled people.
3. To identify which architectural elements are required within the built spaces based on their disability consideration factor.
4. To analyze how barrier-free accessible built environment play's a major role in an individual's life.

Scope: The purpose of the study is to analyze the public-built spaces that were built to consider the disabled keep in the mind. Sample for studying are public-built spaces that were open in lockdown as emergency services such as primary hospitals, vaccination centers, covid centers, banks, grocery stores. This topic includes information about Architectural built elements that are required for physically challenged people. The study is particularly in the Akole Taluka of A.Nagar district under Maharashtra.

Limitations: The study will not include information about mental, intellectual, multiple disabilities. not included data rather than emergency services that were open in lockdown.

Methodology:

Need Of The Topic: Previously researchers had not thought about all emergency services opened up in lockdown and did not include data on all physically challenged people. That's why data does not include information on physically challenged people struggling for access. This research is useful for physically challenged people, for disability law enforcement officers, for strengthening PWD's law, architects, decision-makers, and local people who do not think about a universal approach.

Matrix:

Building Typology	Vaccination Center	

Name	Rural Hospital Akole			
Location	Rural Hospital Akole, Tal. Akole, Dist. Ahmednagar			
Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**
Entrance And Exit	• 2 ramps are provided one is for entry and the another is for the exit. • There are no handrails. • Steps are not provided for entry or exit.		The exit ramp is not in proper ratio because of that there is a difficulty for a wheelchair user to run a wheelchair through a ramp and railings are not given it causes difficulty for visually impaired people.	Many architectural elements are missing in the structure and lack of access through the elements is why physically challenged people face a lot of challenges for accessing the vaccination center. There is a need for stairs and railings which are a very primary need to access services. There is a need for a toilet that is accessible to everyone and the door should be like this that is not be opened in the corridor. There is a need to provide guide floor material, textual signals, and migration chairs. For exit ramp the ratio used is 1:7 there is a need to provide a 1:12 ratio ramp.
Flooring	• Non-Slip resistant materials are used for flooring		A physically challenged person can easily get access with their mobility equipment.	
Exterior	• Some trees are planted on the periphery of the building block and some of them are planted in front of the building block to create shade for the outdoor seating.		There is an outdoor seating area below the tree and the exterior area is accessible for physically disabled people.	
Pathway	• Worm brick concrete floor blocks are used.		The pathway is accessible and barrier-free for physically challenged people.	

Toilet	• The universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.
Light Ventilation	• Large windows are provided for lighting and ventilation purpose.		Light and ventilation are good and enough.
Corridor	• The corridor is large or unobstructed with a seating area. • The width of the entry and exit corridor is 1800 mm. • The corridors are a width of 2500 mm which leads towards the online registration for vaccines.		The corridor is large and unobstructed enough space for the circulation of mobility devices. But the door in the corridor which leads toward the vaccination area opens outward in the corridor creates an obstruction for the mobility devices.
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.
Door	• Doors are open from outside in the corridor, which leads towards the vaccination area.		The main door is accessible for mobility devices but the door in the corridor which opens outward in the corridor creates an obstruction for the mobility devices.
Textural Indication	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.

Building Typology	Vaccination Center	
Name	Jilha Parishad Prathmik Kendra Shala Akole Mule.	

Location	Jilha Parishad Prathmik Kendra Shala Akole Mule, Tal-Akole, Dis-A.Nagar, Maharashtra 422601.			
Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**
Entrance And Exit	• A huge gate is provided for the entrance. • Steps and ramp are provided but they aren't in good condition. • The railings are not proper in condition.		There is no good flooring to access through that gate with mobility equipment. Steps are provided without railings that are completely damaged, the ramp has also been damaged and not in proper ratio. The railing is not in the right condition and all these things cannot be used by physically challenged people.	There are missing architectural elements, damaged flooring, and lack of access by the elements which is why physically challenged people struggle for access. There is a need for good flooring. There is a ramp with a 1:6 ratio so there is a need to provide a 1:12 ratio ramp and railing which is a primary need to get access to any building. Proper pathways, the accessible door, should be accessible toilet which is accessible for everyone. Need to provide guide floor material, textual indication, and evacuation chair.
Flooring	• Shahabad tile is used for flooring. • For circulation, there is damaged flooring.		The flooring is completely damaged which causes difficulty for physically challenged people.	
Exterior	• There are large trees within the periphery of the building block.		There is an outdoor seating area below the tree but the outer area is not accessible for mobility equipment due to the floor.	
Pathway	• Mud floor is used for pathways.		Disabled people face difficulty because there is no flat surface.	
Toilet	• The universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.	
Light Ventilation	• Windows and doors are provided for natural ventilation.		There are enough windows for natural ventilation.	

Corridor	• The flooring of the corridor is damaged.		The flooring is completely damaged which makes it difficult for physically challenged people to enter the corridor.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• A double wooden door is provided.		The width of the door is not wheelchair accessible so people with disabilities face difficulties.	
Textural Indication	• There is no textural indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building Typology	Vaccination Center	
Name	Zilla Parishad Ahmednagar Primary Health Sub-Center Nawalewadi, Tal. Akole, Dis. A. Nagara	
Location	Vittal nagar nawalewadi Tal. Akole, Dist. Ahmednagar, Maharahtra 422601.	

Architectural Building Elements	Description	Photograph	Remark	Inference

Entrance And	• For the main entrance, a huge metal gate is provided. • Separate gate is provided for main entry and exit. • A ramp and staircase are provided for the building entrance.		The ramps are not in proper ratio because of that there is a difficulty for a wheelchair user to run a wheelchair through a ramp and railings are not given extra rail causing difficulty to visually impaired users.	Some architectural elements are there but not in the proper ratio, some architectural elements are missing, and randomly grown grass all create a barrier for physically challenged people. Here they used 1:6 and 1:3 ratio ramp but There is a need for a ramp in a proper ratio which is 1:12. The ramp has railings on both sides with an extended railing that is 0.30 meters across the top and bottom of the ramp, and there is a need for landing space. Need of non-slippery tiles and exterior pathway without obstacles and accessible floor material. Need to provide an accessible toilet and evacuation chair, guide floor material in the corridor, and Textual indication.
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	
Exterior	• Large open space in front of vaccination center. • A huge compound wall is used to create a visual barrier. • Some linearly planted flowering plant is there on the right side of the building block. • There are no huge trees in the periphery of the building block.		The exterior area is accessible for physically challenged people but the exterior area which leads towards the exit gate there is messy grown grass which creates an obstruction for physically challenged people.	

Pathway	• Worm brick concrete floor blocks are used for the exterior floor. • There is messy grown grass on the pathway which leads towards the exit gate.		The pathway is accessible and barrier-free for physically challenged people. But the pathway which leads towards the exit gate there is messy grown grass which creates an obstruction for physically challenged people.	
Toilet	• The universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.	
Light Ventilation	• Windows and doors are provided for natural ventilation.		There are enough windows for natural ventilation.	
Corridor	• The corridor is large or unobstructed.		The corridor is large and unobstructed enough space for the circulation of mobility devices.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• A metal sliding door is provided for the entrance. • And other doors are wooden single doors.		There is not enough landing space in front of the door so it is difficult for disabled people to get in through the door.	
Textural Indication	• There is no textural indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building Typology	Covid Center	
Name	Prathmik Arogya Kendra Sugaon Khurd, Tal-Akole, Dis-A.Nagar.	
Location	Sugaon Khurd, Tal-	

Architectural Building Elements	Description	Photograph	Remark	Inference
Akole, Dis-A.Nagar, Maharashtra 422601.				
Entrance And Exit	• There are stairs and ramps for entry and exit.		The ramps are not in proper ratio because of that there is a difficulty for a wheelchair user to run a wheelchair through a ramp and for railings extra rail are not given it causes difficulty to visually impaired users.	Some architectural elements are there but not in the right ratio and some architectural elements are absent which is why disabled people face a lot of challenges to entering the Covid center. Here is a ramp with a 1:5 and 1:4 ratio but needs to provide a ramp with a 1:12 ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. Need to provide non-slippery tiles an accessible toilet and guide floor material, an evacuation chair, textual indication. There is a need to remove obstructions in the entrance which is created because of the floor mat.
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	
Exterior	• There is only one tree is on the site. • There is a large open space in front of the covid center which acts as a parking space.		The Exterior area is accessible for physically challenged people.	
Pathway	• Worm brick Concrete floor block is used.		The pathway is accessible and barrier-free for physically challenged people.	
Toilet	• The universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.	
Light Ventilation	• Doors and windows are used for natural ventilation. • Artificial light and ventilation are also used there.		Light and ventilation are good and enough.	

Corridor	• The corridor is large and unobstructed.		The corridor is large and unobstructed enough space for the circulation of mobility devices.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• For entrance, there is a sliding metal gate and a wooden double door is provided.		The door is accessible for mobility equipment but there is a floor mat that creates an obstruction.	
Textural Indication	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building typology	Covid Center	
Name	Vitthal Lawns	
Location	Akole Bypass Road, Vitthal Nagar, Tal-Akole, Dis-A.Nagar, Maharashtra 422601.	

Architectural Building Elements	Description	Photograph	Remark	Inference

Entrance And	• For the main entrance, there is a large sliding metal gate is provided. • There are stairs for entry and exit.		The entrance is not wheelchair accessible because there is no provision of a ramp, Railing is not there to support visually impaired people.	The structure has missing architectural elements and a lack of access through built space which is why physically challenged people are finding it difficult to enter the Covid center. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. Need to provide non-slippery tiles for the interior flooring and paving blocks for exterior pathways. Need to provide an accessible toilet and guide floor material, an evacuation chair, textual indication. And proper windows must be provided.
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	
Exterior	• Large open spaces for parking and there are many trees on the exterior.		The exterior area has lavish greenery but there is a shallow slope no plain floor to operate mobility devices.	
Pathway	• Muram stone is laid on the surface of the soil. • There is a mud floor for the pathway.		Difficulty while operating a mobility device.	
Toilet	• The universal toilet is not there. • Toilet block is almost 6m away from the main building block.		There is a provision of the toilet but it is not accessible for physically challenged people and it is almost 6m away from the building block.	
Light Ventilation	• There are large openings without a window for natural ventilation. • Artificial light and ventilation are used there.		Without a window, that big opening increases the cold at night in that building block.	
Corridor	-		-	

Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• For entrance, a large sliding metal gate is provided. • And rolling shutter is provided for the toilet.		The gate is accessible for mobility equipment but the floor is not flat which causes difficulty for physically challenged people.	
Textural Indication	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building typology	Healthcare	
Name	Shinde Hospital	
Location	Shinde Hospital, Akole, Maharashtra 422601, India.	

Architectural Building Elements	Description	Photograph	Remark	Inference
Entrance And Exit	• Steps are provided. • There is no provision of a ramp.		The entrance is not wheelchair accessible because there is no provision of a ramp, And for railings, extra rail is not given it causing difficulty to visually impaired users.	There are obstructions for circulation of mobility devices, no access from the building elements, and absence of architectural elements in design which is why disabled people do not get access. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	

Exterior	• There is not enough space for parking and there is no kind of landscape.		There is no plain floor it causes wheelchair person face difficulty to get in.	that is 0.30 meters across the top and bottom of the ramp. It is necessary to provide non-slippery tiles for the interior flooring and paving blocks for the exterior pathway. The corridor should provide without obstacles. Accessible toilet and guide floor materials, an evacuation chair, textual signs must be provided.
Pathway	• There is a shallow slope on the pathway. • The ground soil floor is there.		People with disabilities face difficulties due to a lack of flat surfaces.	
Toilet	• Universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.	
Light Ventilation	• Doors and windows are used as natural ventilation. • And artificial light and ventilation are also used.		Light and ventilation are good and enough.	
Corridor	• The seating desk and reception desk create obstruction in the corridor. • And footwear is also created obstruction.		There is a seating desk and the reception desk creates an obstruction for mobility device users.	
Guide Floor	• There is no guide floor material provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• For entrance, a rolling shutter is provided. • Wooden and glass single door is also used there.		There is not enough landing space in front of the door so it is difficult for disabled people to get in through the door.	
Textural Indication	• There is no textual indication.		Visually impaired people suffer because there is no textual indication.	

Evacuation	• Evacuation chair is not there.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building typology	Healthcare	
Name	Shree Saibaba Hospital	
Location	Shree Saibaba Hospital, Akole, Maharashtra 422601, India.	

Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**
Entrance And Exit	• Steps are provided. • There is no provision of a ramp.		The entrance is not wheelchair accessible because there is no provision of a ramp, And for railings, extra rail is not given it causing difficulty to visually impaired users.	There is not enough circulation space for mobility equipment and the absence of architectural elements in design that's why people with disabilities are having difficulty accessing services. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. It is necessary to provide non-slippery tiles for the interior flooring. The corridor should provide without obstacles it should be large. Accessible toilet and guide floor materials, an evacuation chair, textual
Flooring	• Ceramic floor tile (glossy finish) is used.		floor is slippery which makes it difficult to use mobility equipment.	
Exterior	• There is space for parking but there is no landscape.		Physically challenged people get access to the exterior areas without getting difficulties.	
Pathway	• Worm brick Concrete floor blocks are used.		Because of concrete floor blocks, there is no kind of issue to run mobility devices.	

Toilet	• Universal toilet is not there.		There is a provision of the toilet but it is not accessible for physically challenged people.	signs must be provided. Need to provide more windows for natural ventilation.
Light Ventilation	• There are very few windows for natural ventilation. • And artificial light and ventilation are used.		Because of the narrow area and minimum circulation space, there is the issue of natural light and ventilation.	
Corridor 	• There is not enough space for circulation. • The seating desk creates obstruction in the corridor.		Because of minimum circulation space and seating desk, there is no space to enter a mobility device.	
Guide Floor	• There is no guide floor material provided.		Guiding floor material is not there to guide visually impaired people.	
Door	• For entrance, a metal rolling shutter is provided.		The door is accessible for mobility equipment but there is a floor mat that creates an obstruction.	
Textural Indication	• There is no textual indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• Evacuation chair is not there.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building Typology	Grocery Shop	
Name	D K supper market akole	

Location	D K Supper Market Akole, Maharashtra 422601, India			
Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**
Entrance And Exit	• There are several steps to reach a height of 1050mm. • There is no provision for the ramp.		The entrance is not wheelchair accessible and the Railing is not proper for Visually impaired users.	There is an absence of architectural elements within the structure which causes inconvenience to disabled people for entering the service. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. Grocery store furniture should be low in height so it is easy for wheelchair users and circulation space min 1.50m to 1.80m to allow easy passage of two wheelchairs without any obstructions, may passage have a width less than 1.50m but not less than 0.90m. Guide floor materials, an evacuation chair, textual signs must be provided. Need to provide more windows for natural ventilation.
Flooring	• VCT (vinyl composition tile) material is used for flooring.		The tiles are non-slippery so there is no difficulty to use mobility equipment.	
Furniture	• Grocery store furniture is not are in low height.		All Furniture is not wheelchair accessible.	
Exterior	• Long entry passage is provided for entrance. • There are no trees in the entry area.		The Exterior area is accessible for physically challenged people but there, is no kind of landscape.	
Pathway	• Worm brick Concrete floor blocks are used.		The pathway is accessible and barrier-free for physically challenged people.	
Toilet	• There is no provision for the toilet.		-	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Light Ventilation	• A full-height spider glass is provided for the entrance. • And there is mechanical ventilation, no windows for natural ventilation.		There are not enough windows for natural ventilation.	
Circulation	• There is not enough space in between the furniture.		There is not enough space for mobility-impaired people to operate their mobility devices.	
Door	• A glass door is provided for entry and exit.		There is not enough landing space in front of the door so it is difficult for disabled people to get in through the door.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Textural Indications	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.	

Building Typology	Grocery Shop	
Name	Dhananjay super shopee	
Location	Kolhar Ghoti Rd, Akole, Maharashtra 422601	

Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**

Entrance And Exit	• Steps are provided. • There is no provision of a ramp.		The entrance is not wheelchair accessible and the Railing is not proper for Visually impaired users.	There is an absence of architectural elements within the structure and some built elements create an obstruction for mobility equipment which causes inconvenience to disabled people for entering the service. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. Grocery store furniture should be low in height so it becomes easy for wheelchair users and circulation space min 1.50m to 1.80m to allow easy passage of two wheelchairs without any obstructions, may passage has a width less than 1.50m but not less than 0.90m. It is necessary to provide paving blocks for the exterior pathway. Guide floor materials, an evacuation chair, textual signs must be provided. need to provide more windows for natural ventilation.
Flooring	• VCT (vinyl composition tile) material is used for flooring.		The tiles are non-slippery so there is no difficulty to use mobility equipment.	
Furniture	• Grocery store furniture is not are in low height.		All Furniture is not wheelchair accessible.	
Exterior	• There is not enough parking space and no any kind of landscape.		There is not plain surface for movement of wheelchair.	
Pathway	• Mud floor is there.		There is no any kind of artificial flooring natural flooring is there because of that there is no plain floor.	
Toilet	• There is no provision for the toilet.		-	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	
Light Ventilation	• Mechanical light and ventilation are provided and spider glass is provided in front of the shop for light.		There are not enough windows for natural ventilation.	

Circulation	• There is not enough space in between the furniture.		There is not enough space for mobility-impaired people to operate their mobility devices.	
Door	• A glass door is provided for entry and exit.		There is enough space for landing but there is a riser to enter through the door which causes difficulty for people with disabilities.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Textural Indications	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.	

Building typology	Bank		
Name	Ahmednagar District Central Co-Operative Bank		
Location	SH44, near Sarda Petrol Pump, Akole, Maharashtra 422601		

Architectural Building Elements	Description	Photograph	Remark	Inference
Entrance And Exit	• Steps are provided for entry of bank and ATM and there are no ramp and railings.		The entrance is not wheelchair accessible because there is no provision of a ramp, Railing is not there to support visually impaired people.	There are missing architectural elements and some built elements create barriers for mobility equipment that causes people with disabilities to struggle a lot. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. It is necessary to provide
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	
Elevators	• The elevator is not provided.		Wheelchair users face difficulty because there is no provision of an elevator.	

Furniture	• The height of the bank desk and cash counter is not low.		The height of furniture is high which causes difficulty for wheelchair users.	non-slippery tiles for the interior flooring and paving blocks for the exterior pathway. The corridor should provide without obstacles. Accessible toilet and guide floor materials, an elevator, an evacuation chair, textual signs must be provided. Need of accessible furniture.
Exterior	• A long passage is for entry. • Liner trees are planted at one side of the site to create shad for parking.		Natural flooring is there because of that there is no plain floor it causes wheelchair person face difficulty to get in.	
Pathway	• Mud floor is there.		Difficulty while operating a mobility device.	
Toilet	• There is no public toilet.		-	
Light Ventilation	• Large windows and ventilators are provided. • Mechanical light and fans are provided.		Light and ventilation are good and enough.	
Corridor	• The plastic grass mat is spread on the floor which creates an obstruction in the corridor.		There is an obstruction in the corridor so it is difficult for physically challenged people to get enter through a corridor.	
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.	
Circulation	• There is enough space for circulation and an Adequate seating arrangement.		There is enough circulation space for physically challenged people to operate their mobility devices.	
Door	• A metal folding door is provided for the entrance and the other are single and double wooden doors.		There is a step in front of the door so there is not enough landing space in front of the door so it is difficult for people with disabilities to enter through the door.	

Textural Indication	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.	
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.	

Building typology	Bank	
Name	State Bank Of India	
Location	Akole Karkhana Road, Maharashtra India, Akole, Maharashtra	

Architectural Building Elements	**Description**	**Photograph**	**Remark**	**Inference**
Entrance And Exit	• Steps are provided for entry of bank and ATM, the railing is provided only one side of the stair on the other side there is a wall where railings are not provided. • There is no ramp.		The entrance is not wheelchair accessible as there is no provision for the ramp. For railings, extra rail is not given and railings are only given on one side of the stairs causing difficulty to visually impaired users.	There is a lack of architectural elements which makes it difficult for physically challenged people to access the service. There is a need to provide a ramp with proper ratio with handrails and extra rail on top and bottom and with an extended railing that is 0.30 meters across the top and bottom of the ramp. It is necessary to provide non-slippery tiles for the interior flooring. The circulation space should provide large and without obstacles. Accessible toilet and guide floor materials, an elevator, an evacuation chair, textual signs must be provided.
Flooring	• Ceramic floor tile (glossy finish) is used.		The floor is slippery which makes it difficult to use mobility equipment.	
Elevators	• The elevator is not provided.		Wheelchair users face difficulty because there is no provision of an elevator.	
Furniture	• The height of the bank desk and cash counter is low.		Wheelchair users do not face difficulties as the height of furniture is low.	

Exterior	• There is not enough parking space and no kind of landscape.		Physically challenged people get access to the exterior areas without getting difficulties.
Pathway	• Worm brick concrete floor blocks are used.		Because of concrete floor blocks, there is no kind of issue to run mobility devices.
Toilet	• There is no public toilet.		-
Light Ventilation	• Windows are provided for natural ventilation. • Mechanical light and fans are provided.		Light and ventilation are good and enough.
Corridor	-		-
Guide Floor	• No guide floor material is provided.		Guiding floor material is not there to guide visually impaired people.
Circulation	• There is not enough circulation space.		There is not enough circulation space to run mobility devices.
Door	• Metal and wooden door is provided for the entrance.		There is a step in front of the door so there is not enough landing space in front of the door so it is difficult for people with disabilities to enter through the door.
Textural Indication	• There is no kind of textural indication.		Visually impaired people suffer because there is no textural indication.
Evacuation	• There is no provision for an Evacuation chair.		There is no evacuation chair for mobility-impaired people, if any emergency happened then they might be face difficulty.

Conclusions: Emergency services aren't physically accessible to everyone, Because of the lack of architectural elements in the design, there is a need to provide at least a basic architectural building element with a proper ratio that gives access to built spaces for physically challenged people. This little bit of change can make their lives happier.

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Urban agriculture as a strategy to alleviate heat island effect in the rural-urban fringe of Pune

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Abstract: The rural-urban fringe is under constant transition. These are hinterlands trapped in an urban premise, which are engulfed in the surrounding development. Due to the rapid urbanisation, we see increase in surface temperatures across the city. Urban agriculture can be defined shortly as the growing of plants and the raising of animals within and around cities. It plays a vital role in making city resilient with food supply and economic value and also improves the livelihood of the urban poor. This paper aims to examine how presence of urban agriculture can help reduce the heat island effect.

Keywords: rural-urban, heat island effect, alleviate, urban agriculture

1. Introduction :

Urbanization globally has increased in the past few years. It is a common phenomenon around the world, but more so found in the developing nations due to rapid economic growth (ESSAP, 1993, n.d.). Urbanization has been an important factor leading to global warming. The physical landscape changes due to urbanization and have led to environmental problems affecting the temperature, one such outcome is of Urban Heat Island (UHI) (Sakthivel, 2018).

Heat island is an area specific phenomenon where the temperature of one area is higher than its areas in the vicinity. The physical extent of this heat ranges from a few meters to several kilometres across (ARCHITECTS, 2014). United States Environmental Protection Agency mentions, "As urban areas develop, changes occur in their landscape. Buildings, roads, and other infrastructure replace open land and vegetation. Surfaces that were once permeable and moist become impermeable and dry. These changes cause urban regions to become warmer than their rural surroundings, forming an "island" of higher temperatures in the landscape".

1.1 Urban Agriculture

Urban agriculture is the practice of cultivating, processing and distributing food in or around a village, town or city. It may involve activities such as animal husbandry, agro forestry, horticulture, floriculture and aqua culture, etc. It includes the use of urban residents as labourers, use of typical urban resources (like organic waste as compost and urban wastewater for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions, being influenced by urban policies and plans, etc. Urban agriculture plays a vital role not only in making city resilient with food supply and economic value but also improving livelihood of the urban poor (Peri Urban Agriculture, n.d.).

The impact of urban agriculture co-depend on the following components (Awasthi, 2013),

1.1.1   People

A huge part of the people involved in urban agriculture is the urban poor. Women play an important role, as agriculture, its related processing and selling activities, etc. can be combined easily with their allied tasks in the household.

1.1.2   Location

Urban agriculture can be practised within cities (intra-urban) or in the fringe (peri-urban) areas. The activities may take place on the plot or on land away from the residence (off-plot), on private land (owned, leased) or on public land (parks, conservation areas, along roads, streams and railways), or semi-public land (schoolyards, grounds of schools and hospitals).

1.1.3   Food Products

Urban agriculture includes a range of products, from different varieties of crops (grains, root crops, vegetables, mushrooms, fruits) and animals (poultry, rabbits, goats, sheep, cattle, pigs, guinea pigs, fish, etc.) to products like aromatic and medicinal herbs, ornamental plants, flowers, tree products, etc. or combinations of these.

1.1.4   Product Market

In most cities in the developing countries, an important portion of urban agricultural produce is for self-consumption with surplus being sold. Nevertheless, the essence of market-oriented urban agriculture, both in volume and economic value should not be underrated. The fresh produce is traded at farm gate, by cart in the same or other neighbourhoods, in local shops, or farmers markets or to intermediaries and supermarkets.

1.1.5   Technology

In the city, we may witness various types of farms, individual or family run, group or cooperative farms and commercial enterprises at different scales, ranging from micro and small farms to medium-sized and some large-scale enterprises.

Urban gardens, agriculture lands, street and fruit trees, parks and forests may decrease solar radiation and increase evapotranspiration creating lower temperatures through shading. Urban agriculture's cooling effects must be refined based on factors such as type of climate, type of cultures and the existing local agricultural traditions. In some situations where no huge impact on the UHI is observed, urban agriculture can help build sustainable, resilient and liveable cities by reducing runoffs, creating ecosystem services, building social cohesion, etc. (Mancebo, 2018)

2.   Case of Pune City :

Pune is the second largest city in Maharashtra, India covering a total expanse of 331.3 sq.km. It is located at 18^032" N latitude and 73^051" E longitude with an altitude of 560m above the mean sea level. Two rivers Mula and Mutha are flowing across the middle of city, supporting the urban growth around the city centre. Since 1950, the city has expanded from 125.7 sq.km to 1605 sq.km due to urbanization. As per the census data of 2011, the total population of city is 5.7 million, with a population density of more than 603 per sq.km (Gohain, 2020).

Three dominant seasons witnessed by the city are summer, monsoon and winter. The average maximum temperature is around 38 ^{0}C over hottest months of the city between March to May, while the average minimum temperature of around 22 ^{0}C is observed between the months from June to September. The city experiences annual rainfall of 722mm. The months of highest and lowest humidity over the urban area of Pune city are August and April respectively (Gohain, 2020).

Pune is expanding due to urbanisation and the city extents are growing beyond the hinterlands. Along with increase in the built, we also get to see reduction in the vegetation cover. The paper by (Sakthivel, 2018) titled "Urban Heat Island (UHI) analysis using geo-spatial technology in Pune city, Maharashtra" studies the relationship between Land Surface Temperature (LST) and land use/land cover (LULC) of

Pune over three decades of 1998, 2008 and 2018 respectively. The Table 1 below summarises data on area under Land Use Classes (%) Land Surface Temperature (^{0}C) for the years 1998, 2008, 2018.

Table 1: Area under Land Use Classes (%) Land Surface Temperature (^{0}C) for the years 1998, 2008, 2018 (Sakthivel, 2018)						
Classes	Land Use Classes (%)	Land Surface Temperature (^{0}C)	Land Use Classes (%)	Land Surface Temperature (^{0}C)	Land Use Classes (%)	Land Surface Temperature (^{0}C)
	1998	1998 (Avg)	2008	2008 (Avg)	2018	2018 (Avg)
Water Bodies	2.02	10.41	1.27	11.84	1.86	12.17
Vegetation	44.95	20.75	40.5	23.60	37.61	24.27
Barren Land	23.93	22.01	23.88	25.03	18.01	25.74
Built Up Area	29.1	27.00	34.36	30.70	42.52	31.58

The Land Surface Temperature (LST) of Land Use Classes of Vegetation, Water Bodies and Barren Lands are observed less as compare to the Built up Area. The above classes also show slight rise in temperature from 2008 and 2018 as compared to 1998. The rapid spatial expansion and built densification together with depletion of vegetation cover has resulted into a significant average rise of 2.99 ^{0}C temperature across the city of Pune. The highest LST corresponds to Built Up area and Barren Land, followed by Water Bodies and Vegetation (Sakthivel, 2018). This leaves ample scope for us to utilize the barren lands for development under urban agriculture forms.
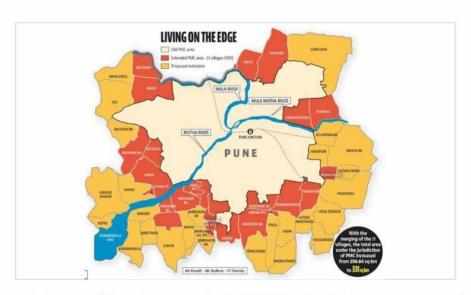
Figure 1: A map of Pune showing extended PMC limit with the new merged village

(Expanding Pune: How ready is PMC to uplift merged villages?, 2022) ©: hindustantimes

As per Pune Municipal Corporations notification, 23 villages are merged as of 30.06.2021, which are Mhalunge, Bavdhan Bk., Sus, Bhilarewadi, Jambhulwadi, Khadakwasla, Kirkitwadi, Kolewadi, Kondhve Dhavade, Kopre, Mangdewadi, Nanded, Nandoshi, Narhe, Nimbalkarwadi, Sanasnagar,

Autade handewadi, Holkarwadi, Manjri Bk., Pisoli, Shewalewadi, Wadachiwadi, Wagholi (Draft and Sanctioned Development Plans, 2022). These villages (as shown in Figure 1) predominantly function on agriculture along with infrastructure development.

2.1 Urban Agriculture in Pune

With increase in urbanisation, the city has expanded along its periphery. The edges of Pune city, which were earlier villages, continue to harbour a sizeable number of small farmers and residents rearing animals. Among them are people holding on to their lands, unhindered to the surrounding development and continue to grow crops, rear cattle, etc. We also see such pocket farms existing in the heart of the city. Some of the residents and farmers proactively contribute in the following ways; the residents practising agriculture in the rural counterparts or along fringes of the city, supply their fresh produce to the city while using garden waste from it back to their own farms. Some residents collaborate with farmers and work on cooperative basis, with farmers sharing expense of the rented store while residents sell their fresh yield to the people. Household waste generated in residential premises collected and converted into a resource on a farm. Pune Municipal Corporation (PMC) offer a five per cent rebate on property tax if residents undertake one of the activities from vermicomposting, rainwater harvesting and solar water heating. If two or more of these activities are executed then a rebate of ten percent is offered. In addition, PMC facilitates the sale of vegetables and farm produce through weekly markets at different locations; presently there are fifty markets across different wards of the city. The sludge from city's ten sewage treatment plants are available for use as manure without charges (Thomas, 2021).

Urban agriculture is one of the ways to moderate the impact of heating of areas which also allows for better water retention in soil. It also reduces the length of food journey thus saving on energy consumption.

3. Conclusion :

The increase in urbanization and a paradigm shift from rural to urban poverty has led to consequences of food security. Urban agriculture refers to growing and distributing edible plants in both public (parks, vacant lots, abandoned interstitial areas, flower beds, traffic islands, etc.) and private (terraces, roofs, indoor gardens, etc.) places of a city. It can take the form of micro-farms to kitchen gardens, community gardens, and street gardening (Mancebo, 2018). The perks of employing urban agriculture methods along the rural-urban fringes are fresh inflow of food supply from informal markets, diversification of livelihood opportuinites for the residents and association of the local farming communitites with their heritage and relationship with their land. This uplifts the identity of fringe settlements making them self reliant.

Pune city is undergoing urbanization at a fast pace to accomodate increase in population that has accelerated depletion of urban greenery and agricultural land during the past decade. This has resulted into a significant average rise of 2.99^0C temperature across the city, posing a serious threat to the urban micro-climate. The UHI effect has not only intensified but also spread to newer areas (Sakthivel, 2018). The magnitude of rural-urban temperature contrasts is largely controlled by agriculture, moisture availablity from irrigation and aerosols (Kumar, 2017). Thus we need to encourage the farming and allied activities along the rural-urban fringes which help the people become self-sustainable and evoke a sense of ownership with their land; the society by reducing the concerns of food security and nourishment; and finally the environment as agriculture can help control the urban micro climate alleviating the impact of heat island effect.

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A Study of the Concepts of Critical Regionalism in the Cultural Buildings designed by Charles Correa

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Abstract: Critical regionalism - as an architectural concept - strives to strike a balance between globalization and localization. Modernism and globalization have led to a loss of identity. The emergence of the term "Critical Regionalism" became the bridge that attempts to connect identity with a global vision. Indian Architects like Charles Correa, Raj Rewal, and B V Doshi have strived hard to overcome the influence of modernism that Western education had on them. They began incorporating the ideas of critical regionalism in their works to counter the homogenization of architecture resulting from modernism. Their works acted as models for critical regionalist architecture in India in the decades to follow. India being a developing country, cannot consume all its resources and energy in the construction and operation of buildings that are mere copies of the western world. We should follow architectural practices that are sensitive to local conditions. Charles Correa has applied the concept of Critical Regionalism in a wide array of his projects. In this paper, we will study the principles of Critical Regionalism in some of the cultural buildings designed by him. The cultural buildings have been studied for the characteristics that make them regionalist. The aim of this paper is to signify that a cultural building can be highly potent and significant despite adhering to its critical regionalism principles.

Keywords: Charles Correa, Critical Regionalism, Modernism, Cultural Buildings

1. Introduction :

The term coined by Kenneth Frampton, "Critical Regionalism" refers to a modern approach to an architecture seeking balance with the local needs and potential. It prevents the lack of placelessness and identity of the international style of a building and rejects the Postmodernism approach of ornamentation. This approach contemplates the idealistic views of international design, according to which, every building can function with high compatibility and can be placed anywhere.

Critical Regionalism can be defined as an architectural approach that strives to counter the homogeneity inherent in modernist architecture (Henrique, 2013; Slessor, 2000). Critical regionalism gives meaning to architecture and imparts it a sense of place by using contextual forces. The practitioners of critical regionalism seek to integrate global architectural and technological developments with regional sensibilities derived from spatial, cultural, and historical contexts (Yeang, 1987, pp. 28).

Adhering to this concept, each region has a specific characteristic, that influences its form, function, and efficiency. It also means that the materials and treatment vary in every region. "Critical regionalism self-consciously seeks to deconstruct universal modernism in terms of values and images which are locally cultivated, while at the same time adulterating these autochthonous elements with paradigms drawn from alien sources." (Frampton,1983). Critical Regionalism strives to find a middle

path between traditional or vernacular architecture and modernism. This concept emphasizes the fact that every building should have a local character.

Critical Regionalism through its approach seeks an answer to the statement by Paul Ricoeur, "*There is the paradox: how to become modern and return to sources; how to revive an old, dormant civilization and take part in universal civilization*" History and Truth (Ricoeur, *1965*).

The phrase "critical regionalism" was first presented in 1981, in 'The Grid and the Pathway,' an essay published in *Architecture in Greece,* by the architectural theorists' Alexander Tzonis and Liane Lefaivre and, with a slightly different meaning, by the historian-theorist Kenneth Frampton. Sri Lankan Architect Minnette De Silva was one of the pioneers in practicing this architecture style in the 1950s and termed it 'Regional Modernism'.

Critical Regionalists thus hold that both modern and post-modern architecture is "deeply problematic".

According to Frampton, critical regionalism should adopt the modern architecture, critically, for its universal progressive qualities but at the same time value should be placed on the geographical context of the building. The emphasis, Frampton says, should be on topography, climate, light; on tectonic form rather than on scenography (i.e. painting theatrical scenery) and should be on the sense of touch rather than visual sense. Frampton draws on phenomenology for his argument.

2. Charles Correa:

Charles Correa's work falls into the category of modernism. His approach to architecture is contextual and a prime example of what Kenneth Frampton called 'Critical Regionalism.' Correa - who studied at the University of Bombay, University of Michigan Ann Arbor, and the Massachusetts Institute of Technology - makes use of simple forms, his interest lies in the architecture embodying the mechanics of society, and the use of concrete as a sculptural building material. His insistence that his building should reflect their context through climate responsiveness and the use of local materials separates him from the placelessness of much of modernism.

A key part of Correa's architecture is designing according to the way people live and inhabit a space. The spaces designed by him are mindful of how people relate to the built environment. The use of local materials and local building technology helps reduce the price of construction, the natural ventilation created by high ceilings, raised roofs, and open courtyards keep the interior comfortable throughout the year. The careful crafting of layered spaces, creation of separations and connections omits the need for doors and windows. He uses the importance of open-to-sky spaces to take advantage of the warmer climate, the use of the chhatri, or overhead canopy, creates minimal shelter from the sun in the hottest part of the day, while allowing users to enjoy being under the open sky.

3. Criteria to identify Critical Regionalism projects:

3.1.**Contextual response**: The design should respect its surroundings and respond to its urban context by site-specific factors.

3.2.**Climatic responsiveness:** The building should respond to the local climatic conditions. The design should be such that it minimizes the building's dependence on mechanical ventilation such as air-conditioning and artificial lighting for its proper functioning (Correa, 1983; Yeang, 1987, pp. 57; Henrique, 2013).

3.3.Materials and Construction Techniques: The building should make use of the locally available materials and construction techniques such that it involves the local workforce (Henrique, 2013).

3.4.Landscape and Ecology: The building should minimize the impact of its construction on the ecology and the site surroundings. (Yeang, 1987, pp.29)

3.5.Socio-cultural Behavior: The building should take care of and respond to the social needs, culture, and lifestyle of its users. (Lefaivre and Tzonis, 2003, pp. 11; Jain, 2000)

3.6.Technology: The building should adopt modern construction technology in a sustainable way. (Lefaivre and Tzonis, 2003, pp. 37; Yeang, 1987, pp. 28)

3.7.Historical knowledge: The design should take into account the local tradition of the region. The design should incorporate the essence of the local history and not resort to literal references (Mehrotra, 2011, pp. 122). The design should blend with contemporary architecture.

4. Critical Regionalism in some of the Cultural Institutions designed by Charles Correa

Table 1: List of some Cultural Institutions designed by Charles Correa

Name	Year	Location
1. Gandhi Memorial Museum	1962	Ahmedabad, Gujrat
2. Bharat Bhawan	1981	Bhopal, Madhya Pradesh
3. Kala Academy	1983	Panjim, Goa
4. British Council	1992	New Delhi
5. Jawahar Kala Kendra	1992	Jaipur, Rajasthan

4.1. Gandhi Memorial Museum or The Gandhi Smarak Sanghralaya:

The Gandhi Smarak Sanghralaya or Gandhi Memorial Museum is one of the first important projects that Correa acquired during his private practice. It is a memorial museum and a study center designed to house some documents, books, photographs, and 30,000 letters written to and by Gandhi. The simplicity of Gandhi's life is reflected in the design of the museum. The concept developed into a design that has an indefinitely scalable structure, repeating modular grid patterns, and modernist functional planning. The modular pavilion unit – a single element – is designed in a way that it can be easily extended. The units are placed in an asymmetrical grid pattern to accommodate five distinct spaces.

4.1.1. Space and Planning:

The site is located and is a part of the large ashram complex and blended with its gardens, on the banks of the Sabarmati River. The building is planned with repetitive modular units designed taking into accord with the smooth future expansion of the museum, and emphasizing the idea of a single element making whole. The modules 6 M X 6 M are asymmetrically placed synonymous with an

Indian village (Khan, 1987, pp.20), with pathways and randomly placed buildings and their meeting points. Correa has carved out five different interior spaces using an asymmetrical grid plan and meandering pattern, creating a pathway along which leads the visitors to the centrality of the water court. The subtle changes in the enclosure permit variety in lighting, temperature, and visual permeability.
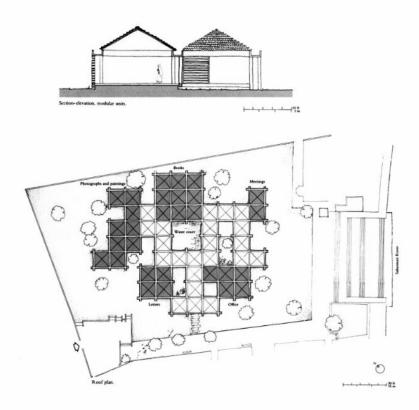
Figure 1 : Sectional Elevation of the exhibition halls (top), Roof Plan (bottom)
Photo credit: Correa, Charles

4.1.2. Materials and Construction technique:

This modest and humanly scaled structure uses basic local materials like brick walls, stone floors, wooden doors, louvered windows without glass, and tiled roofs. The museum uses a simple and delicately detailed post and beam structure. The brick load-bearing columns support the concrete channels, which in turn support the wooden roof and direct rainwater. The tiled roofs are layered with wooden boards at the bottom of the joists, covered with waterproofing, and then finished silver-white to reflect back incident heat. Along the top of the joists, lightweight battens support roof tiles, creating an air gap that provides insulation from solar radiation. The foundation, raised about a foot above the ground, is made of concrete. The operable wooden louvers provide light and ventilation to the building.
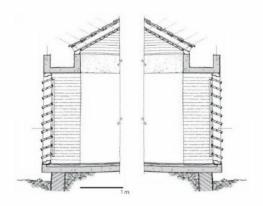
Figure 2 : Details of the louvered windows
Photo credit : Correa, Charles

4.2. Bharat Bhawan

Bharat Bhawan, a multi-arts center and museum, first opened its doors in 1982. It houses a variety of cultural facilities, and hosts a multitude of verbal, performing, and visual arts events.

4.2.1. Location:

The site for this cultural center and museum is located on a naturally contoured sloping land overlooking a lake in Bhopal. The spaces are organized around courtyards and terrace gardens making complete use of the natural slope of the site.

4.2.2. Space and Planning:
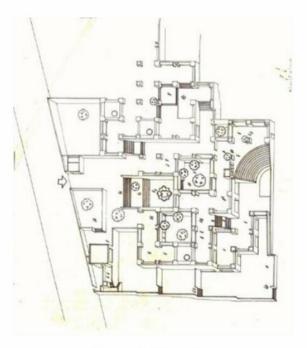
Figure 3: Floor Plan
Photo credit: Charles Correa Foundation

The center houses a variety of cultural facilities, a museum, library, galleries, workshops, studio, indoor auditorium, and an open-air amphitheater. The network of courtyards and terraces unfold – like a maze or puzzle – and the internal streets reflect a village layout. The entire building complex reflects Bhopal's own organizational layout. The top-lit 'cannon' provides light and ventilation to the sunken-covered spaces. Additionally, two sets of shutters: the inner ones constituting of operable panels and fixed glass; large wooden doors for the outer ones for security. The lake forms a natural backdrop for the open-air amphitheater.

4.2.3. Architectural elements and their concept:

The ritual of following a sacred pathway is, Correa claims, "a universal impulse, found in all cultures and religions." He emphasized the spirituality of his own pathways by drawing parallels with those found in religious architecture, including "the sun temples of Mexico" and the Hindu temples of Bali "with their ritualistic pathways up the hillside." The placid courtyards act as spaces that provide rest and relaxation while the route through the terraces encourages movement down the site's natural gradient. The flight of stairs between the terraces leads to the lake, suggestive of the ghats which lead to a body of holy water, the bathing ghats on the bank of the river Ganges at Varanasi as a stylistic influence. Correa placed emphasis on the environment and climate control in all his architectural works. The spaces designed by him took into consideration lighting, ventilation, and India's hot and humid climate. To reduce the temperatures inside, without relying much on artificial ventilation, Correa created "open-to-sky spaces". The raised terraces at Bharat Bhawan provide fresh air and space at cooler times of day, while the sunken courtyards provide shade from the midday scorching heat. This climate-control solution was lifted directly from India's architectural history, inspired by the courtyards and terraces of the Red Fort at Agra. Correa was profoundly influenced by the sky and it held immense spiritual power and mythical significance for him. He described the sky as "the abode of gods" and "the source of light which is the most primordial of stimuli acting on our senses". The people emerging from the galleries to the courtyards undergo a dramatic spatial experience. The concrete 'shells' above the structure allow light and air in the inside through the circular openings, thus incorporating the sky into the interiors. On the exterior, these shells represent the decorative chhatris ('umbrellas') aboriginal of Rajasthani palaces. The courtyards represent a contemplative void and with sculptures in their center that act as a meditative focal point for the viewers, influenced by the Japanese courtyards.
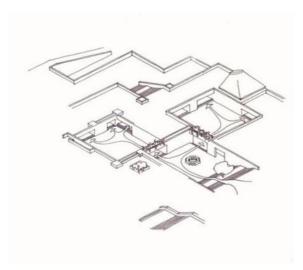
Figure 4: Sketch view of air-circulation across the campus

The steps around the courtyards act as a communal public space that provides seating for people to meet and socialize. The terraces help people spend their evenings promenading down the water's edge and enjoying various cultural programs. Thus, Correa is successful at creating a building well-suited and blending tradition with modernity, establishing distinctly Indian Modernism.

4.3. Kala Academy:

This 10,500 sqm. of Centre for Performing Arts is located in Panaji, along the historic Mandovi river. The project took 10 years to complete.

4.3.1. Building Design and Components:

The site of the building is on the Campal, a wide tree-lined road running through an old residential area. The large pergola-covered foyer for the auditorium and the amphitheater is the main 'event' along the road; thus, keeping a low-key and unobtrusive built form ranging from one to three floors.

The building has a 1000-capacity auditorium, a 2000- capacity open-air amphitheater, and a special black box for experimental purposes. There is also space for the accommodation of performing groups and teaching classical dance and music.

The auditorium is acoustically treated which allows a variety of events right from plays, speeches, to music concerts and orchestra, etc. The sound-absorbent materials are placed in hidden compartments and cannot be viewed above the transparent false ceiling.
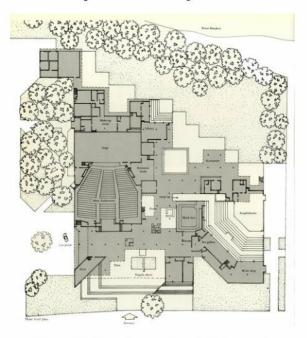
Figure 5: Main floor plan of Kala Academy
Photo credit: Aga Khan Trust for Culture

4.3.2. Wall treatment:

The renowned Goan artist Mario Miranda painted the walls of the auditorium with illusions of an old Goan theatre, complete with boxes and local inhabitants. The real curtains lie behind the figures in boxes that reduce the reverberation time in the auditorium.

The lighting in the auditorium dims slowly as the show starts, with the illuminated paintings in the balconies fading at last. The spotlights illuminate the painted ceiling that shows a jungle scene of Goa inside the compartment.
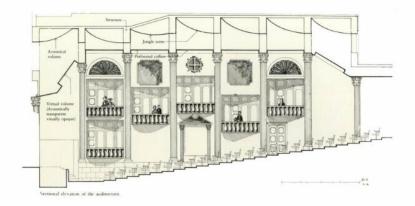
Figure 6: Sectional elevation of the auditorium
Photo credit: Aga Khan Trust for Culture

4.4. British Council, New Delhi:

The building is composed of a variety of functional components that include an auditorium, a library, an art gallery, and is the Headquarters of their offices in India.

These functional components are arranged in a series that recall the historic interfaces that have existed between India and Britain over the last several centuries. The main entrance gate leads down to the main axis which has three nodal points leading to the rear garden wall. The three nodal points along the axis are structured around three axes' Mundi, each recalling one of the principal belief systems that exist in the Indian sub-continent.
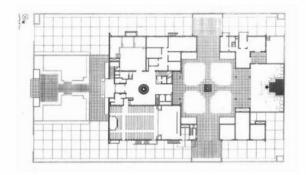
Figure 7: Plan of British Council, New Delhi
Photo credit: uncubemagazine.com

The spiral Mundi lies at the last end of the axes that symbolizes Bindu – the energy center of the cosmos in Hinduism. The next nodal point is the traditional Islamic Char Bagh – the garden of paradise. The third nodal point is a European icon, inlaid in marble and granite, representing the Age of Reason.

The shadows of a giant tree preside all over this and it represents India. It is the work of the British painter Howard Hodgkin executed in an exquisite inlay of white makrana marble and black kuddappa stone.

4.5. Jawahar Kala Kendra:

Jawahar Kala Kendra is a contemporary art center based on the archaic idea of the cosmos. It is based on the old plan of Jaipur that had the concept of the Navagraha Mandala (nine planets), with one square, moved aside, to provide an entrance. Each square is 30m in length and width with 8m high walls that also represent the fortified old city of Jaipur.

Figure 8: Plan of Jawahar Kala Kendra, Jaipur
Photo credit: Charles Correa

The symbols inlaid in white marble and granite on the square walls represent the corresponding planets. The internal configuration of the squares, each representing the planet, corresponds to the mythical qualities associated with the planet. Mars signifies power, so the Mangal Mahal houses the administration building. Mercury represents knowledge, so it houses the library. Venus representing the arts houses the theatre. The central square as per the Vedic science represents nothing which is everything and hence kept void. There is a diagram of lotus in the flooring pattern of the central square representing the sun.
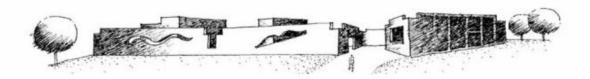
Figure 9: Architect's sketch of the entrance façade
Photo credit: Charles Correa

5. Conclusions

Critical regionalism has contributed to creating remarkable cultural buildings in India. In the present time also, critical regionalism can be incorporated in design and architecture to create some remarkable and noteworthy cultural buildings. The application of critical regionalism design principles in future buildings and also in other building types like offices, shopping centers, government buildings, residential buildings, etc. will help strike a balance between the modern and traditional principles of a building. The principles of regionalism can be seen naturally in almost all of the buildings designed by Charles Correa. He has effortlessly incorporated the regionalism principles in the layout, walls, pergolas, use of materials, courtyards, etc. The cultural buildings designed by him

are a perfect example of localization of a building without losing its function and relevance to the surrounding. Last, but not least, critical regionalism principles, can be applied to almost all building types and it addresses the issues of climate, culture, tradition, local materials, and building technologies, and at the same time create noteworthy buildings.

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EDUCATING AND EMPOWERING THROUGH RURAL ARCHITECTURE

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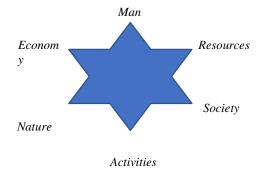
Abstract:
Rapid urbanization throughout India has impacted all aspects of life in both urban and rural parts of the country. Haphazard growth patterns which have led to the transformation of villages into cities have given rise to various issues. The paper puts forth the various challenges faced for Architecture in rural India. The paper discusses architectural case studies in the rural contexts which attempt to sustainably bridge the gap between the rural and the urban for long term benefits to the society at large both in terms of culture and architecture. The paper deliberates that architecture can be used as the key component of rural development to educate and empower the rural population.

Introduction

Rural and Urban development together are two parallel tracks for the progress of any region. Rapid urbanization in India has brought out various issues at all levels of development. Blind duplication of western building techniques irrelevant to the Indian local context has changed the skyline of most villages and towns in India to replicate the western cities. Thoughtless replication of the building techniques has given rise not only to the urban heat effect but also has resulted in loss of traditional and appropriate construction techniques using local resources.

In the book Paths Uncharted, B V Doshi's explained the six pointed star pointing to Man, Resources, Society, Activities, Nature and Economy. The interdependency of the six aspects needs to be emphasized in education framework at all levels.

SIX POINTED STAR

All edifices of vernacular architecture are lessons in sustainability. Such architecture uses local resources and have energy efficient lifecycles. Educating the society at large about the virtues of such architecture has become very important in today's scenario of urbanization. New architecture in rural areas of India needs to be very critically designed and be presented as educating examples for the rural public to understand and follow rather than blindly imitate western irrelevant trends.

The following case studies are discussed as examples and case studies of apt built insertions in the rural context to be able to educate and hence empower through architecture.

Case study 1:
ECOHAMLET, Kamshet, Maharashtra

The farmhouse owned by an artist, based in Paris, sits gracefully in the farmland in the idyllic village of Kamshet. Even though the organic architecture of the house blends it into the village fabric one cannot miss the house on Kamshet – Uksan road. 'The house should manifest the feeling of returning home' was the only brief which the architect worked around. Elements like a heap of thatch in the fields, the evergreen bullock cart, an arrangement of cowdung cakes left to dry, the classic *aangan* which doubles up the indoor space, the *konada* [niche] adding utility to a wall, *tulsivrindavan*, load bearing stairs, courtyard were subconsciously integrated into the design of the house.
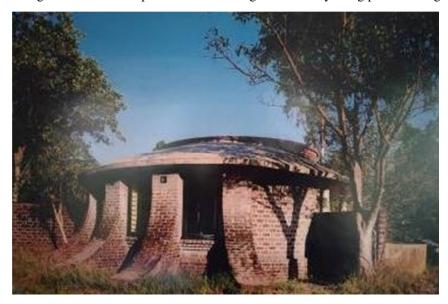
Eco hamlet
Courtesy: Author

 The organic arrangement of the built masses creates interesting inbuilt spaces. The roof concept was crystallized first which was inspired from the heaps of thatch seen commonly in farmlands. The elements put together speak a contemporary vocabulary of vernacular ethos. Exposed brick walls and arches replicate the warmth of a village house. Interiors spill out in *aangans*. *Paar* and seat converse in the *padvi*. Seat, *paar, padvi, aangan* provide the vocabulary for the house to dialogue with the neighboring hamlet. The building elements are designed to frame indoor and outdoor space. Courtyards in different manifestations become the soul and spirit of the house and bring back nostalgia. Niche (konada) adds art to the walls and creates interesting backdrops. Tulsivrindavan, jaali wall inspired from arrangement of cow dung cakes left to dry, stairs leading to the viewing gallery are the elements which gives the essence of a village house. The site is surrounded by hills and the rain water of the entire catchment passes through a channel which divides the farm. The house is made to sit on both the banks of the water channel flowing through the site. One side is the main house with living, dining, kitchen and two bedrooms with the courtyard. The bridge provides a link between the aangans on both sides. Outdoors flow inside giving a smooth transition of spaces connecting indoors with aangan and further to the other part of the house on the opposite bank. The hobby room court

acts as gateway to the other side of the farm. Internal spaces flow freely to mimic the tranquil water flow. Curved surfaces create meandering spaces. Skylights add to the dynamics of the space. The bedrooms are cantilevered on corbelled connoids onto the water channel. The connoids have cut outsto view the flowing water from the bed. The house is linear to enjoy the view and pre cooled breeze coming over the farm and the water body. Cortile planning, stack and roof openings enhance ventilation. Carefully designed openings keep cool air movement at the body level. Jali walls enhance cross ventilation. Buttresses which are designed as a response to the curved walls hold wind shafts having the inlet outside in the shady overhang and outlet inside the room at skirting level. Curved walls in rat trap brick masonry reduce the heat gain through envelope. Curved shell roof in Ferro cement with polystyrene insulation layer and finished with china mosaic, sits over curved loadbearing walls and ferrocrete columns. The existing water channel is realigned and made impervious to conserve water for irrigation to hold 4.0 lakhs litres of water. Underground laid fabric filled drain recharge the existing bore well on site. The energy pole designed to integrate with the main structure houses water storage tanks and solar flat plate collector. The house experiences a 12 degree temperature difference in the indoors & outdoors. Indoor thermal comfort can be achieved even though the outdoor temperature varies to a great extent by using passive design strategies.

Ecohamlet view,
Courtesy: Author

The edifice located in the rural farmlands of Kamshet sits as an appropriate example of modern architecture seeped in the vernacular traditions and culture. It has proven to be an example which is replicated by the locals and most importantly who take pride in their own traditional construction techniques and wisdom so a snot to fall prey to the western influence.

Case study 2:
KrishiVigyan Kendra, Sagroli, Nanded, Maharashtra

Sanskruti Sanvardhan Mandal has built the KVK in 50 acres land. Demonstrative fields being the prime requirement of the Krishi Vigyan Kendra, the building is designed to sit onto the fields. The fields provide the appropriate landscape to the building. The project has two phases. First phase is Krishi Vigyan Kendra and second Utkarsh Skill Development Center. The Krishi Vigyan Kendra building is placed at an angle to get noticed while entering the campus and to be enjoyed in perspective.

The building of KRISHI VIGYAN KENDRA at Sagroli celebrates the cultural sentiments of the Indian farmer of revering the Mother Earth, Water & Muscle power of the Cattle into its architectural design.

KVK building
Courtesy: Author

An entire side of the building has a sloping plane which allows the edifice to embrace the surrounding fields making the structure an integral outcrop of site. The building seamlessly blends into the surrounding farmland because of the rendering of grit plaster with the grit of local stone. The massive look because of the grit plaster and the dark colour scheme reveres the muscular strength of farmland cattle. The arrival court is round in shape symbolically designed as a reverence to the "Well" where dialogues happen in the village culture. The spaces are planned around three large water courts which are used for controlling the microclimate in the hot and dry region. These water courts collect the rain water which is used for pre cooling of breeze and evaporative cooling ventilation system. Water courts act as daylight reflective pools as well.

The milieu of village Sagroli, in its different scales is replicated in the special arrangement of the Krishi Vigyan Kendra. The spaces of the KVK offer a bazaar like experience breaking formality to increase farmers' participation in the functioning of the building. Spatial arrangement of the building, similar to the milieu of the bazaar and spaces such as trees with *paars*, extended sit outs, exhibition areas, stone seats in the interiors, flower beds help to create an informal environment.
The building experiences more informal spaces for interaction rather than formal meeting areas.

The glass is used for dividing the spaces which provides transparency to make the whole system user friendly and approachable. The double height exhibition space is defined by the sloping plane to guide the vision. The spaces visually flow through courts. The building enjoys natural ventilation and daylight because of cortile planning. Carefully designed openings with low sills allow ventilation at body level and daylight at work planes reducing dependency on artificial lighting. Façade composition with deep recessed windows designed as a response to climate and as per the activity of habitable areas, cut the glare for the daylight to be enjoyed. Shading devices are designed as aesthetical elements, keeping the fenestrations in shade. Precast pergola creates a contrast to the mass of the building. Pergola over the sit outs increases the functional efficiency of the space. The sit outs on North West serve as buffers to protect the building envelope from heat gain. The building has linear composition for each activity to enjoy the view of the fields and the daylight to reach the depth of the building. It also helps for cross ventilation. Spatial and volumetric syntax allows cross ventilation and adds to the aesthetics.

Evaporative Cooling
The wind is taken inside through the stone jali. The jali and change of direction helps to increase the velocity of the wind entering the building. The water is sprayed and the heat exchange takes place in the evaporative cooling shaft. Water is circulated with the solar pump. The pre cooled air is supplied in to the building through the opening in the water court. The sloping plane is used to divert the hot air to the stacks at terrace level which are in the form of Nubian vaults in ferrocement. The stacks become architectural element to form the skyline of the building. The floor spaces are connected to these stacks through openings in the roof slab at first floor and terrace level which helps to take the hot air out through the stacks. The activities are organized around the water courts, to enjoy the pre cooled breeze coming over it. The cabins have ducts above the partition doors to take out the hot air and the louvered glass partition allows the ventilation to take place.

Design strategy and innovation
Remoteness of site, unavailability of renowned contractor and budget constraints being a NGO, drive certain design aspects. Entire building planned on grid of 7.35m x 7.35m which was derived from the design brief and requirements, for the ease of execution and communication. Structural members are standardized. All the column & beams are 200 x 650. All the circular columns are 280 dia which is the diagonal at the intersection of beams. Precast elements are used to control the size of pergola members.

Alternative construction techniques The building envelope is in hollow compressed stabilized earth block with cavity wall construction. The old dilapidated residence of the Chairman of SSM was selected for procuring the soil for CSEB. The soil samples were lab tested to know the soil composition. The soil was prepared with the addition of 20% sand and stabilized with 6% cement. This soil test report and the soil mix were validated by Auroville Earth Institute. The compressive strength of the earth blocks was tested in construction lab. The 150 dia clay pots are used at terrace level and for sloping slab to insulate the building.

Locally made blocks onsite
Courtesy: Author

Sustainability
The building experiences 8°C temperature difference due to the various solar passive strategies used. Local stone tandoor is used for flooring to accentuate the local essence, to create stone seats for informal seating and for stone jali, inspired from traditional architecture which enhances the velocity of the breeze and brings about temperature drop. This jali pattern is created out of the wastage from the tandoor stone slabs used for flooring. The permanent finish of the grit plaster helps to reduce the lifecycle cost of the building.

Capacity building
Capacity building programs were conducted by the architect for various alternative construction methodologies. Workshops were held to train the local labor for casting, curing, handling and construction of hollow compressed stabilized earth blocks. The coordinator from SSM was sent to Auroville to learn the process of CSEB construction. Local labor contractor was trained for the jali pattern used as the inlet of the evaporative cooling shaft. The architect had an orientation to the occupants to understand the evaporative cooling system incorporated in the building design.

Design philosophy
Spatial arrangement of the building, similar to the milieu of the bazaar and informal spaces such as trees with *paars*, extended sit outs, exhibition areas, stone seats in the interiors, flower beds, landscape areas with informal greenery replicating the natural vegetation of the surrounding village bring in informality to make the farmers comfortable inside the KVK building.

KVK building interiorsCourtesy: Author

Villagers owning the KVK buildingCourtesy: Author

Schooling through architecture

The building promotes the concept of "school through architecture" which the architect strongly believe in, by demonstrating Cost effective techniques & Solar passive strategies to achieve comfort conditions.

KVK building
viewCourtesy:
Author

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Study of Traditional Occupation of Vadar community with new Transform

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Abstract: Vadar community is one of the oldest nomadic communities, known for their stone carving and stone work. Stone working is one of the earliest and important occupation in India. Vadars are prominent in conserving this traditional occupation. Components of house construction like door frames,Varandah seating,tulsi vrundavan,jata & pata(grinding stone), stone flooring, decorative cornices,columns are some of the products of the skillful work of this communities for so many years. But, due to urbanization and technological uplift, the stone products are losing their values and getting mere wages. The Vadar communities are migrators. But in the most recent years the people are migrating for jobs other than the stone carving and stone products. One group of this community migrated to Wardha and settled there. Some of the people try to keep this traditional work alive by making the stone carving and stone products and selling them on mere wages. Due to the awareness of historical buildings and attachment of people to history this profession got new platform to grow. Being migrators the most challenging part is to get the dwelling place, since the urban area cost so high, such people have to live in slums. They work in their dwelling place and sell the products on roads. The purpose of the study is to understand spatial requirement for conserving this traditional occupation of stone carving in the dwelling space of Vadar community.

Key words - Vadar community, traditional occupation, spatial, stone carving, conservation.

Introduction

Vadar also called as Bhovi,mati vadar,jati wadar etc. had traces originally from Orissa, their they are believed to be migrated to various parts of India. They are majorly located in Kranataka, Maharashtra and Telangana. The main occupation of this community is the traditional work which includes stone cutting, mine work, stone engraver, digging, construction etc. From ancient times they are engaged in the construction work and are known for their work in building forts and historical buildings. Since they are engaged with earth and earth excavation the name is given as 'Bhavi'. Originally the word Bhovi derived from Bhavi which means earth diggers in Kannada. The Vadar community is known for their hard work. Male and female contribute equally in social and economic activities.

The traditional work they perform demands migration hence this tribe has to migrate from one place to another as per the job requirements One of the group migrated to Wardha in search of work and got settled at Arvi Naka.High rates of real estate made them live in slums. The earning by the head of the

house is inadequate hence almost all the members in the family are working. The head male of the house is doing the traditional work while the female works on daily wages. But the decline in the stone product products due to technologies and low income from it shifts the attention of the new generation towards the daily wages work.

The study shows that the people are skilled in stone work but the low product selling lead to insecurity of the earning The stone products are losing their values due to urbanization and technological uplift and getting mere wages. The migration and mere wages contribute to low standard of living. The livelihood is highly compromised. The purpose of the study is to understand spatial requirement for conserving this traditional occupation of stone carving in the dwelling space of Vadar community. The study will try to find out the future of this traditional occupation.

Aim– To identify and enhance the sense of place, culture and occupation of Vadar Community.

Objectives –

a) To study about Vadar community
b) To study their occupation and livelihood.
c) Identification of issues for livelihood.
d) To study the spatial requirement for their occupation.
f) To study the availability of market for products and skills.
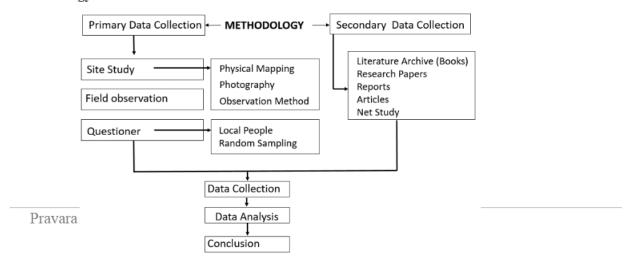
Methodology

The present study was conducted in the slum of Arvi Naka,Dist-Wardha of Maharashtra state. The study is purely based on primary data collection; the data collection has made from Vadar communities of Wardha.The slum has 20 houses of vadar. The researcher has selected 5 houses from the slum to conduct the study.The secondary data is also used to strengthen the study. The collection of secondary data is from books,articles,research papers and data available on internet.
Primary data collection
  1) Interview
     The interview was scheduled in local language i.e Marathi. The family head male and female were interviewed. This interview gave the information about the personal information, traditional work, source of raw material and other occupation adopted over a period of time for survival.
  2) Group discussion-
     The discussion with the Vadar community provided with vital information relevant to study.

Methodology Flow Chart

Literature Study

Vadar community is recognized by their typical profession. Stone cutting stone engraving and earth digging work. But in this 21st century the traditional profession of Vadar community is appearing to be vanished. Modern machinery and technology has replaced the role of Vadar in the society. So Vadar community has lost their work. Therefore, now days it is seen that Vadar people accept any work that is available, instead of their traditional skilled jobs. This tribe is known as Nomadic tribe but now settled at one or other places.

The study suggests that out of 500 people of vadar community 67% not doing family business only 33% are doing their traditional jobs. The income of these people vary from 1000- 15000 Monthly Income. Due to their acute poverty and nomadic way of life, the Wadars have a low social and economic status in society.The problem faced at workplace is the availability of raw material, storage and display of the finished product to sell. The set up for traditional occupation workplace is easy as most of work takes place at home in verandah or angan. Since the wages are low for stone products the vadar people opt for supportive business. Living condition is of low standard due to low income of major group in community and lack of education.Awareness about the Government opportunities is low

The Vadar community are called as **keeper for craft**. The Vadar community has contributed in construction of. From ancient period they are known for the traditional work. They have built wells to drink water, lakes and also canals. They built houses and palaces to live. They built places live temples, statues, caves, etc. to pray. They built roads, railways, pools over the rivers and lakes for communication.to make life easy of women's they built *jata, pata, khalbatta* etc. The historic places we see today is built by them. The list is never ending. Though they have such glorious history their hard work is lesser known. Restoration of historic building are taking place,vadar community skills are being used by the Archaeological Survey of India (ASI) and at UNESCO World Heritage Site as well.

Data collection - Study of Vadar slum in Wardha at Arvi Naka

Introduction to the Wardha city

India is a developing country and many regions in the country are developing rapidly in the context of industries, education, trade and agriculture. Thus giving rise to new infrastructures. In present scenario, Wardha city is powerfully emerging as an education and industrial hub in the region. From being rural vicinity decades ago it has now become the busiest emerging city in the Vidharbha region. With the development the city is also inviting the migrants in search of employment. Giving birth to slum.

Figure 1.map showing Wardha city

Figure 2.map showing location of Arvi Naka and slum

Figure 3 Slum at Arvi Naka

Location of Vadar community(slum):
- Slum is situated in prime square of city the square is known as Arvi Naka.
- It is 4 kilometer form Wardha Railway Station.
- Total area of Slum is 50,000sq.ft.
- Total population of slum is 350 and near about 100 Vadar resides in the slum

History of the slum:
- The land acquired by wadar community was once acquired by Shikh's
- In 1984, the Indira Gandhi was killed by a Sikh.
- On that background, the people around the land made them to vacant the place.
- The vacant was then acquired by Wadar, in today's date it makes more than 50 years.

Study of Individual Houses from Slum

1. **House no. 1-**   Name: Uttam Jadhav(55)   (no. of people in house- 8)
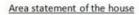
Figure 4 Location House no.1   **Figure 5** Working space outside the house in Angan and Finished product storage inside house.

Table 1. Details of traditional and other occupation of house no. 1

Origin	Traditional occupation	Other Occupation		Working of traditional occupation			
		Members	Occupation	Alone	Community	At home	Some other place
Uddir, washim Maharashtra	Stone work	Man Wife	Stone work garbage collection	✓		✓	
		Son (1) Wife	daily wages house wife	**Source of material**		**Transportation**	**Medium of transport**
		Son (2) Wife	daily wages house wife	Pipri (15 km from wardha)		Alone ✓	Truck Rs-2500/trip
		Daughter Son-in-law	not working			Community	

Table 2. Details of Space required and product selling

Space required (for stone work)		Product Selling	Market Value of the occupation
Working	3.2 X 3 = 10 m sq.	Door to door By cycle	•They are in great demand during 'yatra'
Raw Material	in working space		
Finished product	1 x 2 = 2 m sq inside the house		

Area statement of the house
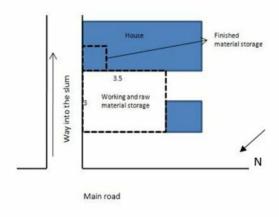
Figure 6 Area Distribution of house no.1

Table 3. Details of Earning and Remark

Earning		Remark
Stone Work	**Other Occupation**	• the new generation is not taking interest the traditional occupation due to low value of the Product
5-6 product a month Rs- 250-300/product 2,000 /month	a) Wife – 150/ day b) son (1)- 200/day c) son (2)- 200/day	• the head of the family is not leaving the stone work job because he thinks its his identity.
Total - 2000/month	Total - 16,500/month	
Family income - 18,500/month		

Source- Site visit by Researcher

2.   House no. 2-   Name: Fakirdas Jadhav (no. of people in house- 7)

Figure 7 Location House no.2   **Figure 8** Working space in the Verandah with finished product storage

Table 4. Details of traditional and other occupation of house no. 2
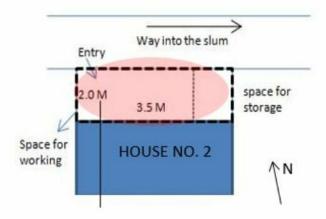
Origin	Traditional occupation	Other Occupation		Working of traditional occupation			
		Members	Occupation	Alone	Community	At home	Some other place
Parbhani Maharashtra	Stone work	Man Wife Son (1) Wife Son (2) Wife Son (3)	Stone work house wife stone work house wife stone work and daily wages house wife stone work	✓		✓	

			Source of material	Transportation		Medium of transport
			•Pipri (15 km from wardha) •Amravati	Alone	✓	Truck Rs-2500/trip
				Community		If outside wardha Rs-3500/trip

(Source : site visit)

Table 5. Details of Space required and product selling of house no. 2

Space required (for stone work)		Product Selling	Market Value of the occupation
Working Raw Material	3.2 X 2= 7m sq. in veranda no space near house some other space	•They sell products in yatra •Door to door by cycle	•They are in great demand during 'yatra' • door to door selling gives variables
Finished product	1 x 2 = 2 m sq veranda		

(Source : site visit)
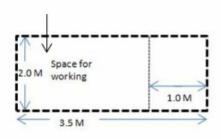
Figure 9 Area Distribution of house no.2   Figure 10 Exploded plan showing working space

Table 6. Details of Earning and Remark

Earning		Remark
Stone Work	**Other Occupation**	• due to the involvement of more people in the occupation from same house maximum products are sold . • during 'yatra' all male members work to get max. finished products • rest of the time, other work can be opted for livelihood
10-15product a month Rs- 250-300/product 4,500 /month	a) son (2)- 200/day	
Total - 4500/month	Total - 6000/month	
Family income - 10,500/month		

(Source : site visit)

3.   **House no. 3-   Name- Jiram Jadhav   (no. of people in house- 3)**

Figure 11 Location of house no. 3

Figure 12 Showing raw material storage, owner of the house and the storage of finished products inside house.

Table 7. Details of traditional and other occupation of house no. 3

Origin	Traditional occupation	Other Occupation		Working of traditional occupation			
		Members	Occupation	Alone	Community	At home	Some other place
They don't know	Stone work	Man (dead) Wife Son (1) Son (2)	Stone work daily wages daily wages not working	✓		✓	
				Source of material	Transportation		Medium of transport
				•Pipri,wardha •Amravati • Nagpur	Alone	✓	Truck Rs-2500/trip
					Community		If outside wardha Rs-3500/trip

(Source : site visit)

Table 8 Details of Space required and product selling of house no. 3

Space required (for stone work)		Product Selling	Market Value of the occupation
Working	2 X 2= 4m sq. in veranda	•Door to door by cycle	• door to door selling gives variables • satisfactory market value .
Raw Material	in working space		
Finished product	1 x 2 = 2 m sq inside home		

(Source : site visit)
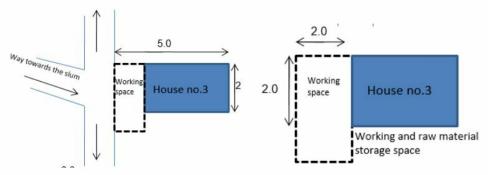
Figure 13 Area distribution of house no. 3　　　**Figure 14** 　Exploded view showing working and storage area in plan

Table 9. Details of Earning and Remark

Earning		Remark
Stone Work	**Other Occupation**	
5-6 product a month Rs- 250-300/product 1,800 /month	Wife – 150/day son (2)- 200/day	• no involvement of the new generation in the stone work business • wife and son opted for another job for the income consistency.
Total - 1800/month	Total -10,000/month	
Family income - 12,300/month		

(Source : site visit)

4.   House no. 4-   Name: Ram Prasad Mule (no. of people in house- 9)

Location of house no. 4

Figure   15

Figure 16 Showing raw material storage, owner of the House working on stone and the storage of finished products
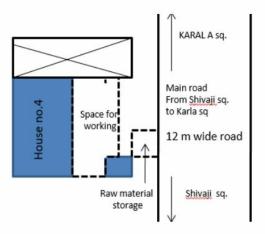
Table 10. Details of traditional and other occupation of house no. 4

Origin	Traditional occupation	Other Occupation		Working of traditional occupation			
		Members	Occupation	Alone	Community	At home	Some other place
They don't know	Stone work	Man Wife Son (1) Wife Son (2) Wife Children (3)	Stone work stone work driver daily wages stone work daily wages	✓		✓	
				Source of material		Transportation	Medium of transport
				•Pipri,wardha • Nagpur		Alone ✓ Community	Truck Rs-2500/trip If outside wardha Rs-3500/trip

(Source : site visit)

Table 11 Details of Space required and product selling of house no. 4

Space required (for stone work)		Product Selling	Market Value of the occupation
Working	4 X 2.5= 10 m sq.	•Client come at home	• satisfactory market value .
Raw Material	road side		
Finished product	1 x 2 = 2 m sq inside home		

(Source : site visit)
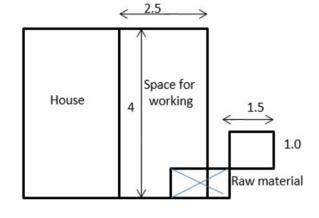
Figure 17 Area distribution of house no. 4

Figure 18 Exploded view of house 4 showing working and storage area in plan

Table 12. Details of Earning and Remark

Earning		Remark
Stone Work	**Other Occupation**	
9-10 product a month Rs- 250-300/product 2700 /month	Son(1)- 250/day Wife – 150/day Wife(2) - 150/day	• due to the consistency in the product selling the next generation is taking part • client coming home reduced labor work • The location of the house played an important role
Total - 2700/month	Total -16,500/month	
Family income - 19,200/month		

(Source : site visit)

5. **House no. 5-   Name: Chandrakala Harale (no. of people in house- 7)**

Figure 19 Location of house no. 5   Figure 20 Showing shop and rear of house facing shop and shop owner

Table 13. Details of traditional and other occupation of house no. 5

Origin	Traditional occupation	Other Occupation		Working of traditional occupation				
		Members	Occupation	Alone	Community	At home		Some other place
They don't know	Stone work	Man	construction contractor					
		Wife	grocery shop owner	Source of material		Transportation		Medium of transport
		Son (1)	driver					
		Wife	house wife			Alone		
		Son (2)	driver					
		Children (2)				Community		

(Source : site visit)

Table 14 Details of Space required and product selling of house no. 5

Space required (for stone work)		Product Selling	Market Value of the occupation
Working(shop)	2 X 2.5= 5 m sq.		No satisfactory value for the stone work
Raw Material			
Finished product			

(Source : site visit)
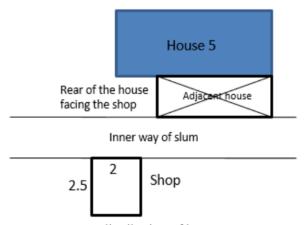
Figure 21 Area distribution of house no. 5

Table 15. Details of Earning and Remark

Earning		Remark
Stone Work	**Other Occupation**	• No satisfactory value for the stone work hence they shift their occupation. • after leaving the traditional occupation and adopting other occupation their living standard raised. • They have regret for leaving the traditional occupation.
	Man- 250/day Wife- 150/day Son(1)- 250/day Son(2)- 250/day	
	Total -27,000/month	
Family income - 27,000/month		

(Source : site visit)

Data Analysis
Following is the findings of above data

1) Out of 5 selected houses,4 are working on traditional occupation of stone i.e stone cutting and stone engraving. While one shifted to other occupations.
2) It is observed that only the head of the family is working on the traditional occupation.
    3 houses head male are working on traditional stone work while in 1 house all the members are working.
3) Due to mere wages of stone work only few members of family are involved and opt for daily wages jobs.
4) Expenses of raw material is beared by individual families.
5) The storage of raw material is outside the house either in *varandha or angan*
6) Working space is near the storage because of the heavy weight of raw material. Only the finished product is kept inside the house.
7) The work has to be carried out in day light, hence all the material and working are kept outside the house.

8) The space follows the same pattern, as given below

Home

OCCUPATION

WORKING AND STORAGE   DISPLAY AREA

Figure 22 Pattern of vadar houses from wardha slum

9) The working and display area is approached by road.
10) More or less the working and storage space are equal.
11) Young generation of the family are not interested in this profession due to hard work and low money earning.

Conclusion

Traditional occupation of Stone is on the verge of extinct. Only the male of the house is working as a tribute to this occupation. Once he is gone no generation will take this job. This is due to the mere wages. The job has to be done in broad daylight and hence work is carried out in verandah and angan. Archeological Survey of India and United Nations Educational, Scientific and Cultural Organization (UNESCO) are using their skills to restore historical buildings. But the awareness about the job opportunity is yet to reach this nomadic tribe. Hence awareness program must be done. This tribe is already known for the migration; hence they find no difficulties in migrating from one place to another wherever the historical sites are. Man and women perform equally for the job hence whole family needs to migrate. Hence the spaces must be provided to cater whole family. The study concludes understanding the importance of place making and retaining the identity and culture of Vadar community in urban fabrics.

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Agro-waste usage as building Construction material

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Abstract: The building construction sector, has a major requirement of sustainable building materials and onanother side, the agricultural industry also facing the problem of agro-waste disposal. Waste and natural products can be used in the building materials industry, with beneficial consequences for environmental protection and the preservation of natural resources. Thus, various materials derived from agricultural products and waste are to be studied and analyzed with their advantages compared to conventional materials. The sugar cane bagasse and the straw bells are locally available in Indian rural areas where the transportation cost of it is negligible, but due to lack of experimentation or lack of popularity of such materials. The rural peoples use conventional building materials even though most of them cannot afford the cost of conventional materials. It is necessary to find that why in India people don't use such materials which are eco-friendly, sustainable, and reduce the overall cost of the project.

Keywords: Sustainability, agricultural waste, construction material, SCBA, Straw-bale

1. Introduction :

Agricultural waste generates in India about 350 million tons every year. A study by IIT Kanpur said," since farmers can't find buyers for the waste, they burn it and it producesa huge amount of emissions - or dump it leading to soil and because of its water gets contaminated.

The wastes generated from agricultural sources in major quantity is sugarcane bagasse, jute fiber,rice husk, coconut husk, cotton stalk, etc. So the major issue in the agriculture industry is to dispose of agro-waste and similarly, in the construction industry, the need for eco-friendly building material with low cost is required. Both the industries' issues can be resolved if we used the agro waste and convert it into construction materials.

In many of the literature studies, it is observed that researchers are currently focused on identifying strategies aimed at protecting natural resources and using new renewable energy sources.

1.1. Need of research

The increasing cost of building construction materials is amajor factor of great concern. Everyone wants that their houses must be strong and should build by using the construction material ataffordable rates.

Agricultural waste is a major concern nowadays; some are using it for energy generation purposes and some are using it as construction material. The use of Agricultural waste also contributes to sustainable construction. Thus the building construction sector has a major requirement of sustainable building materials and also the agricultural industry facing the problem of agro-waste disposal.

Waste and natural products can be used in the building materials industry, with beneficial consequences for environmental protection and the preservation of natural resources.

1.2. Aim

To study and analyze the by-products of agricultural wastes like straw bales and sugar cane bagasse, convert to reuses as construction material to achieve low cost of construction and sustainability.

1.3. Hypothesis

The use of agricultural waste as a building material is beneficial for sustainable development in the country.
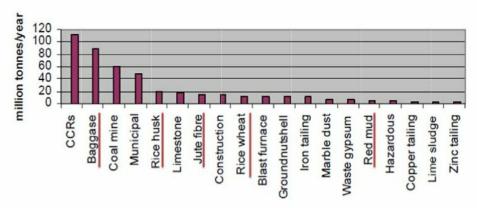
Figure 1: Agricultural production/year

1.4. Objectives

a) To study the present condition and materials that contribute tothe regeneration of agricultural waste into construction material.
b) To identify the issues and challenges of using construction materials made out of agricultural waste.
c) To study the potential of building materials that are re-generated by agro waste.
d) To check the quality, and durability of building materials made up of straw bell and sugar cane bagasse.

1.5. Research Methodology

The methodology is conducted through, Data collection, Literature review, case studies and interviews, and experimentation and analysis that is,

• The agro-waste like straw bales are to be identified by visiting farmers' places, and bagasse is identifiedand analysed by visiting sugar factories.
• Case study of built structures constructed by using these materials.
• Comparing the bagasse and straw bells with other conventional materials concerning construction method and strength.

2. Straw-bale

In straw bale construction uses straw from oats,wheat, barley, rice, and others in walls covered by earthen or lime stucco. Straw bales are traditionally a waste product that farmers do sell as animal bedding or landscape supply due to their durable nature. In many areas,it burned, and it is the reason forsevere air pollution problems. It is important to identify that straw is the dry plant or stalk left in the field after a plant has matured, been harvested for seed, and is no longer alive.

Straw is an annually generated natural product. We can get this from wheat, rice, oats, hops, barley. Among these rice, straw is contenthigh silica content. It is also a waste product for farmers and is being wasted by burning or any other way which is having an impact on the environment directly or indirectly. It is being produced by the collaboration of environment so the use of this in construction would be an environmentally friendly and would have a lot of merits for our quality life. In the world's largest straw-producing countries like India, it is used for the paper factory for the production of papers and some other purposes but this is not enough for proper utilization and still,our country is wasting it in ample amount. The use of agricultural wastes like straws has been commenced before decades for construction. Straw bales can be used for building buildings, churches, schools, officials and grocery stores, etc.

Wheat production in India is more than 100 million tons (MT)/ year. Therefore one can only imagine the amount of wheat straw that is being left to decay or is burnt. If the 100 million tonnes of surplus straw are used for local buildings, we could build at least 1,12,50,000 houses of 150 m2 per year.

Straw-bale walls also act as super-insulation acoustically. There are 2 recording studios in the USA built of straw bales for their soundproofing quality and insulation.

In addition, methods for installing plumbing and electrical inputs are also very similar to conventional methods.According to many researchers, the straw bales have passed load-bearing tests and are used to build at least 2-story houses. Straw, particularly organic straw, is a healthy alternative to modern materials. It is natural and harmless.

2.1. Construction using straw bells

All kinds of approved foundations, floors, and roofs which we used in traditional construction can also be used for straw bale construction in terms of structural support. However, for preventing excessive moisture intrusion and thermal bridging some special considerations need to be made in terms of design and construction techniques. For example, the tops of foundation walls should be about 16 to 24 inches above the finish grade of the site to prevent the bottoms of bale walls from meeting moisture. Air-fins are used between the frames and bale walls to compensate for thermal bridging. Also, roof overhangs are recommended to be exaggerated to minimize the amount of weathering that is met by the exterior walls. In addition to the framework, exterior, non-structurally supportive frames are also often built to support the openings for doors and windows. Because of the great width of bales, some extra insulation may also be used in areas, such as in between rafters or within the foundation.
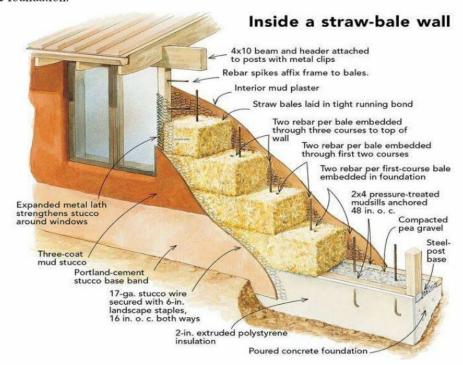
Figure 2: construction of straw-bale wall

1. Groundwork completed with damp-proof membrane lapped over loadbearing wall footing. Thermal bridging design detail is neededfor this type of footing.
2. Timber structure and roof with significant overhang installed.
3. Straw bales are laid in stretcher bond format with overhang pinned, rebound, and cut.
4. Bales compressed (with steel jacks or similar) to the required level.

5. Wooden patresses (and penetrations) were installed to provide a fix for service conduits.
6. Render applied inside and out.
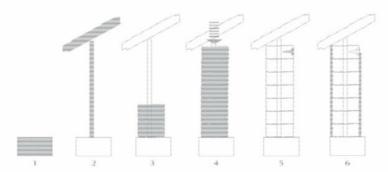
Figure 3: Stages of construction of straw-bale wall

Figure 4: Second coat of plaster has been applied

Figure 5: Six courses of straw bales laid in stretcher bond

Figure 8: A completed wall with straps connecting the wall plate to the base

2.2. Case study-1: Straw bale house in Sri Lanka

In this research, the first straw bale house, which is situated in Kiribathgoda, Gampaha in Sri Lanka was used to take field measurements. Thermal measurements were taken on a sunny day in the straw bale house. The straw bale house is a single-story house of a basic architectural design. It

consists of a living room, a kitchen, and a toilet. This house is a load-bearing structure, the entire wall is built using straw bales. However, the bathroom was built using red bricks, as there was the chance of water seeping through.

Figure 9: Exterior view of strawbale house in Shri Lanka

The straw bale is a rectangular cube with a length of 950 mm Xwidth of 400 mm, and a height of 450 mm. The box made with 1 inchgalvanized iron welded fabric of gauge 14 was placed inside the mould to encase the bale. Two 5.5 mm Mild Steel rectangles sections were fixed to the wire fabric box to keep the shape of the bale. The quantity of straw that goes into a bale was regulated by weight, 25 kg in each bale, compressed into three layers. Two strings are placed inside the moulds before depositing straw in them, for binding the compressed bales. The compressed and tied bales should be stacked in a dry ventilated atmosphere until they are used. The straw bale machine is a manually operating machine and 10-ton Hydraulic Jack was used to press the straw inside a rectangular mould. Strawbale walls were built over a concrete foundation, which also acts as a physical barrier against moisture and insects. Straw bales are placed along the length of the wall with 40 x 45 cm sides touching each other, and 40 cm sides to form the width of the wall. Vertical stability of walls is by introducing bamboo sticks or Steel bars (to resist earthquakes) at an interval of 1.0 meters, running from the foundation up to the wall plate along both sides of the walls, and connected to the wall plate with the help of brackets. This arrangement helps the roof and walls tied down to the foundation to withstand strong winds.

2.2.1. Analysis of case study

The World trend is sustainable development. So the passive buildings play a major role there. According to the result, it is proved that straw bale building has a good thermal performance than the other materials in tropical climatic conditions. It was found that the straw bale construction is a good alternative for common materials and also this will be a cost-effective construction.

2.3. Case study-2: Straw bale house in Bali

The "Bali Baler" is designed by JeniKardinal and Frank Hyde. The idea is to keep the strands of straw as long as possible in the horizontal direction and to press in the shorter direction (unlike the typical "pine needle style baler"). The double levers are made from Iron Wood and the box is made of teak and plywood. Each section interlocks and comes apart. Two half bales can be made (with a plywood divider inside the box) or 1 full bale measuring 50 cm x 50 cm x 100 cm in about 10 minutes per bale. The modifications included "used" fishing nets in the spirit of working with waste materials. The nets helped create a shape to the corners. The rubber matt at the top course gives a bit of insurance against possible leaks from the natural grass roof in the future. Earth plaster used local clay, rice husk, volcanic sand and straw, fermented cactus water, and earth from the site. The interior-treated bamboo truss designed by Jeni Kardinal has an upper vent to allow the warm air to rise out of the building keeping the interior space cool.

Figure 10: Bali house   Figure 11: Mud plaster   Figure 12: Interior of house

2.3.1. Advantages

- Avoids thermal bridging and provides good air tightness with simple retreated detailing.
- Good insulation qualities.
- Lightweight material with simple construction details and processes.
- Lightweight reduces the load on foundations, reducing the need for materials with high embodied energy.
- A low-cost renewable material, available from local sources, that stores carbon throughout its life.
- Simple building skills suited to self-build and community projects.
- Suitable for in situ and prefabricated approaches.
- Vapors-permeable construction envelope Limitations.

2.3.2. Limitations

- As an agricultural co-product, inconsistent properties (eg. density, dimensions, and moisture content) can cause problems during construction
- Details are restricted by theneed to protect the straw from water ingress; careful detailing is needed for exposed areas.
- Limited to relatively lightweight fixings
- Limited water resilience (giving rise to concerns over flood damage) and problems for repair if water-damaged (especially loadbearing walls)
- Requires shelter before finishes can be applied.
- Suitability of rendered external finishes limits application in some areas.
- Use limited to above damp-proof course or equivalent level.

3. Sugar cane Bagasse

Sugarcane is a widely available crop in Maharashtra.Sugarcane production in India is over 300 million tons/year.It is the major resource for sugar production. The waste created after juice extraction from sugarcane is called Sugarcane bagasse (SCB).After the controlled burning of sugarcane bagasse, the Sugarcane bagasse ash (SCBA)was prepared. The SCB creates an environmental nuisance due to direct disposal on the open lands and forms garbage hills in that area. One ton of sugarcane generates 280 kg of bagasse waste. It generates environmental as well as economic related issues, to solvethese issues, enormous efforts have been global towards bagasse waste management i.e. handling, disposed-off and application. To reduce the environmental burden, the usage of waste materials in concrete is significant aspect, the sugarcane bagasse ash (SCBA) is a waste material of the sugar industry, which has a good potential to utilize in concrete as cement replacement,Which improved long-term durability of mortar, concrete, and other construction materials. Bagasse is also used as blocks for wall construction after compacting it. Sugarcane bagasse ash mainly consists of amorphous silica and hence this by-product can be used asa supplementary cementitious material in cement-based paste and concrete.

Figure 13: SCBA preparation process

3.1. The process to obtain bagasse ash

- Bagasse is placed inside electric control furnace.
- Burnt at a temperature of 1200 degrees C.
- This bagasse ash is now collected and burned again at 600 degrees C.
- After this, the ash is dried for 24 hours.

3.2. Application of bagasse ash

- Making of floor and wall tiles
- Making the bricks
- As mineral admixtures
- Use as lightweight concrete

3.3. Advantages

- Sugar cane bagasse ash (SCBA) is can act as an alternative cement replacement material in concrete.
- SCBA in concrete gives the higher compressive strength as compared to the normal strength concrete
- To improve the quality and reduce the cost of construction materials.
- Has high silica content:87% in cement it is only 22%
- Low specific gravity that is 1.80 in cement it is 3.15
- Valuable pozzolanic material and its cost are similar to fly ash.
- Reduce negative environmental effects and landfill volume.
- Bagasse ash can use making ceramic products
- The replacement of cement with SCBA increases the workability of fresh concrete; therefore, the use of a super-plasticizer is not essential.

4. Conclusion

The above research is concludedthatthe use of agricultural waste as a building material is beneficial for sustainable development in the country. Both the industry's issues can be resolved by using such materials. Also,we getlow-cost building materials from agricultural waste. So the common man or LIG peoples can get benefits from this, also the farmers or people's lives in tribal areas can use their farms agricultural waste to construct their own houses. These people will also get the work and income source after their season of the top is over. Even the projects like Ashram schools, Construction of eco-friendly resorts, some agricultural workers can get employment too because these methods of construction don't requirevery skilled construction labor.

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IMPACT OF ARCHITECTURE
ON RURAL ECONOMY

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ABSTRACT: The purpose of this study is to explore and evaluate the impact of Architecture on the Rural Economy.

Aim: To provide policies for the factors which creates impact of Architecture on the Rural economy.

Objectives:
1) To study factors which creates impact of architecture on the Rural economy.
2) To study Rural economy.
3) To study about planning of Rural areas for the sustainable development of Rural economy.

Methodology
To study Rural economy, architecture and its relation.
To study points which creates impact of Architecture on the economy in Rural areas through survey and literature review.
To choose few points, study it and study related case studies.
To evaluate it.
To provide policies and role of architecture for the sustainable development of the Rural economy.

Architecture can be defined as a process to plan, create, develop and improve the quality of the built environment.

In rural areas, there is usually an undefined preference for development. Preparation for a sustainable development plan is often neglected and hence the Architecture has a role to play in rural development. This paper identifies and studies ways in which Architecture can play a role and act towards the development of the rural economy.

Due to less advanced technology rural areas and populations are lagging though they are the heart of the nation for the significant activities they engage in.

Access to advance knowledge, technology and facilities plays important role in evolving quality of life, facilities. Fundamental necessities and economic uplifting of the population in rural areas.

The following points are listed which creates Impact of Architecture on the economy in Rural Areas:

1. Policy planning Better Infrastructure.
2. Refining Tourism
3. Entrepreneurship development
4. Hygiene and health
5. Inducing ways to educate.
6. Development Through People Participation.

The study will focus on: 2.,3. & 4. Points.

The paper finally concludes that to fortify the role of architecture and to provide policies in the rural economy, there is a need for continual involvement in sustainable planning, regular studies, motivation, growth, and development.

Keywords:

Architecture, Rural, Economy, development

1. Introduction:

Every thought needs skillful Planning to execute. Architecture is one of the most important components which is a prerequisite for planning and execution of development.

Architecture is the most important element to provide the basic need of Humans "Shelter".

Architecture is both art and science, drawing on and intertwined with psychology, sociology, economics, politics, and more. Architecture impacts daily life, wellbeing, and simultaneously economy

The city is known for the buildings and buildings are the result of a thoughtful design. These buildings create communities and develop the areas around and the city. Thus, a building that may be catering to commercial, hospitality, entertainment, residential, historical, healthcare, Government, industrial requirements creates a significant impact on the social and economic uplifting of the area. Architecture plays a vital role in the design of such buildings which has long-lasting impacts on the local development which translates into benefits of evolving quality of life and economy.

Historically it is observed that the rural areas are transformed into major economic centers after a considerate vision was translated via planning and execution (Fig. 1, Fig 2). Architecture demonstrated the power of a city, town, or region and emphasized their economic and political position.

Nevertheless, in the last few decades, a distinct transformation took place. Architecture is not only the reflection of the current state but it became an instrument in process of creating and planning in marketing strategies – the economic potential of a space.

Today architecture is used as a marketing device that creates competitive advantages for the cities in a post-globalization period.

In the last decade cities like Bilbao, Shanghai and Dubai used successfully architecture to enhance their image, to generate economic growth and to emphasize their positions on the global village background.

Figure 1: Dubai in 1980

Figure 2: Dubai in 2015

The study further elaborates following 3 aspects with emphasizes the Impact of Architecture on the economy in Rural Areas:

1. Refining Tourism
2. Entrepreneurship development
3. Hygiene and health

1. Refining Tourism

Tourism is a powerful means which attracts foreign exchange and boosts the national economy and fetches investments, creates jobs, and promotes the sale of local arts and crafts.

According to The Ministry of Tourism, India "Any form of tourism that showcases the rural life, art, culture, and heritage at rural locations, thereby benefiting the local community economically and socially as well as enabling interaction between the tourists and the locals for a more enriching tourism experience can be termed as rural tourism".

Rural tourism experience includes wide range of attractions and activities. Being rural, the destinations are less populated and have a potential to explore new areas. It changes with seasons and local events and is based on the preservation of culture, heritage, and traditions.

Rural locations offer release from the stress of urban living and the detachment from the urban environment. It also provides the opportunity to re-engage with a simpler, quieter way of life that offers relaxation.

Rural areas are healthier and offer the opportunity for outdoor recreation.

Everything in the rural areas is connected with sensitive elements like culture, tradition, belief, and lifestyle. There is an increasing desire for authentic experiences for the local food, interaction with local people and expoler the art.

Rural tourism is a very important tool for development. Proper planning and implementation, can strengthen the economical, cultural, and social aspects of rural communities.

Rural tourism is broadly classified into the following types,
1. Heritage tourism
2. Nature-based tourism/Ecotourism
3. Agritourism (Agricultural Tourism)

1.1 Heritage tourism- It includes leisure travel that has as its primary purpose the experiencing of places and activities that represent the past. It supports local culture in rural areas, encourages restoration of historic sites.

Pushkar, Jaisalmer, Udaipur are among other places in Rajasthan that are prominently known for heritage tourism due to the culture and conservation of the ancient architecture.

1.2 Nature-based tourism/ecotourism- (a.k.a recreation-based tourism) It is visiting areas to enjoy the natural landscape, including plants, wildlife. It comprises nature holidays and ecotourism, walking, hiking, riding, adventure sports, and health tourism, fishing, educational travel, and, in some areas, ethnic tourism.

1.3 Agritourism (Agricultural Tourism)- It includes the act of visiting a working farm or any agricultural, horticultural, or agribusiness operation for enjoyment, education, or experience of the day-to-day activities of the agricultural operation. It includes taking part in a broad range of farm-based activities, engaging in overnight farm stays and other farm visits, and visiting agriculture-related festivals, museums, and other such attractions.

Significant benefits have been identified as potential outcomes associated with promoting the development of agritourism.

Pravara Rural College Of Architecture, Loni

Following are the benefits of Rural Tourism:
1. Retention of jobs in retail, transport, hospitality, and medical care and also provide additional income for farmers.
2. New Business opportunities job creation in hospitality and F&B industry.
3. Facilitates expansion of complementary businesses such as to catering the needs of tourists for recreation, local art& crafts, travel, local infrastructure.
4. The fundamental element in both the tourist's and host community's feelings is for "Sense of place" which makes the area attractive to visit and live in. By providing museums or experience centers the sense of place is promoted and both culture and heritage can also be preserved. It helps in the preservation of Rural Culture and Heritage.
5. Organizing arts and crafts festivals as a marketing mechanism to encourage tourism and promote the sale of local arts and crafts.
6. Landscape conservation has become an increasingly important form of heritage protection.
7. Infrastructure development such as traffic regulation, sewage, and litter disposal can be assisted by tourism authorities. This helps develop pride of place, important in retaining the existing population and businesses, and in attracting new enterprises and families.
8. The historic built environment can benefit from rural tourism by generating the revenue from charging for admission and help to maintain their structures and surrounding gardens and parklands.

Redesigning and remodeling the redundant buildings imaginatively can be used for supporting a micro-level economy. They can become attractions in their way. The small town of St. Jacobs in Ontario, Canada, has converted grain stores into craft centers.

Local events have been found to increase business, income, and employment and are seen to assist with social and economic development. Tourism not only offers business opportunities to residents, but it can also enhance local quality of life.

2. Entrepreneurship development

In this development process for business in the region, there must also be an increase in the quality and in the infrastructures that allow people to use the environment. Furthermore, the development of small- and medium-sized enterprises represents a possible opening strategy, only if it allows the possibility at the same time of reusing the existing building heritage and acknowleges its presence as a unique value for a region. The small- and medium-sized enterprises should be supported by specific services, such as access to information and communication technologies, and they must also have new types of sustainable infrastructures for the environment that allows businesses to establish themselves in a region and to promote new initiatives.

The rural areas must function as incubators of the knowledge-based businesses driving the new economy. The rural area will have to compete to attract the knowledge workers whose ideas serve to grow these economies. And to attract the best and the brightest, they must invest in the drivers of growth, that can become places for innovation and change.

The "magic" formula for attracting and retaining the best and the brightest is designing a great place to live; designing an area that works. Today's young working generation can

choose to live and work anywhere. The more attractive an area, the more people want to live there. We want them to choose these rural areas.

To this end, following strategies can be used to encourage the development of a rural region,

2.1 Construction Industry as a Prime Motivator

The construction industry is generally responsible for the physical development or the transformation of the environment which makes the built environment very vital to the social-economic development of a region. It comprises building, civil, and heavy engineering works. The industry is the prime motivator in any economy.

The construction industry is a large sector of economy, responsible for millions of jobs and a significant proportion of GDP in most countries. When allied to other sectors and industries in materials production and distribution as well as services sectors such as transport, finance, and the property market, its impact on society and the environment and its influence is tremendous.

Architecture is concerned with the planning, design, and production of buildings either existing or new.

2.2 Creative Industries (Architecture and Design) as Economic Resources

Richard Florida, a leading expert on economic competitiveness, innovation, and demographic trends, is credited with coining the term "Creative Class," which describes young and talented individuals who are traveling and more likely to locate where there is an exciting and creative environment.

Attracting and retaining talented young people and companies is increasingly important. The area's arts and culture play an important role in attracting these talents.

Countries such as China, Korea, and the Netherlands are overtaking the United States in economic growth, product innovation, technology infiltration, and educational achievement.

The policymakers should recognize that a competitive edge and a creative edge go hand-in-hand to support economic prosperity.

Creative industries are growing and playing prominent economic and social roles. The market value of products is increasingly determined by a product's uniqueness, performance, and aesthetic appeal, making creativity a critical competitive advantage to a wide array of industries; Also that most desirable high-wage jobs require employees with creativity and higher-order problem solving and communications skills. Business location decisions are influenced by the ready availability of a workforce and the quality of life available for employees.

Furthermore, in this environment, a region's arts and cultural resources can be economic assets. The arts and cultural industries provide jobs, appeal investments, and stimulate local economies through tourism, and shopping. Significantly, contributing and creating communities with a higher demand to residents, businesses, and tourists, and funding the economic accomplishment.

The creative economy includes human, organizational, and physical resources. Industries that comprise the arts and culture sector include advertising, architecture, the art, and antique market, crafts, design, fashion, film, digital media, television, radio, music, software and computer games, the performing arts, publishing, graphic arts, and cultural tourism. The creative industries are important to the economies.

The transformation of the rural area into an entrepreneurship development hub cannot be a coincidence-it can happen because of proper planning and strategic investments. Through careful design, an environment has to be created that attracts and keeps the people and the businesses that enable the rural area to grow and sustain the competitive economy.

3. Hygiene and Health

Health and hygiene is basic necessity that should be accessible to all but lacks in rural areas. The lack of basic facilities is one of the reasons of migration of the younger population to the cities and deters the development.

For improving it, government policy plays an important role via. various programs and schemes. Architecture acts as a facilitator for the planning and implementation of various developments in the area.

Health and hygiene do not include only hospitals and clinics but also public toilets for the people and especially women along with access to water.

Other than that by providing community bathrooms, domestic sanitation systems, SCHOOL WASH Program to inculcate healthy practices and eventual habits that can increase the quality of lives of the children and diffuse to their households under Shramik Bharti Yojana. E.g.In India, Shramik Bharti constructed 70 community bathrooms.

Also To manage this menace efficiently Shramik Bharti with the support of HDFC Bank has constructed 332 Household wastewater soak pits in 21 villages of Uttar Pradesh and 310 soak pits in 12 villages of Punjab.

Through Community hygiene greater health and prevention of disease are provided to a group of people living near one another.

Health educational can significantly improve awareness among rural people.

Community hygiene is the cooperative effort to bring greater health and preventing the spread of disease. Community and surrounding cleanliness is the first steps in the process towards safe water access.

Through enabling communities to gain access to Water, Sanitation, and Hygiene (WASH) services and emphasize developing good WASH behavior for the sustainability of infrastructure.

In India, under NRHM (National Rural Health Mission)
1. Health Plan for each village through Village Health Committee of the Panchayat,
2. Strengthening existing PHCs and CHCs,
3. Preparation and Implementation of an inter-sectoral District Health Plan prepared by the District Health Mission, including drinking water, sanitation & hygiene, and nutrition.

By implementing it one can improve Health and Hygiene in Rural areas.

Several features of development are intertwined with sanitation which comprises the monetary losses due to the lack of sanitation, health aspects, aesthetic appearance for tourism, etc.

By educating people about proper Waste disposal and providing Waste Management Center creates job opportunities in Rural areas.

Infrastructure development can enhance the local appeal, ease of life, promote pre and post-construction phase employment.

Funding to clinics and Hospitals for its construction and running by local leaders can stop rural people from going to cities.

Native people from Rural areas who have got higher education can also contribute to the Rural economy by giving services on particular days in a week or a month.

By using local material, technology, by providing aesthetically appealing buildings, and use of local materials, labor and technology one can help in improving Health and Hygiene in Rural areas.

It retains youth people at their native places and promotes local job opportunities helping reverse migration.

4. Conclusion

This paper saw architecture as the primary facilitator of the built environment with regards to the design, planning, and execution of buildings, landscape, infrastructure, and urban design in the rural economy.

Architecture is partly exploited in a process of enhancing the economic potential of rural areas. It should be explored as a way of innovative reality creation and to value abilities to create the atmosphere stimulating the planned financial effects.

The economic impact of Architecture encompasses all modern new development as they are carried out in a planned and organized way.

Following Architectural aspects creates significant impact on the Rural economy and should be referred to as part of policymaking.

- Sustainable planning of development for rural areas.
- Even though architecture contributes to economic development in terms of good quality designs and stimulating other related economic activities, the tourism sector is largely untapped and is comparatively low in rural areas of the country. Planning and implementation can promote rural tourism which strengthens the communities economically, culturally, and socially.
- Focus on local Entrepreneurship development by encouraging new construction of buildings, public spaces, experience centers, and secondary needs in the areas. There is a lot of revenue potential through man-made scenes of beauty besides existing natural features and peripheral development, emphasizing a good return on investments.
- Stimulating creative industries and events have been found to benefit employment and are seen to assist social and economic development.
- Access to better basic infrastructure facilities plays important role in evolving quality of life, health, and encourages reverse migration which in turn supports the local rural economy. The space's appeal and value increase if the users can access the facilities with ease which triggers happiness and satisfaction.

There are astounding cost-benefits that nations are eyeing to tap the potential to reap the benefits and create job opportunities for their citizens. Thus for developing the rural economy and increasing effectiveness one of the first devices to rethink is Architecture.

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Roadmap for strengthening Rural Development:
A Case of Ribandar, Goa.

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Abstract: Cities are encroaching on the fringe agricultural lands leading to environmental degradation and hampering rural lifestyle. Cities and villages are organic in nature, multilayered in culture, social pattern, and economy. Each place echoes the essence it holds as it has passed over ages. The social and physiological needsof the people are ever changing.The major cities random development is affecting its multi - ethnic culture. People's adaptation to these spaces and the resulting lifestyle, has been evolving through the decades. But all this change is not balanced especially with respect to rural and urban areas. More attention is being given to urban development than rural and hence the out migration is strongly seen. Many policies are being made but better implementation is required. It is critical that each rural areas' uniqueness is identified and implementation is done. Studying these changing needs and developing alternative models of development of villages is the aim of the paper.The objectives are to do resource profiling, understanding urban rural linkages, field observation and live case study, and developing policies. The methodology employed for this study is case study of Ribandar Village in Goa, which is adopted after through primary data collection of the existing concerns. The characteristic of rural-urban coexistence defining the urban and the rural better ensure lesser environmental burdens and sustained growth across regions will be a solution for exploring the rural-urban linkages for alternative models of sustainable growth and development.

Keywords:environmental degradation, social needs, lifestyle, migration, alternative models, sustainable.

1. Introduction :

Urbanisation is rapidly growing with city centres getting crowded. There is burden on the infrastructure, services and goods. They are acting as magnets where self-economic development is assured. Hence leading to migration from the town centres to cities.

From the Census of India 2011, the definition of urban area is as follows; 1. All places with a municipality, corporation, cantonment board or notified town area committee, etc. 2. All other places which satisfied the following criteria: i) A minimum population of 5,000; ii) At least 75 per cent of the male main working population engaged in non-agricultural pursuits; and iii) A density of population of at least 400 persons per sq. Km. A geographical area that is situated on the outskirts of towns and people are engaged in Primary industry is reffered to as Rural Area. Primary is considered here as production of any product for the first time in co-orperation with nature.(Banakar & S.V.Patil, 2018)With Respect to migration as per Census 2001 shows that the total number of migrants has been 314 million. Two reasons namely push and pull factors influence this migration. Push factors are poverty, unemployment and natural calamity, at the same time, better opportunity, better salaries , relatives or friends stay since long time are the indicators of pull factors.(Sali & Shanta.B.Astige, 2015) A study done by economic and social commission for Asia and the Pacific (ESCAP, 1991) observed that "migration from rural to urban areas continues at a rapid pace in many countries of the

region, and it was often beyond the capacity of towns, cities and metropolitan areas to cope with the increasing numbers. The increasing trends of rural to urban migration should be seriously reviewed in the context of development of slums in urban area.(Singh, 2016)The National Commission on Urbanisation defines urbanisation in India as "a process whereby the surplus population of workers from rural areas resettles in urban centres, where non-agricultural job opportunities are available". Thus the concept is based on rural elements. The Commission further adds: "If job opportunities are productive and lead to gainful employment, urbanisation becomes a catalyst for economic development. If, however, urbanisation is merely a process of transfer of rural poverty to an urban environment, it results in a concentration of misery." This is exactly what is happening to Indian cities. (Environment)

The biggest concern with the Urbanization and rural migration is development of slums as the urban centers are not able to provide healthy living conditions for the migrants. Which in turn poses unreasonable burden on the infrastructure of the Urban center.

1.1 Need for rural and urbanlinkages

A basic definition of rural-urban linkages is that they consist of flows (of goods, people, information, finance, waste, information, social relations) across space, linking rural and urban areas. (Tacoli C, 2015)Urban-rural inkages touch on a broad variety of thematic areas ranging from urban and territorial planning, strengthening small and immediate towns from enabling spatial flows of people, products, services and information to fostering food security systems and touching mobility and migration, reducing the environmental impact in urban-rural convergences, developing legislation and governance structures and promoting inclusive financial investments among others. Fostering Partnerships- between urban and rural areas at the local level are crucial for transformation. Territorial development is necessary for transforming towards sustainable and resident societies.Decentralization is needed.

The Urban-rural link is a co-dependant where each one profits from the other. Urban benefits from rural with respect to meeting the need of food, water and raw materials where as rural benefits in terms of markets, employment opportunities. Thus a well managed rural urban linkage is necessary till it does not affect the sustainability of either areas. (Gebre & Gebremedhin, 2019)

UN-Habitat initiated and convened the process to develop ''urban-Rural Linkages: Guiding principles and framework for action with over 130 experts working in the field of urban, rural and territorial development, representatives of national and sub-national governments, development partners, think tanks, academia, and intergovernmental organisations. (Programme, 2018)

Urban rural linkages guiding principles by UN
- Locally grounded interventions
- Integrated governance
- Functional and spatial systems based approach
- Financially inclusive
- Balanced partnership
- Human rights based
- Do not harm and provide social protection
- Environmentally sensitive
- Participatory engagement
- Data driven and evidence based

1.2 Need for Strengthening the Villages

As per Census of India 2011, Almost 65% of India's population lives in the rural areas and the level of urbanization increased from 27% in 2001 to 31% in 2011. The Proportion of rural population has been steadily been declining. The lack of infrastructure, amenities employment opportunities, poor education standards are just a few reasons why this movement from rural to urban is taking place.   As per Sustainable Development Goals, for sustainable development of nations it is essential that rural

development is given a priority. With even small changes at rural development can provide to a better opportunities for the country. (Kapur, 2019)Smart Villages is a concept developed under the Shyama Prasad Mukherji Rurban Mission (SPMRM) where the main objective is to make village smart growth centeres by making them ecnomically, socially and physically sustainable spaces.

2. Method

The method followed in this paper was primary and secondary data collection by doing live case study to villages in Goa in the vicinity of Panji. There were non-structured interviews of various stakeholders from Goa like activists, practicing Architects, tourists and residents of Goa. For understanding the trends only the present data but also historic trends were plotted on a graph so that the future can be predicted. After the data was collected it was graphically analyzed and using 'Scenario method for Sustainable Planning' three possible projected futures of how Goa will be are suggested. *Scenario planning aims to define your critical uncertainties and develop plausible scenarios in order to discuss the impacts and the responses to give for each one of them.(*Mariton, 2016.) Data was collected of one village Ribandar and projections are done to suggest policies.Tools like systems thinking and application of drivers of change to predict how cities and villages would look and behave were used.Identify ovelapping situations where village and urban character merge. Document and describe their qualities, potentials and threaths to theses potentials and develop an multitude of strategies & ideas for how they can be further developed and applied. Methaphors of Goa were brainstormed and imagined and projected image of the place was developed.The proposal of policies is based on the three pillars of Sustainability i.e. Environmental, social and Economic.
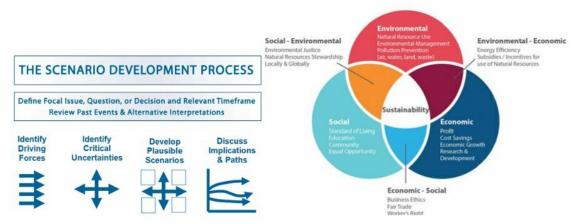
Figure 1: Scenario development process Figure 2: Pillars of sustainability

 (Source: Mariton, 2016)   (Source:(REDALPI))

3. Study Area or context

3.1 Goa as a tourist destination

Goa as an International and National tourist has developed very rapidly through the last decade. The shores have become full of hotels and resorts and it is essential to diversify the tourism development in Goa, but very little attention has been given as the tourist requirement ends at beaches.(BRAMMER & BEECH, 2004). In the Goa Tourism Policy 2020 as well, promoting Goa in

terms of a diverse tourist destination has been given a priority.Goa has 60 mile long coastline dotted with some of the most exquisite beaches in the world. Goa as highest GDP contributor, is under rapid urbanization. Goa as a state, has never restricted personalization of spaces. The colorful festivals of Goa gives a new dimension to goa tourism. The wildlife here is enriched with a fascinating diversity of wild life including birds and mammals. The tourists are now getting attracted to the unconventional style of tourism such as Heritage tourism, Ayurveda, Sanctuaries mangrove interpretation and Eco-tourism, etc. Thus Goa is not only beaches, but the hinterland of other Goan villages have a lot of beauty which needs to be tapped so that that they become economically independent.

3.1.1 Socio – environmental impacts of tourism

People from metros look at Goa as their 2ndhome so it has seasonal use. There is stress on infrastructure and services only in certain areas of Goa. There are high end lavish resorts or very cheap rental stay options available. There is un-controlledgarbage, increased solid waste from restauants, beach shacks. Change in rural landscape due to real estate development. Change in land-use due to conversion of land to commercial and settlement areas. Housing problems has leading to squatter colonies and haphazard development.

There is easy money from tourism hence low skilled and low-educated youth generation. Hence labour influx happens from villages to the coast for job opportunities. People are leaving Goa for better education/ employment opportunities. There is out migration for economic opportunity as there are very few economic opportunities in the traditional occupations in the villages. There is overcrowding of coastal areas and migrating population. Conflicts on limited resources and exploitation beyond carrying capacity is observed.

3.2 Ribandar Village

Ribandar is a town close to Panji Village comes under Panji corporation. Its a beautiful village placed between Panaji and Old Goa in the district of Ilhas or Tiswadi. The Rio De Ourem river separates it geographically from Panjim and forms a large marshy estuary along the Mandovi. Situated near the Ribandar hill at Mandovi river, it boasts of many historical architectural marvels. Ribandar has received it name as *bandar*/ port/ dock of kings. There are a few heritage structures like churches, Royal Portuguese hospital today a management school and Ram temple. Various heritage sites not only reflect the history of the place but also the richness of the history. The ferry wharf at Ribandar is one of the major means of transportation to the islands of Charo and Divar. Being in close vicinity to Panji it has tourist inflow but if planned self sufficiently then its rural charachter can be retained.

Figure 3: Ribandar village in Tisawdi taluka marked in Yellow

(Source: Goa Institute of Management, 2006)

4. Analysis :

4.1 Potentials /strengths in Ribandar Village

4.1.1 The built environment

Urbanness and ruralness are seperate identies which were seen in Goa. Cities and villages exist individually and in complete isolation. Peri urban centres act important in equitable regional development. Good response to climate with rich architecture is reflected in the houses. The Hierarchy of spaces is such that it has Built (house)Semi-open (verandah, porch) and Open (backyard, garden, washing area). Mixed use-residential + commercial. Overlaying of functions are used with a same space to: sell, pray, wait, hub. (Figure 12) Repercussions on typology: multi use spaces, private to public. There are diversity of technologies seen from ancient to use of modern technologies. Natures leftover spaces act as limits, there are no boundaries seperating one house from other. Preservation of heritage is seen from their houses.
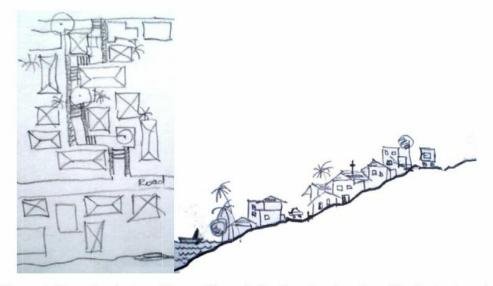
Figure 4: Plan of a cluster of housesFigure 5: Section showing riverside sloping terrain

(Source: Author)

Figure 6: Built and open spaces on sloping terrain   Figure 7: Open spaces

(Source: Author)

Figure 8: Traditional facades   Figure 9:Verrandah Space   Figure 10: Facade

(Source: Author)

4.1.2 Lifestyles & social perspective

Social arrangement is very close knit mixed living. The residents of the village proud of their identity they are Socially tolerant. The people haveproud identity: easily discernable household identity is noticed on the residence facades. Integrated generations with multicultural essence is still prevelant. Existing social interactions happens in the outdoor verandas and open road side spaces. Attitude of reduce/reuse/recycle is practiced by the people. Integrated and organic community but is still organized. There is a fish market near ferry.

Figure 11: Local vendors   Figure 12: Overlaying of functions roadside

(Source: Author)

4.2 Conflicts/ issues in the in Ribandar Village

The key factors affecting the lifestyle that were observed were climate, availability of resources, migration, lack of opportuties (better education/ employment opportunities), religion and degradation of environment. Tension due to migration is seen in the village. Laid back, relaxed attitude is changed to reactive attitude. There is a contrast of rich biodiversity & environmental degradation. Fragmentation of cultures is there. But certainly a change in lifestyle and community composition is noticed. Pressure of elites of India and their leisure needs- thus local people are edged out. There are limited education & health care facilities in the village and they depend on Panji for such facilities. There is speculative real estate development coming up.

Figure 13: Mixed use Figure 14: Multiuse of spaces   Figure 15: Integrated generations

(Source: Author)

5. Suggestions and Policies

Development Drivers with respect to economical, social and environmental aspects were foundout and combination of these three in to project multiple futures was done. Combination of these with ideological positions to generate multiple futures which are probable, possible and preferable. (Keskar, 2011)

There were many drivers of change but the following three were considered.

- Influence of material wealth
- Influence of state and availability of natural resources,
- Potential of goa to compete economically and at national and international levels

5.1 Directions forward in Ribandar Village

Creating a new vibrant livelihood common social spaces- By strengthening inner connectionsin villages & creating awareness amongst people through common activities working as acupuncture & catalysts to repair fragmentization & create more retrofitted community. Small projects & efforts can bring people together & affect at a larger scale. The mentality shift will make people more aware & make them worship the common public spaces. Enhancing existing religious spaces. Natural resources can be used as bonding agent. New vibrancy with old revival can be done by reuse of abandoned rich houses as museums etc.Maintenance of traditional knowledge/products. Scale of spacessmall (neighborhood level) to large (community level) could be provided. Loacl food can be served and homestays can be provided by the residents. This will generate revenue and curb migration to Panji.

Figure 16: Create common social spaces   Figure 17: Enhancing religious spaces

(Source: Author)

5.2 Wayforward for making villages self sufficient

Following are few listed opportunitites in the context of villages in Goa

1. Encourage local occupations-Agro tourism, Farm branding, Productive park, Co-office (Adresses self sufficiency, local job opportunities, space for social interaction, increased work efficiency, social & cultural exchange), Creating specialized institutions. Techno-advanced accessories and techniques can be made available for agro industies and organic farming. Setting of new higher education centres to stop migration. Incentives if made available to farmers for effecient agricultural practices will result in agro technological development.

2. Strengthening communal bonding and existing village character- Cultural exchange centre, Housing typology, Awareness within residents, Net-worked clustes of villages, Empowerment of lower class through communidade system. Overlap of rural-urban lifestyles, a transition from informal meeting space street to backyard farming & household waste treatment. cultural exchange centre. Meeting space for cultural & social exchange, bridges differences, promotes diversity in lifestyles and culture, as well as promoting local identity, cuture & tradition.

3. Improve social and physical infrastructure-Agricultural playground, improve mode of transport, Export- import linkages, Research and development institutes for primarysection

4. Technology development-Local – global linkage

5. Strengthening energy efficiency-Bio-fuel usage for transportation, renewable forms of energy

6. Encourage local identity-Heritage tourism to preserve heritage structures, Through government incentives, Enhancing religious spaces. Heritage tourism and community group housing can be the first steps towards conservation of social values. This will promote social bonding. Overall awareness and education will help in creating sustainable practices for tourists as well as residents. Self sufficiency may cause inward planning of economy. Adressing local job opportunities, strenghtening local culture and traditions, retaining agriculture, promoting self sufficiency, cultural & social exchange, strengthens local identity, adressing environmental issues.

7. Efficient use of natural resources-Polluter- environment linkage, Centralization of waste management, Eco-tourism, have green code or planting code for tree plantation.

9. Preservation of eco sensitive zone- estuary

10.Empowering government and implementation of policies- Centralization and de-centralization linkage, Organization for communidade system, People-driven needs to be subsidised.

11.Land-use- Dense v/s sparse, Co-operation v/s self sufficiency, Vertical village, Agriville, Group housing

12.Urban-rural linkages-Network nodes inbetween Panji adjacent villages and islands.

6. Conclusions:

Since scenarios are only possibilities though of by the authors there are many changing factors to it, hence it cannot be taken as a rigid future or forecast. There can be numerous possibilities to it. Blending in by adopting to the social norms. Every community has its own special history and character but the ones that are able to move forward with the times are the most interesting. In the merge between rural and urban situations a potential for a sustainable urban village life was found in Ribandar. It is extraordinary of the Goan villages that they embrace few of the urban qualities. Embracing village/rural qualities such as: Typology & scale of buildings, retaining sense of community, connection to the land culture & tradition, self-sufficiency Sustainability & environmental qualities is the way forward for strengthening the villages in Goa. Promoting diversity in lifestyle and opportunities, equal rights & social stability, cultural & social exchange, connectivity & networking on a state level, awareness and knowledge of local issues are suggested in this paper in the context one village Ribandar in Goa.

7. Acknowledgement

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Alternative Building Construction Techniques for Climate Responsive Buildings

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Abstract : Climate-responsive architecture, where the building design responds to the local climate. Its built form and structure take into account all the climatic elements like temperature, wind, solar radiation, and humidity that have a direct influence on indoor thermal comfort and energy consumption in a building. In a plotted residential urban area where site approach, plot sizes, and setbacks, etc. are predefined, these norms are constraints in implementing all climatic responsive design features in a building. However, the potential of the building envelope can be utilized up to the fullest by using alternative building construction techniques. Alternative construction techniques for the building envelope are not only low cost but also respond effectively to temperature and solar radiation that are dominant elements in composite climate zone. This research paper intends to identify and analyse different techniques that are used in the construction of building envelope of residences in a composite climate. The study is focused on three residential buildings constructed using alternate construction techniques in Faridabad city, Haryana. The primary case study has been done to identify alternate building construction techniques for walls and roofs and to analyse building performance. Analysis reveals the use of alternative building construction techniques for building envelopes in addition to other climate-responsive design features in a building that improve the building's thermal performance and requires fewer mechanical devices to create comfort inside the buildings. These buildings also require less maintenance as compared to conventional buildings so learning from this study can be implemented in other buildings in composite climate.

Keywords: Composite climate, Climate responsive Architecture, Urban Area, Plotted residential Area, Alternative construction techniques

1. Introduction:

Creating indoor human comfort has always been a primary objective of a building and to achieve this climate-responsive approach has always been in practice and can be experienced in vernacular buildings in India. The limate responsive approach has many dimensions which address the environment, sustainability, and economy as its makes building energy-efficient, cost-effective, and also uses fewer resourcse. Nowadays in growing cities where comfort can be achieved inside the building by installing mechenical devices, design and planning are less sensitive towards the climate. In an urban setting, residential areas are planned which has predefined plot size, setbacks, etc. development norms, all these parameters limit the climate-responsive approach in a building such as desired building orientation, building form, opening, and landscaping can not be achieved, however building envelope which interact with the outer surrounding gives opportunities to play with it. The intensive use of conventional building materials and technologies which are energy-intensive will make it difficult to meet building demand in the future (Reddy, 2004). The use of alternate building construction techniques for the construction of walls and roofs in addition to other possible climate-responsive strategies enhances the building's thermal performance. Intergration of both, climatic responsive design features and alternative construction techniques can be seen in a few environmentaliy sensitive architect's work. It is important to generate awareness for the importance of Climate responsive buildings in cities which is experiencing rapid urbanization and population growth

(Akande, 2010). Therefore this paper intends to highlight and analyze those climatic responsive design systems and techniques used in residences. Three residential buildings in Faridabad city have been chosen for the case study, where alternative construction techniques have been used by architects to the respond the city's composite climate. This paper also outlays that how efficiently the architect has dealt with the constraint and used the full potential of the building envelope to create indoor comfort.

2. Climate responsive buildings:

Climate-responsive buildings respond to the local climate by considering all the climatic elements like temperature, wind, solar radiation, and humidity that have a direct influence on indoor thermal comfort and energy consumption of a building. The Climate-responsive architecture aims is to achieve occupant thermal and visual comfort with less or no substitute to non-renewable energy sources by incorporating the climatic elements of the region effectively (Yannas, 2003) (Daroda, 2011).

Orientation: Buildings that are properly oriented take advantage of solar radiation and prevailing wind (Akande, 2010). The longer axis of a building should be laid along the east-west direction for minimum solar heat gain by the building envelope. A building can be made more energy-efficient if it is planned according to solar orientation and prevailing wind direction.

Floor layout: Bedrooms can be located on the eastern side where it is the coolest in the evening. Living rooms that use the maximum time of the day should be, located on the northern side. Stores and other auxiliary spaces should be located on the western sides.

Ventilation: Natural ventilation increase the air movement inside the building that keeps the indoor environment cool and, therefore, keeps the building cool for inhabitants even without the use of energy. The building can be made more energy-efficient if it is planned considering solar orientation and prevailing wind direction (Givoni, 1998).

Shading: the provision of shading devices on buildings can reduce heat gain significantly (Danja et al., 2020). Shading in a building is done by adopting various means, including the use of dedicated shading devices, nearby structures, and trees. External shading devices are considered the most effective way to reduce the solar radiation passing through the building envelope inside the building. Building envelope absorbs and retains heat over the day and radiates it at nighttime, appropriate material for an envelope can enhance the building thermal performance.

Material: Traditional building materials (mud, bamboo) maintain some passive and cost-effective solutions to the climate of the region, but these materials are no longer in practice in urban areas due to the popularity of contemporary materials (bricks, concrete) (Danja et al., 2020).

Vegetation: Proper tree plantation can reduce the cooling load by 10%-40% and save energy (Raeissi et al., 1999). The temperature of wall which is shaded by plants 5dgree to 15 degrees less than the wall which is not shaded. The roof garden also can keep 10 degrees to 30 degrees below that the bare roof.

3. Alternate building construction techniques:

Alternative building construction techniques refer to those techniques which differ from conventional methods. Alternative building methods involve Eco and Green design approach to minimize energy requirements. Alternative buildings involve a range of building systems and materials that place major emphasis on sustainability. The government of India also has taken many initoatives by establishing an organization like Building material and technology promotion council (BMTPC), Central Building Research Institute (CBRI), SERC, CASTRA Regional Research Laboratories, Application of Science and Technology for Rural Area (ASTRA), Environmental Engineering Research Institute and many more. Alternative building technologies describes as follows;

Energy conservation: Minimize the use of high energy material,

Environment-friendly technology: Concern for the environment,

Decentralization production and maximum use of local skill: Minimize transportation and maximize the use of local materials and resources,

Recycling of building waste, and use of renewable energy sources: Utilization of industrial and mine waste for the production of building materials (Reddy, 2004).

Some of the currently available building technologies are Stabilized mud blocks, Steam cured blocks, Fine concrete blocks, Rammed earth blocks, Mud concrete blocks, Lime–Pozzolan cement, Soil-lime plaster, Composite mortars for masonry, Composite beam and panel roofs, Reinforced brickwork/tile-work roof, Ferro cement, and Ferro concrete roofing systems, Unreinforced masonry vaults and domes, Ribbed slab construction, Filler slab roofs, Rammed earth foundations, Solar passive cooling techniques.

4. Methodology:

Three buildings were identified in the planned sector in Faridabad city where the architect incorporated both climatic responsive features and alternate building construction techniques. Data for development norms and climate were collected through a secondary study. To identify design features and technologies used in residences, a primary case study was done. Every strategy and design feature is observed closely and analyzed concerning climate for thermal performance. Physical visits were conducted to residences to document all building design features and techniques.

5. Case study:

Residences which are chosen for case study situated in Faridabad city. Faridabad is an industrial town of Haryana state and a part of the National capital region (NCR), the region has a composite climate where heat is a prominent element (table-2). The Major part of the city developed in residential areas has planned sectors with various plot sizes. Many residences were constructed between the year 2000 to 2010. Including the residences identified for the study. Residence -1(owner Mr. Arya) is in sector 21-A has a plot area of 418 SQMT, residence -2 (Owner Mr. Gupta) is in sector 21-D (Figure-1), and residence 3 (owner Mr. Mahendra) is in sector 21-B (Figure-2) are also have same plot size, all are designed and built by incorporating climate-conscious design features, material, and techniques for construction. Summary of climatic data of the region and building bylaws shown in table-1 and table-2 respectively.

Figure 1: Image of Residences 1 and 2 ; source: Authors

Figure 2: Image of Residence-3; Source: Authors

Table-1 Climatic condition of Faridabad city

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Avg. Temperature °C	13.6 °C	17 °C	22.7 °C	29.3 °C	32.8 °C	33.1 °C	29.9 °C	28.7 °C	27.9 °C	25.4 °C	20.6 °C	15.5 °C
Max. Temperature °C	20.1 °C	23.7 °C	30 °C	36.9 °C	39.7 °C	38.3 °C	33.7 °C	32.3 °C	32.3 °C	31.9 °C	27.6 °C	22.4 °C
Precipitation / Rainfall mm (in)	23 (0.9)	33 (1.3)	20 (0.8)	14 (0.6)	20 (0.8)	74 (2.9)	208 (8.2)	183 (7.2)	99 (3.9)	13 (0.5)	5 (0.2)	8 (0.3)
Humidity (%)	67%	60%	46%	28%	31%	46%	71%	77%	71%	55%	53%	61%
Rainy days (d)	2	3	3	3	4	7	15	15	8	2	1	1
Avg. Sun hours (hours)	8.2	9.4	10.6	11.5	12.1	11.8	9.5	9.0	9.3	10.1	9.6	8.8

Source:https://en.climate-data.org

Table-2 Development norms in plotted residential area for 418 sqmt plot size

Development norms in 21 Sector	Permissiable limit
Total ground coverage	60%
F.A.R	2.4
Height ristriction	11 m
Front set back	6 m
Rear set back	4 m
Diveway width and location	3 m

6. Discussion and result:

All three residences reflect the climate-responsive consideration in their planning and construction, as the layout of the floor plans shows bedrooms are located in the northeast and north-west direction. Entry where possible kept on north direction otherwise on the south side with projection. Larger and narrow openings are used in houses, larger openings are given on north and south walls, slit windows are given on the walls which are facing east and west sides. Double height kept where the staircase is for better air movement. Filler slab and jack arch roof used in staircase area. Wind chimney is also used in residence-2 at sector 21-D for vertical air movement through stack effect. Orientation of building block of residence-3 at 21-B is kept as per sun direction, shorter wall facing east-west direction and no openings are given on these walls. On the south direction covered

corridor given which shade the wall as well. Apart from all these climatic considerations, the architect used rat trap masonry bond for wall construction. Funicular shell roof, jack arch roof, and filler roof used in each project for build envelope construction describe in detail as follows:

Rat trap bond wall: Exterior walls in all three residences are constructed in rat-trap bond (Figure 3). The cavity in rat trap wall adds an advantage of thermal comfort which keeps interior space cooler in summer and warmer in winter. Different research papers also stated, that the cavity in RTB produces thermal comfort, its R-value is 0.70 m2K/M which is more than the English and Flemish bond (Ullah et al, 2018). It is also a green wall system, 25 % of bricks saved in construction so as 20% cost of the material.

Funicular roof: It is doubly curved shell made with materials which has good compressive strength such as waste stone pieces and brick tiles retrieve from construction site itself, and supported on reinforced concrete edge beams (figure 4). All three projects have a funicular roof. In Residence-1 it is constructed in the drawing room, in Residence-2 the roof is constructed in the kitchen, and in Residence-3 it is seen in entrance foyer which is enhances the aesthetics of the building. 60% less steel and 35% less cement used as compared to conventional RCC slab.

Filler roof: Filler slab roofs are solid reinforced concrete slabs with partial replacement of the concrete in the tension zone by filler material. (Figure 5) shows the ceiling of a typical filler slab roof using Brick filler. Filler slab with brick and fly ash block as a filler material used in large areas in all three residences in larger space like the lobby on the upper floor. It provides thermal effectiveness to the roof and reduces the cost as well, in this kind of roof 38% less steel and 19% less cement is used in comparison with the conventional roof system.

Jack arch roof: In residence-1, Jack Arch Roof was constructed where stair approaches the mezzanine floor. This roof is easy to construct, save on cement and steel, is more appropriate in hot climate (Figure 6).
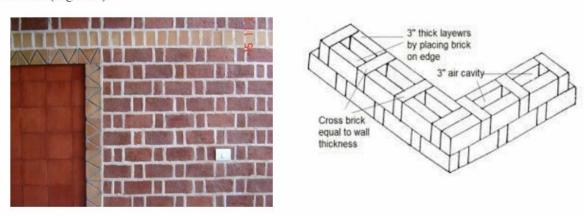
Figure 3: Wall in Rat-Trap bond, Source: Authors
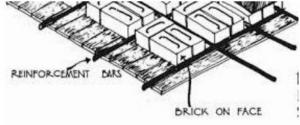
Figure 4: Filler roof slab, Source: Authors

Figure 5: Funicular roof, Source: Authors

Figure 6: Jack Arch Roof, Source Authors

7. Conclusion

A close analysis of all three residences shows that, despite having limited choice in altering orientation, shapes, and setbacks, the architect implemented the basic principles of climate-responsive design to respond to the local climate. The use of alternative construction technology for building envelope enhances the thermal performance of the building and reduces the energy requirement of the building needed to keep interior space cool during summer. The use of alternative building construction technique and material, make the building environment friendly and cost-effective. Many initiatives have been taken by the Government of India and HUDCO by setting up Nirman Kendra (Building centers) with the main objective of promoting building material and construction technology which is not only low cost but environment friendly as well. Due to lack of awareness and training, the alternate construction technique and the design approach is not very common. The three residential dwellings taken as case studies set an example, and demonstrate the durability, cost-effectiveness, and aesthetic side of alternate building construction techniques.

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Creating inclusive and sustainable public open spaces: a step towards making smart villages in India

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Abstract: The term "Smart Village" refers to a concept adopted by India's national, state, and local governments as a comprehensive rural development initiative based on Mahatma Gandhi's vision of an "ideal and self-sufficient village." It was discovered that while developing villages and rural areas in India, the design and development of public open spaces (POSs) receives the least attention. These POSs include parks, squares, riverfront areas and playgrounds. Factors such as a lack of POSs-design standards at the state or national level, a lack of funds, and a lack of user participation in the POSs design process have made POSs an undervalued or neglected subject in the Indian context. The question of how to create inclusive and sustainable POSs is always raised by planners and designers. On other side, scholars all over the world have argued that POSs play an important role in improving people's quality of life. The United Nations (UN) also promoted Sustainable Development Goal 11 (SDG 11), which advocates for inclusive and sustainable development of POSs. This study focuses on parks and examines the literature on urban planning and design. It identified comprehensive aspects such as Place-making, Sustainability, Public realm, and Management that contributes to the creation of inclusive and sustainable POSs. Based on the identified aspects, the study provides design recommendations to assist planners and designers in developing inclusive and sustainable POSs in village areas. The recommendations would not only improve planners' and designers' accountability and decision-making ability, but would also provide attractive, functional, and social, economical, and environmentally sustainable POSs in villages. This initiative contributes to sustainable rural development in order to improve people's quality of life in rural areas.

Keywords: Parks; perception; well-being; community; engagement

1. Introduction :

According to the Indian Census 2011, 830 million people live in rural areas, accounting for 69 percent of the total population. People are migrating from rural to urban areas in search of better education, employment, and business opportunities. According to the United Nations (UN) World Urbanisation Trends 2014 and Economic Survey of 2017, Indian cities will house nearly half of India's total population by 2050. This gradual increase in migration has put a strain on the city's resources, amenities, and infrastructure. These circumstances necessitated the need for inclusive and sustainable development in villages by providing essential amenities such as healthcare facilities, educational institutes, waste management, roads, sanitation, industries, and infrastructure (RADPFI, 2016; SAGY, 2021). These efforts will make the village not only "smart," but also socially,

economically, and environmentally sustainable. The term "smart" refers to improved amenities, the use of technology and innovation to increase farm, industry, and business productivity, and the provision of people with comfortable living conditions (Muralidhar and Srihari, 2015; Somwanshi et al, 2016). While developing villages and rural areas in India, it was discovered that the design and development of public open spaces (POSs) receives the least attention. Factors such as a lack of POSs-design standards at the state or national level, a lack of funds, and a lack of user participation in the POSs design process have made POSs an undervalued or neglected subject in the Indian context (Singh et al., 2010; Chaudhry et al., 2011; MoUD, 2014; Subramanian and Jana, 2018). In India, the majority of existing studies are concerned with environmental, social, and planning issues (Budruk et al., 2009; Sundaram, 2011; Nagendra et al., 2012; Sadoway and gopakumar, 2017; Bharath et al., 2018). There are fewer studies that provide insight into the character and use of POSs, particularly in the case of parks. According to Chen et al., (2020) and Peng et al., (2021) parks are one of the most preferred and popular POS for people of all ages to visit for recreation. To fill a gap in the literature, this study focuses on parks with the aim of making them inclusive, user-friendly, attractive, and functional in order to serve the various facilities at their optimum level. The study examines the literature on urban planning and design. It identified comprehensive aspects such as Place-making, Sustainability, Public realm, and Management that contributes to the creation of inclusive and sustainable POSs. Based on the identified aspects, the study provides recommendations to assist planners and designers in developing inclusive and sustainable POSs in village areas. The recommendations would not only improve planners' and designers' accountability and decision-making abilities, but they would also provide attractive, functional, and social, economical, and environmentally sustainable POSs. This initiative contributes to sustainable rural development in order to improve people's quality of life and well-being.

2. Literature review :

2.1 Defining Public Open Space (POS)

Three important words are included in the term Public Open Spaces (POSs). 'Public' is defined by the Oxford Dictionary as 'pertaining to ordinary people in society or community.' People of various ages, religions, genders, and socioeconomic backgrounds make up this community (Gehl, 2011; Mehta, 2014). Madanipour (2013) argues the term 'public' denotes a society that is shared and accessible to the general public. The second word, 'open,' refers to a natural environment with an open sky (Bosselmann et.al, 1984). The third word, 'space,' indicates a physical, three-dimensional, and accessible area (Woolley, 2003; Madanipour, 2013). Historically, public open spaces (POSs) have long been regarded as an important component of human settlement. People use POSs for recreation, wellness, and socialisation (Marcus and Francis, 1997; PPS, 2019). Scholars believe that POSs' physical, functional, and aesthetic characteristics have an impact on people, influencing their interaction, activity, and perception (Woolley, 2003; Mehta, 2014). POSs have been considered an important component in planning and design in various branches of engineering and architecture due to their unique characteristics. The characteristics of POSs that are taken into account by various fields are shown in Figure 1.

According to Carr et al., 1992 and Carmona et al., 2003, POSs are physical spaces that are typically open and accessible to the general public. Woolley (2003) provided a definition for POSs as "free spaces for people to engage in a variety of activities." According to Carr et al. (1992), POSs are "the stage on which the drama of communal life unfolds." Madanipour (2013) and PPS (2019) argued that, POSs are used to perform regular, casual, and highly anticipated public events. Other scholars such as Whyte (1980) Marcus, and Francis (1997), Amin (2008) argued POSs are outdoor gathering places where city dwellers can socialise, celebrate special occasions, engage in recreational activities, and connect with nature. According to Gehl (2011), POSs include squares, streets, walkways, and waterfront spaces. Out of these POSs, parks are the primary focus of this study. According to Chen et al., (2020) and Peng et al., (2021) parks are one of the most popular and preferred POS for people of

all ages to visit for recreational purposes. Urban and regional development plan formulation and implementation (URDPFI) suggests the definition of park as, 'A recreational/leisure facility that includes landscaping, lawns, open spaces, parking, seating arrangements, a gazebo, public washrooms, fencing, and other amenities.'
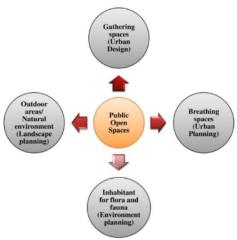
Figure 1: POSs characteristics considered by various fields

2.2 Planning dimensions and Design parameters

For the development of the aspects, the study looked at urban planning and design literature. The field of urban planning focuses on social, economic, and environment dimensions in order to achieve sophisticated and sustainable development (Nadarajah and Yamamoto, 2006; El Din et al., 2013). Scholars believe that these three dimensions are required for inclusive strategic planning. These dimensions might address the various issues that cities and people face (Mitlin and Satterthwaite, 1996). These factors frequently have a positive impact on people's living conditions and communities, indicating a high standard of living. The social dimension encourages citizens to maintain their social values. It creates an atmosphere in which people come together and interact in order to change their conversations, thoughts, and feelings. These activities contribute to the development of a socially healthy society within cities by improving social contacts, relationships, and attachment (Zhu et al., 2017). The economic dimension is concerned with making cities more economically viable. The dimension promotes job creation, business growth, and investment in order to increase economic opportunities and improve people's financial well-being (Mitlin and Satterthwaite, 1996; Zhu et al., 2017). Furthermore, the economic dimension promotes access to common facilities and services that help people reduce their living expenses. Environment protection is the third dimension, which promotes environmental protection through a variety of initiatives aimed at reducing the impact of development on nature (Goosen and Cilliers, 2020; Manzi et al., 2010). This includes environmentally responsible practices like, rainwater harvesting, use renewable energy, solid waste and wastewater management, recycling, and re-uses (Kuhlman and Farrington, 2010).

The goal of urban design is to make POSs usable, attractive, and convenient. It concentrates on the layout of the space, its appearance, user activity, human scale, and the user's attachment to the space (Wiryomartono, 2020). The study considered three design parameters, including functional, aesthetic, and user-centric, in order to establish a theoretical framework. The first, functional parameter concerns the space's ability to engage a diverse range of users in a variety of spontaneous and planned activities. It also fosters a playful environment that promotes well-being by encouraging diversity and providing basic services and facilities (Carr et al., 1992; Woolley, 2003). Scholars believe that a space's functionality determines whether or not people prefer to visit it. The second parameter, aesthetic, is concerned with creating attractive, perceptual, and rich-appearing spaces (Carmona et al., 2003). Experts recommend focusing on the aesthetic parameter, when it comes to designing spaces

that provide users with visual satisfaction (Whyte, 1980; Carr et al., 1992; Woolley, 2003). In POS design, the third parameter, user-centric, emphasises the importance of the user's needs, perceptions, behaviour, and movement patterns (Nasar, 1990; Carmona et al., 2003; Shaftoe, 2012). In order to meet the needs of users, the parameter also ensures that POSs have user-centric facilities and services (Shaftoe, 2012). Usually, users prefer to visit spaces that meet their needs (Weijs-Perree, et al., 2020).

This study considered planning dimensions such as social, economic, and environmental aspects, as well as design parameters such as functional, aesthetic, and user-centric, when developing aspects. The study proposes four aspects based on planning dimensions and design parameters: Place-making, Sustainability, Public realm, and Management. Figure 2 shows planning dimesions, design parameters and aspects considered for the study.
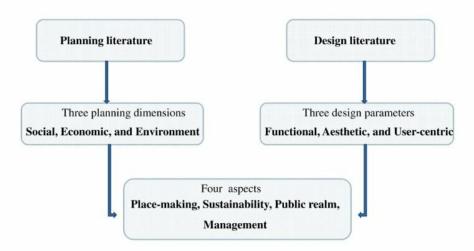
Figure 2: Planning dimensions, design parameters and aspects considered for the study

2.3 Aspects: *Place-making, Sustainability, Public realm, and Management*

According to Balsas (2004) and Corley et al. (2018), people's quality of life is directly related to the convenience offered by their surroundings. The first aspect, Place-making focuses on functional and user centric parameters and social dimension. It promotes the creation of spaces that offer users convenience and engagement through user-centric design and a variety of activities. Literature argued that user activities are influenced by temperature, sunlight, and shade (Bosselmann et al. 1984, Charkhchian and Daneshpour, 2009). These factors must be taken into account in India, where people experience three distinct seasons: summer, winter, and monsoon (Krishan, 2001; Gautam, 2008). Place-making promotes climate-responsive design by providing open and shaded areas, semi-covered seating, and shelters within POSs. These features enable users to stay in a space for an extended period of time (Carr et al., 1992; Marcus and Francis, 1997; Macdonald, 2020). Furthermore, Place-making encourages the inclusion of a variety of activities for people of all ages in order to effectively engage them in the space. Typically, the needs of the users are taken into account when planning and organising these activities. Scholars recommended both active and passive activities (Carr et al 1992; Woolley, 2003). Sports, play, exercise, and other physical activities in which users actively participate are examples of active activities. Passive activities include watching and listening to others, looking at views, resting, reading, and socialising. Scholars argued that the ability to keep a diverse range of users engaged for an extended period of time could be used to assess the success of the space (Carr et al., 1992). Figure 3 shows dimension, parameters and variables considered for the aspect 'Place-making'.

The second aspect, sustainability focuses on economic, environment dimensions and functional and user centric parameters. In terms of POSs, the aspect focuses on achieving economic and environment sustainability. Economic sustainability can be recognised by promoting adequate employment, businesses, and livelihood opportunities, as well as lowering the cost of living and health care (Sugiyama et al., 2018). According to some scholars, the ability of POS to promote nearby businesses such as shopping, hotels, street food, and other commercial activities not only helps the neighbourhood and city grow economically, but it also improves the quality of life for those who rely on these businesses. Furthermore, POS helps to lower the cost of living by providing access to community services, amenities, and recreational facilities. POS provides physical and psychological comfort, lowering health-care costs for users (Bedimo-Rung et al., 2005). Next, environment sustainability focuses on the adoption of responsible energy, water, and soil conservation practices (Mitlin and Satterthwaite, 1996; Zhu et al., 2017; Goosen and Cilliers, 2020). Environment sustainability, according to POS, encourages practices such as the use of renewable energy resources, rainwater harvesting, waste management, energy and water-efficient irrigation systems, and intelligent artificial lighting (Blowers, 2013). Environment sustainability, according to scholars, could also be achieved by promoting sustainable landscape practices such as the use of native species, xeriscaping, and the preservation of natural topography (Selman, 2008; Van and Cook, 2010). Xeriscaping is landscaping and gardening that reduces or eliminates the need for irrigation water. According to studies, Xeriscaping could be a viable alternative to various types of traditional gardening. Figure 4 shows dimension, parameters, and variables considered for the aspect 'sustainability'.
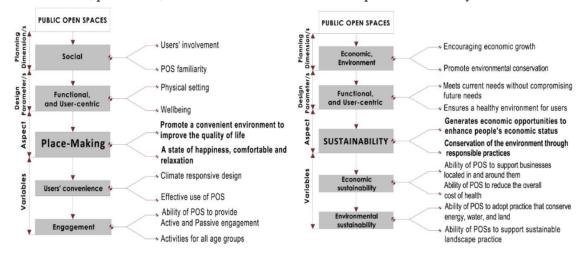
Figure 3: Aspect, Place-making   **Figure 4: Aspect, Sustainability**

Third aspect, the public realm is concerned with user-centric, functional parameters, and social dimensions. The public realm promotes a convenient, comfortable, and democratic environment in order to improve users' quality of life. When users are in a comfortable and convenient environment, they are more likely to enjoy, relax, and be stress-free. Scholars argued that a person's level of physical and psychological comfort is directly related to his or her well-being (Carmona et al., 2003; Mehta, 2014; Carmona, 2019). In this study, 'comfort' refers to a state in which space provides physical and psychological relief and meets human needs by providing convenient physical conditions, activities, and facilities (Carmona et al., 2003; Mehta, 2014; PPS.2019; Peng et al., 2021). A well-defined, barrier-free, and visible entrance, as well as wide, single-level walkways within the POS, provide physical and visual comfort to users, allowing them to use the POSs (Mensah et al., 2016; Zhou and Xu, 2020). The physical state of the space, which includes well-organized elements, rich aesthetic details, focal points and vistas, cleanliness and neatness, improves the user experience and provides visual pleasure (Vernon, 2009; Charkhchian and Daneshpour, 2009; Wood et al., 2017). These elements create a perceivable and positive image of the POS among users (Lynch, 1960; Jacobs, 1961). All of these POS features provide peace, ease, and pleasure, making them popular

among users and attracting a large footfall. Furthermore, the active and lively edges of POSs contribute to keeping users for a long time. These edges promote activities such as eating, drinking, reading, shopping, and entertainment. Encouragement of local culture and arts within POSs frequently provides a user with the opportunity to connect with other users.

Safety and security are also important factors in attracting users to POSs. Scholars argued that people preferred to visit places where they feel safe, particularly women, children, and senior citizens. A secure environment improves the public realm and gives it a distinct personality. Scholars proposed some methods for achieving safety within POSs. Shaftoe (2012) and Oc and Tiesdel (1997) advocated for a 'Panoptic approach,' which includes security guards and CCTV systems in POSs. Furthermore, Marcus and Francis (1997) and Lang and Marshall (2016) proposed 'passive control,' which includes the display of written or symbolic instructions to prevent unwanted behaviour and activities. Scholars such as Carr et al (1992) and Carmona et al (2003) proposed using a regulatory approach with explicit rules and spatial regulations. Shaftoe (2012) and Jacobs (1961) advocated for 'eyes on space,' or natural surveillance by space users and adjacent neighbourhood residents. Figure 5 shows dimension, parameters and variables considered for the aspect 'Public realm.

Aspect fourth aspect, 'Management' is connected with the user-centric, functional parameters as well as social and environmental dimensions. Management promotes the creation of inclusive spaces that foster a sense of belonging, equitable gathering, and discussion (Holland et al., 2007). These spaces provide equal access to all users regardless of age, gender, religion, or socioeconomic background (Moulay et al., 2017). Such feature contributes to positive interactions and social sustainability. Such a feature promotes positive interactions and social sustainability. The aspect also ensures that basic facilities such as drinking water, clean washrooms, and first aid are available within the space. Furthermore, it encourages keeping the space neat and clean. Carr et al. (1992) suggested a 'responsible freedom,' which means that a person can use POS as he or she wishes, but with the understanding that POS is a public and shared space. According to Zamanifard et al. (2019), a user should use a space in such a way that he or she does not threaten or compromise the similar rights of others. Carmona (2019) and PPS (2019) argued that users should treat POS as national property, avoid vandalism and littering, and keep the space peaceful. Figure 6 shows dimension, parameters and variables considered for the aspect 'Management'.
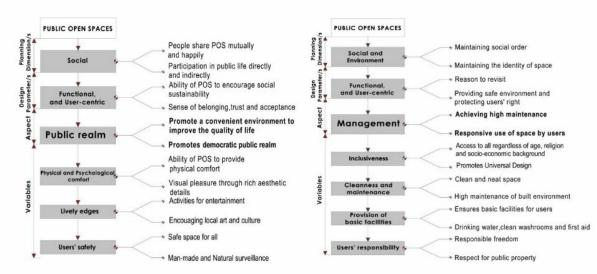
Figure 5: Aspect, Public realm　　　　**Figure 6: Aspect, Management**

3. Design recommendations for improving the character and usability of POSs

The study makes design recommendations for improving the character and usability of POSs based on a review of the literature. These recommendations will assist planners, designers, and government agencies in developing inclusive and sophisticated POSs in rural areas.

Accessibility
i.   The POS should provide equal access to all users. It should connect to adjoining neighbourhoods via a pedestrian network. Walkways (footpaths) should be wide, single-level, and barrier-free to encourage people to walk to POSs.
ii. The main entrance to the POS should be welcoming, appealing, and free of obstacles. The entrance, walkways, furniture, seating arrangements, and subareas should be designed in accordance with 'Universal Design Principles' so that people with physical and visual disabilities can easily access and use the POSs.

Design, Activities, and aesthetic
i.   The POS should be designed to be climate-responsive. It should have open/shaded areas, a mix of open, shaded, and covered seating arrangements, and walkways that allow users to enjoy the space throughout the seasons.
ii.   POS should be adaptable to meet the needs of the local community. When determining and assigning POS activities, all age groups of users, such as children, young people, middle-aged people, and senior citizens, must be taken into account. POS design should accommodate both active and passive activities.
iii. A variety of social programmes and events must be organised at the neighbourhood level through POSs. These programmes and events should allow locals to interact, participate in healthy debates, and share their experiences. Programs that promote local culture and art should be prioritised. Furthermore, the edges of POSs should be active and vibrant, encouraging shopping, eating, and entertainment.
iv.   The furniture, landscaping, signs, sculpture, fountains, lighting, and other details in the space should be of high quality and visually appealing.

Basic facilities and Users' 'rights'
i.   The parental authority should provide basic amenities like drinking water, clean washrooms, and first aid within the POSs. POSs should have dedicated washroom for wheelchair and visually impaired users. Furthermore, keep the POS clean, neat, and well-maintained.
ii. The authority should promote and protect the "rights" of users. Users' privacy should be respected, and they should be free to roam, take photos, relax, and interact with others.

Sustainable Practices
i.   POS must integrate sustainable methods such as renewable energy, rainwater harvesting, solid waste and waste water management, energy and water efficient irrigation systems, and intelligent artificial lighting. These are requirements for the twenty-first century.
ii. It is also essential to reduce turf areas while encouraging xeriscaping and native vegetation. It lowers the amount of water needed. Furthermore, to prevent soil erosion, restoration of the site's natural topography should be encouraged.

Evaluation, Design standard and Policy framework
i.   Existing POSs should be evaluated with users at a neighborhood and site scale to see if they fulfill their needs. The evaluation would assist in determining what users expect from POSs. Furthermore, it would help designers and planners create a design initiative to improve the functionality and aesthetics of existing POSs. For evaluation, the authority may request input from architecture institutes, design specialists, and non-government organisations (NGOs).

   ii.   A 'POS design standard' must be developed at the state or national level with the help of experts such as urban designers, planners, landscape architects, climatologists, sociologists, horticulture experts, institutions such as the Indian Green Building Council (IGBC) or the Green Rating for Integrated Habitat Assessment (GRIHA), and relevant non-governmental organisations (NGOs). These professionals will provide advice on a wide range of topics, including function, facilities, services, aesthetics, maintenance, and socioeconomic factors. This effort will help cities build sophisticated and comprehensive POS networks. In India, this is a critical requirement.

   iii.   Policies should be developed to support POS planning and design while also promoting inclusiveness. These policies should be adaptable to the needs of city dwellers, assisting in the advancement of modern lifestyle and well-being. Furthermore, these policies should promote long-term social, economic, and environmental sustainability. It is also necessary to have a simple and easy strategy for putting the policies into effect.

4. Conclusion

According to the literature, POSs are viewed as a recreational element by people of all ages and socioeconomic backgrounds. Children would like to play safely here, young people would like to mingle with friends and participate in active activities, and the elderly would like to relax and find peace. The purpose of this research is to identify comprehensive aspects of POSs that will make them inclusive and sustainable. Planners, designers, and government agencies must all focus on improving POS activities, appearance, and services. It would make POSs more inclusive, sustainable, and beneficial to people's well-being. These inclusive POSs will be able to meet user needs while also being socially, economically, and environmentally sustainable, representing villages on a national scale, creating an identity, and making them smart. Such an initiative would not only promote integrated rural development but would also have a positive impact on people's quality of life. Future research could use the data from this study to create an index that can be used to evaluate existing POSs in rural areas. This evaluation would show how existing POSs are performing and whether they are meeting the needs of local users.

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ROLE OF OPENINGS IN DIFFERENT CLIMATIC ZONES IN THE VIEW OF SUSTAINABILITY

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Abstract: Openings such as windows allow natural light and ventilation into the structure. Doors are designed to provide entry and exit in the building. The openings play a vital role in thermally insulating the structure and they connect the building and the environment. The aim of the research is to study the role of the openings in different climatic zones to make the building sustainable. The objectives include to study sustainable Architecture Principles, to collect information about the planning strategies in climatic zones, to study case studies of different climatic zones. The case studies are based on the following parameters that is location, orientation, size, number of openings, material, height of the openings in different climatic zones. According to the climatic zones the ratios and proportions vary. Research is useful to the architects, students, and designers which will give a great approach to design the opening in the sustainable point of view in the different climatic zones.

Keywords: Sustainable Architecture, Sustainable Architecture Principles, Climatic Zones

1.Introduction :

Openings play a very important role in different climatic zones and for people living in these climatic zones to save energy into the structure in the form of natural ventilation into the structure considering sustainability. Interests in the sustainability and climate and comfort of the humans into the structure.

Literature-1 The basic principles of sustainable Architecture The sustainable Architecture is Creating and responsibly sustaining healthy environment, responding to ecological need, making optimal use of energy without overexploitation of natural resources.

Literature-2: Understanding Climate for Sustainable Building Design –A Case Study in Warm Humid Region in India. Understanding climate for energy efficiency or sustainable architecture. The paper identifies options of integrated climatic considerations as an integral part of planning and building design taking the case study of Tiruchirappalli, India.

Literature-3 Investigating Sustainability in hot and dry climate- courtyard houses in Iran. Parameters of central courtyard houses such as orientation, scale, proportion, courtyard components, and material were compared.

All of them focused on design principles of the building as a whole and not the openings particularly in their research. It is important to the designers to know the role of the openings in the building in the climatic zones of India so that they implement it into their design and which will save the energy into the building.

2.Aim: To study the role of openings in different climatic zones to make the building sustainable.

3.Objectives:

1. To study sustainable Architecture Principles.

2. To collect information about the planning strategies in climatic zones in India.

3. To study different climatic zones case study and analyze it.

4.Need of the Topic
- The researchers had not thought about the materials, the sizes, the orientation of the opening in the particular climatic zones of India considering sustainability.
- They studied on the how the shading devices can be done in particular climate but not on the heights of the orientation and sizes of the openings according to sustainability.
- Research is useful to the architects which will give a great approach to them in the sustainable point of view to design the opening in the different climatic zones of India

5.Scope:

- The purpose of the research is to identify the openings in different climatic zones of India considering sustainability.
- Studying on the 5 climatic zones of the India in 5 different cities of India.
- The location, orientation, size, material, height of the openings in 5 climatic zones of India.

6.Limitations:

- It deals with the study of a single building in a city not all the cities or states under the particular climatic zones.
- It deals with the old structure in the particular climatic zones.
- Research deals with only two components of sustainable architecture that is energy saving into the structure, thermal comfort into the structure and climate responsive openings.

7.Methodology:

- Studying structures of Hot and dry climate, Hot and humid climate, Composite Climate, Temperate Climate, Cold climate
- Case study of structure in each climate
- Analysis of case studies

Wherever possible try to ensure that the size of the text in your figures (apart from superscripts/subscripts) is approximately the same size as the main text (12 points).

Sr. No	Parameters of Openings	Climate Zones of India				
		Hot and dry Jaisalmer, Rajasthan	**Hot and humid** Thuckalay Tamil Nādu	**Composite** Gual Pahari Gurgaon ,Delhi	**Temperate** Bangalore Karnataka	**Cold** Leh, Himachal Pradesh
1	**Introduction**	This Haveli was commissioned to serve as the residence of Diwan Mohata Nathmal, the PM of Jaisalmer. Its Architecture and miniature is very famous	Padmanabhapuram is a town and was the erstwhile capital of the kingdom of Travancore, ruled by the king Rama Verma and the palace antiques, Armory, wood work is very famous	The building is a one among the 3 building complexes and is residential block	It is a research institute that specializes in the fields of energy, environment and sustainable development.	The house was built for Babu Dorje and his family. Mr. Dorje was the engineer behind the construction of the airport of Leh in 1948
2	**Structure Name**	Nathmalji-ki-haveli. Year-1885A.D. Architects-Hathi and lulu	Padmanabhapuram palace. Year-1601 C. E	Guest House of Solar energy center. Year-1988	Energy research Institute Year-2001	Dorje House Year-Early 1900's
3	**Orientation of opening**	East-west	North-south	North-west	North-east	South
4	**Sizes of openings**	Inlet-large Outlet-small	Large -lower level, small at higher level	Large arch window	Normal size opening	Small openings
5	**Heights of opening**	Low door height More sill heights	0.6m max sill level	Normal 2.1m-doors and no sill to external windows.	sill 0.9m from floor 2.1m-doors	sill 0.9m from floor 2.1m-doors
6	**Number of openings**	Window-75 Door-40 Courtyard-2	Window-300 Door-125 Courtyard-6	Window-25 Door-20	Window-20 Door-30	Window-8 Door-10

7	Types of opening	Jali Window, Doors, Courtyards	Windows Doors Courtyards	Large Windows, Doors	Windows doors	Windows Doors
8	Plans of the structures					
9	Material of opening	Yellow sand stone	Hard wood panel with colored mica	Aluminum panel	Aluminum panel	Wooden panel
10	Inference	The traditional architecture has the sustainable architecture principles dwelled into it. The courtyard is the main element seen. The Nath-mal-li-ka-mahal in Jaisalmer is energy efficient. The Number of openings are more at the short side of the structure. The sizes and the heights differ according to the climatic factor to achieve thermal comfort into the structure. Ratio-1:0.20	The Padmanabhapuram palace in Tamil Nādu saves energy into the structure as it has proper openings according to the climatic conditions. The traditional architecture has the sustainable architecture principles dwelled into it. The courtyard is the main element seen.. The sizes and the heights differ according to the climatic factor to achieve thermal comfort into the structure. Ratio-1:0.20	The Guest house in Delhi has large openings windows which circulate air into structure and is energy saving building with maintaining thermal comfort. The sizes and the heights differ according to the climatic factor to achieve thermal comfort into the structure. Ratio-1:0.17	The energy research institute (TERI) is a sustainable building which saves energy and the openings are in n-e direction and ventilation by solar chimneys. Ratio-1:0.18	The Dorje house has small openings from south street and the warmth in the structure is maintained as it is traditionally constructed house and the openings into the structure circulate adequate air into the structure and achieves thermal comfort into the structure. The materials are very keenly used according the climatic condition. The sizes and the heights differ according to the climatic factor to achieve thermal comfort into the structure. Ratio-1:0.1

9.Conclusion:

- The openings play a very important role in thermally comforting the structure. The traditional architecture has the sustainable architecture principles dwelled into it.
- The courtyard is the main element seen in most of the structures of the different climate zones of India.
- It is Investigated that the openings are orientated in such a way that it saves the energy into the structure and also increase thermal capacity into the structure which is one of the sustainability principles.
- The ratio and proportions vary according to the climatic conditions.
- The materials are very keenly used according the climatic condition.
- The sizes and the heights differ according to the climatic factor to achieve thermal comfort into the structure.

10.Reference:

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Comparative analysis of various methods used for mapping carbon footprint of a region

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Abstract: The term 'carbon footprint' is now been widely used by organizations, companies, regions, cities and nations. With climate change high up on global, political and corporate agenda, carbon footprint calculations are gaining considerable importance and have become one of the important environmental aspects of regional planning. For estimating carbon footprint different tools are being used ranging from basic online calculators to more scientific methodologies such as life-cycle analysis and input-output based methods. However it has been observed from literature review, that while estimating carbon footprint the basic terminology is generically interpreted depending on various factors such as intent of estimation, data availability, scale of the entity etc. Large variations in the spectrum of the terminology interpretation ranges from direct carbon dioxide (CO2) emissions to full life-cycle greenhouse gas (GHG) emissions. There is also variation in the unit in which carbon footprint is expressed for various entities. This paper comparatively analyses the methodologies used in carbon footprint mapping of three cities as case studies and critically reviews the variation in protocols regarding the mapping approach, type of emissions, unit of measurement, emission sources, potential gases and system boundaries under consideration. It finally concludes into suggestive approach for devising a methodology for mapping carbon footprint of an administrative ward level of a region in Indian context.

Keywords:carbon footprint, greenhouse gas emissions, life-cycle analysis, regional planning, administrative ward.

1. Introduction:

Recognizing the global reach of Green House Gas (GHG) pollutants, more than 160 countries have signed the Kyoto protocol , which pledges GHG emissions reductions of at least 5% relative to 1990 levels. (Ramaswami 2008). Green house gas emissions are result of day today human activities that are mainly influenced by lifestyles, choice of technologies, choice of products made and technologies chosen for their production. Polulation in any region is responsible for multidisciplinary activities at various sectoral levels. The activities are largely interlinked as well as linked with the activities taking place outside the geopolitical boundaries, but are responsible for GHG emissions for the needs of the region. Hence if GHG mitigation measures are to be implemented, measuring these emissions becomes important at regional level. It is observed from literature review, that there is a large variation in the definitions used for the term carbon footprint by various companies, organizations, NGO's, consultancies, businesses and city level inventories. The definition mainly is driven by the goal for which carbon footprint quantification is to be done. Data availability and scale of the entity are other governing factors. Accordingy the protocols for various studies are observed to be devised in terms of type of emissions, unit of measurement, emission sources, potential gases and system boundaries under consideration. There is no commonly accepted standard or protocol that is followed globally when it comes to carbon footprint mapping of a region. Decisions taken with respect to the above parameters become more difficult when it comes to the measurement of carbon footprint of larger scale entity like a region with an urban development. Considering development pattern and administrative structure of civic bodies in India, if carbon foot printing is done at an administrative

ward level, it would be possible to focus and handle the issue locally and hence more efficiently because local authorities can motivate and influence the wider community into action by better understanding local circumstances and priorities. Thus this paper discusses the methods used for city level carbon footprint mapping and concludes into suggestive approach for devising a methodology for mapping carbon footprint of an administrative ward level of a region in Indian context.

1. Methodology :

The paper adopts literature review methodology. Carbon footprint mapping studies for three cities viz. London, Denver and Pune have been critically reviewed. Comparative discussion is done with respect to various parameters like intent of the study, scale of the entity under consideration,type of emissions, unit of measurement, emission sources, potential gases, system boundaries and approach methodology. All the above four selected cases differ in the approaches taken and hence provide a fair basis for critical review of the methodologies used to map the carbon footprints under various relevant parameters. This area is not much explored in Indian context. The sources of information for the three cases are as follows:

i)Carbon footprint of City of London by URS Corporation Ltd., London (URS Corporation Ltd. 2009), ii)Carbon footprint of Pune City by Pune Municipal Corporation in conjunction with TERI(TERI 2009-10), iii) Carbon footprint of City of Denver, Colorado (Ramaswami may 2007)

2.'Carbon Footprint' – Definition

For devising a methodology for calculating carbon footprint of the entity comprehensive understanding of the term'carbon footprint'is essential as it will further facilitate to develop protocols for measurement of emissions related to different parameters with respect to the intent of calculation.Definition of carbon footprint proposed by Wiedmann and Jan Minx in ISAUK Research Report 07-01, titled 'A Definition of Carbon Footprint' is as follows: "The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product." While considering a regional level carbon footprint, however there could be inclusion of other potential green house gases alongwith carbon dioxide from various sources. Hence more comprehensive interpretation of the basic definition could be considered as follows : "The carbon footprint is a measure of the exclusive total amount of green house gases (GHG) emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product." This includes activities of individuals, populations, governments, companies, organisations, processes, industry sectors etc. Products include goods and services. All direct (on-site, internal) and indirect emissions (off-site, external, embodied, upstream, downstream) need to be taken into account in order to achieve reduction of GHG emissions at regional level.

2.1 Approaches used for measuring carbon footprint

The task of calculating carbon footprints can be approached methodologically from two different directions: bottom-up, based on Process Analysis (PA) or top-down, based on Environmental Input-Output (EIO) analysis. (Thomas Wiedmann and Jan Minx 2007). The method of choice often depends on the purpose of the calculations and the availability of data and resources.

Amongst the three cases under consideration, carbon footprinting of London and Pune city has been done by taking top-down approach that utilizes Environmental Input- Output analysis. Fuel data from stationary and mobile fuel combustion from various activities taking place in different sectors is obtained and converted into green house gas emissions. Fuel-based method recommended in tier 2 approach outlined in IPCC guidelines for National Greenhouse Gas Inventories 2006 is adapted that estimates $CO2$ based on the total carbon content of fuel combusted, irrespective of the technologies used for combustion using local (country-specific) emission factors. Athough one of the big advantage of input-output based approaches is a much smaller requirement of time and manpower once the model is in place, its completeness comes at the expense of detailing. The suitability of

environmental input-output analysis to assess micro systems such as products or processes is limited, as it assumes homogeneity of prices, outputs and their carbon emissions at the sector level. Although sectors can be disaggregated for further analysis, bringing it closer to a micro system, this possibility is limited, at least on a larger scale (Thomas Wiedmann and Jan Minx 2007).In a region there could be a pool of materials and products those are significantly responsible for indirect, embodied emissions and need to be acted upon. The other bottom-up, based on Process Analysis (PA) approach helps to understad the environmental impacts of individual products from cradle to grave. Process analysis has clear advantages for looking at micro systems: a particular process, an individual product or a relatively small group of individual products. (Thomas Wiedmann and Jan Minx 2007).But this may suffer a system boundary problem - only on-site, most first-order, and some second-order impacts are considered (Lenzen 2001). Further there is a difficulty in applying this approach for larger entities like cities or regions because, even though estimates can be derived from information contained in life-cycle databases, results will not be accurate as these procedures usually require the assumption that a subset of individual products are representative for a larger product grouping and the use of information from different databases, which are usually not consistent (Jansen, Tukker 2006).

Carbon footprint of City of Denver, Colorado takes more comprehensive hybrid approach that combines strength of both environmental input output and process analysis approach through integration.It tries to understand Denver's GHG footprint with respect to the flows of materials and energy in and out of the city, by viewing the city as a demand center for material and energy. In addition to the emissions form direct energy use, this method, covers end of life GHG impacts associated with wastes supplementing the standard ICLEI method with life cycle GHG emissions associated with producing certain critical urban materials (such as concrete, food, water and fuel). This approach is recommended by the World Resource Institute (WRI).

Table 1 : Comparative chart of carbon foot printing methodologies

Case	London	Pune	Denver
Information source	URS Corporation Ltd (2008), London	ESR 2009-10, Pune, Report by TERI	The Urban Sustainable Infrastructure Engineering Project, (2007), Department of Civil Engineering, University of Colorado Denver
Study Aim	To identify most carbon intensive activities within a square mile. To compare residential and commercial carbon footprints for UK's major local authority areas.	To understand its current emission patterns	To understand Denver's GHG footprint with respect to the flows of materials and energy in and out of the city.
Unit of analysis	Square Mile - City of London	Pune Municipal Corporation area	City and County of Denver
Approach	Top-down	Top-down	Top-down and Bottom-up
Methodology	Environment Input-Output	Environment Input-Output	Hybrid EIO and PA
System boundaries	Sources of direct, indirect emissions within the boundaries of city limits	Sources of direct and indirect emissions within the boundaries of municipal limits	Sources of direct, indirect and embodied emissions within and outside the city boundaries

Scope	Scope I, Scope II	Scope I	Scope I, Scope II, Scope III
Emission sources	Scope I - direct emissions from combustion of fuels and Scope II - indirect emissions from use of electricity consumption in buildings and energy usage for treatment of water in the city	Scope I - direct emissions from combustion of fuels and direct emissions from municipal waste disposal sites and sewage transport by pipelines within the city.	Scope I - direct emissions from combustion of fuels Scope II - indirect emissions from use of electricity consumption in buildings and energy usage for treatment of water in the city and scope III - embodied emissions in key urban materials and food packaging.
Activities included	Primary energy consumption in building usage for gas, electricity, non-transport petroleum, water and CHP heat consumption	Energy consumption in residential, commercial, institutional, industrial and construction, transportation, utilities, municipal sewage disposal and transport services.	Personal transport, personal materials, personal material use, personal home energy use, community-wide goods and services.
Gases	Only CO_2	CO_2, CH_4	CO_2, CH_4, N_2O
Estimation method	Fuel based method, irrespective of technology used for combustion.	Fuel based method, irrespective of technology used for combustion.	Fuel based method with consideration of tail pipe emissions and material embodied energies
Estimation period	One calendar year	One calendar year	One calendar year
Unit of expression	(tCO_2) per annum, (tCO_2) per resident (tCO_2) per unit of commercial floor space	(tCO_2) per annum on sector basis	(tCO_2) per annum on sector basis (tCO_2) per annum on per capita basis

2.2 Protocol on Scopes and System Boundaries of GHG emissions

It is important for the concept of 'carbon footprint' to be all-encompassing and to include all possible causes that give rise to carbon emissions, irrespective of any physical or geopolitical boundaries of the entities under consideration for completeness. In order to avoid possibility of double counting the sources of emissions are classified into three categories by the World Resources Institute and World Business Council for Sustainable Development (WRI/WBCSD 2004) Corporate Accounting and Reporting Standards (often called the GHG Protocol). Scope 1 emissions: Direct emissions resulting from the combustion of fossil fuels in the equipment's or vehicles. Scope 2 emissions: Indirect emissions from electricity consumption associated with the generation of greenhouse gas emissions at a power plant. Scope 3 emissions: Indirect and embodied emissions associated with equipment's not owned or controlled by the organization e.g. commuting, business travel, waste production and the

production of purchased materials.While accounting for indirect emissions, methodologies need to be applied that avoid under-counting as well as double-counting of emissions, therefore the word 'exclusive' in the definition. (Thomas Wiedmann and Jan Minx 2007) .

In case of London city, sources of direct and indirect emissions only within the boundaries of the city were taken into consideration (Fig 1). The study included only scope I and scope II emissions. Scope I emissions included direct CO_2 emissions from combustion of fuels for building usage in domestic and commercial sector. Direct emissions from public transportation, transportation of goods and services and through traffic are not considered. Scope II emissions included indirect CO_2 emissions from use of electricity in the buildings and energy usage for treatment of water within the city. There was no consideration for emissions resulting from manufacture of goods and consumables used in the city, waste disposal and treatment. The study excluded scope III embodied emissions from any of the activities. Further the methodology ignored the indirect upstream emissions of materials for example, cement, water, transportation of fuels and food which are used intensively in all cities but are typically produced outside city boundaries.

Carbon footprint study of Pune city considered only scope I direct GHG emissions resulting from combustion of fossil fuels in all urban activities within the city limits including transportation. Also direct emissions from municipal waste disposal sites and sewage transport by pipelines within the city were included. (TERI 2009-10). It excluded any indirect emissions resulting from electricity usage in building facilities within the city that take place at power plants located outside the city. Furthermore embodied carbon in goods and services was not included in the inventory.

Protocol taken on consideration of only scope I and II emissions for a region, as in case of Londonand Pune is useful for getting comparative picture of fuel combustions in various sectors, but it does not include indirect emissions resulting from electricity usage in building facilities in all sectors. It excludes scope III embodied emissions from any of the activities. Further the methodology has also ignored the indirect upstream emissions of materials for example, cement, water, transportation of fuels and food which are used intensively in all cities but are typically produced outside city boundaries. Thus, there will not be a comprehensive understanding of actual energy usage and associated GHG emissions within the city.
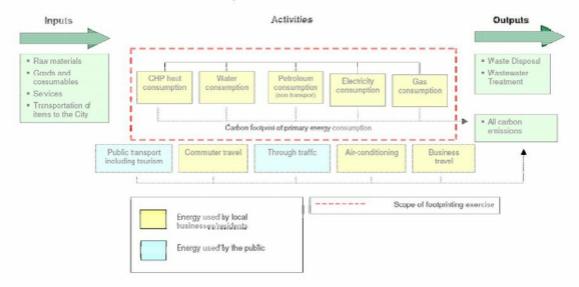
Figure 1 : Scoping for measurement of carbon footprint of City of London
Source : URS Analysis December 2008.

The study of Denver included direct and indirect emissions under following 3 categories :
i) Direct (end-use) energy consumed in buildings and facilities, located within city boundaries.
ii)Direct (tailpipe) emissions associated with transportation of people and goods to and from the city

iii) Indirect emissions associated with the embodied energy of key urban materials as well as end-of-life of wastes (e.g., landfill).
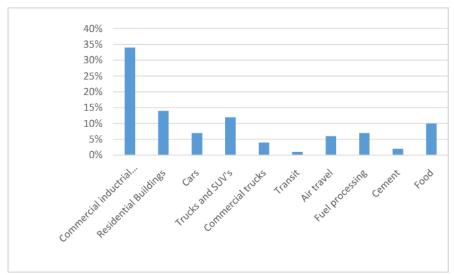
Figure 2 : Denver's GHG emissions summary by activity in 2005
Source : Green House Gas Inventory for the City and County of Denver

Scope III emissions for marked sectors are not included in the previous two cases (Fig. 2).

In the previous two cases of measuring carbon footprint GHG accounting for individual cities was confounded by geopolitical boundaries. It did not considered the impacts of material and energy flows into the city and outside the city that are demanded within the city. Denver GHG inventory has used demand-centered hybrid LCA-based inventory methodology by viewing a city not merely as a bounded plot of a land, but as demand center for energy and materials.

2.3 Protocol on greenhouse gases to be considered in carbon footprint estimation.

The greenhouse gases that should be quantified and included in carbon footprint are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), PFCs (perfluorocarbons), HFCs (hydrofluorocarbons) and SF_6 (sulphur hexafluoride). All these gases are potentially responsible for global warming. However, many of those are either not based on carbon or are more difficult to quantify because of data availability constraints. (IPCC Guidelines 2006) . Protocol is to be developed depending upon the significant sources of emissions and data availability. For example, in most cases the emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from fossil fuel combustion, electricity generation, waste disposal and wastewater will be the most significant sources of greenhouse gas emissions in community and government operations inventories.

In case of London city only carbon dioxide (CO_2) emissions had been considered. The inventory for Pune included CH_4 emissions from municipal waste disposal sites and sewage transport by pipelines alongwith CO_2 emissions whereas Denver inventory covered the three major GHG contributors that are primarily associated with energy use and wastes: carbon dioxide (CO_2), methane (CH_4) and nitrogen oxides (N_2O).For considering carbon footprint of a region, it is first essential to prepare a comprehensive list of all the activities which will contribute to the emissions within the selected boundary. Protocol needs to be taken on prioritizing the sources of emissions depending on their contribution and significance for the actions planned. Also global warming potential of the gases should be considered since in certain cases even if the quantum of emission from certain activity seems to be smaller the global warming potential of the gas emitted might be higher creating significant impact and hence shouldn't be ignored.For example, nitrous oxide is 310 times more potent than carbon dioxide as a global warming gas. Therefore, one unit of N_2O is equivalent to 310 units CO_2 equivalents.

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2.4 Unit of expressing carbon footprint

Carbon footprint is often expressed as an area-based indicator by converting it to an area unit such as ha, m², km² etc. In some cases it is expressed as an unit-based indicator by converting it to units such as 'per capita', 'per household' (Jackson 2010)etc. The 'total amount' of carbon dioxide (CO2) is physically measured in mass units (kg, t, etc.) (Thomas Wiedmann and Jan Minx 2007). The conversion would have to be based on the aim of the study and the outcomes expected to reduce errors. Accuracy increases with appropriate sampling and calculation method. For example When it comes to the share of emissions by energy consumption by households of varying income groups, energy consumption varies considerably depending on lifestyles. Hence, appropriate sampling from each income group will increase the accuracy of calculations.

Measurement of carbon footprint of the city of London was done with the aim of identifying the most carbon intensive activities within the Square Mile. It was also aimed atcomparing residential and commercial carbon footprints for UK's major authority areas. So, the overall carbon footprint of the city was expressed in tones of carbon dioxide (tCO2) per annum. The residential carbon footprint was expressed in terms of tCO2 per resident while commercial carbon footprint is expressed in terms of tCO2 per meter of floor space.

Carbon foot printing study of Pune city as per TERI 2009-2010 was aimed at understanding its current pattern of emitting carbon emissions, in order to plan specific strategies/interventions to reduce the same. The outcome was aimed at calculating total carbon footprint of the city and its breakdown across various sectors. So the unit of expression was (tCO2) per annumacross emission levels by various sectors under consideration viz. residential and commercial (Table 1)
GHG emission inventory was carried out for the City and County of Denver, United States, aimed at understanding Denver's GHG footprint with respect to the flows of materials and energy in and out of the city. The outcome presented total carbon footprint of the City and County of Denver with trends of GHG emissions in each sector from 1990 to 2005, trends per capita, and trends by fuel type and GHG distribution by building sectors. (Fig 4). The results were expressed on total sector wise as well as a per-capita basis allowing private citizens to better understand their personal GHG impact.(Ramaswami may 2007).

When carbon footprint is expressed as per capita at national level, for countries like India, where large chunk of population lives in rural areas with comparatively less share of total national energy consumption carbon footprint measurement could be interpreted wrongly. For this reason, unnecessary conversions should be avoided and attempt should be made to express the carbon footprint in more accurate way, in tons of   carbon dioxide. Protocols for conversions should be developed depending on the data availability and the level of detail required for the actions planned.

2.5 Period to be considered while expressing carbon footprint

As observed in all the case under consideration, it is better to express carbon footprint on yearly basis because it should comprise of all the emissions occurring during a selected calendar year. There is considerable variation in the patterns of energy use especially in building facilities due to seasonal variations during the year. For example, energy use for space heating and cooling in buildings increases during winter and summer seasons. Equipment's used for these purposes contribute to the emissions caused by electricity consumption in large commercial spaces to a great extent. Also when it comes to the availability of data, where government operations records are available only on a fiscal year basis, efforts should be made to categorize emissions sources on a calendar year basis because the base year for the UNFCC and subsequent Kyoto Protocol is calendar year 1990 establishing benchmark for reduction.

3   Conclusion

After critically reviewing the methodologies used for carbon footprint mapping for the cities of London, Pune and Denver following conclusions can be drawn, if an appropriate methodology is to be devised for carbon footprint mapping of a region in an Indian context.

1. The scale of mapping in case of Indian context can be an administrative ward, as considering development pattern and administrative structure of civic bodies in India, if carbon foot printing is done at an administrative ward level, it would be possible to focus and handle the issue locally and hence more efficiently because local authorities can motivate and influence the wider community into action by better understanding local circumstances and priorities.
2. The aim of the study should be identifying all the potential sources of GHG emissions those are impacting emission levels of the region irrespective of the location of emission sources. This will enable targeted actions for curbing emissions of the region under consideration.
3. Adoption of hybrid approach with application of top-down and bottom-up approach would be helpful for comprehensive study. Completeness of both the approaches could be achieved by developing a model that will consciously strive to overcome limitations of individual approaches.
4. As a region under consideration can be a demand centre for various emission intensive materials, scope III, embodied emissions due to these material usages in the region should not be excluded from the study as it will help strategize the usage of such materials within the region.
5. While taking protocol on gases to be considered for quantification of carbon footprint of a region, it is first essential to prepare a comprehensive list of all the activities which will contribute to the emissions within the selected boundary. Protocol needs to be taken on prioritizing the sources of emissions depending on their contribution and significance for the actions planned. Also global warming potential of the gases should be considered.
6. It is convenient to consider a calendar year to map and express the carbon foot printing study outcomes for a region from data sources availability and eliminating double counting.
7. Protocol on unit of expression of carbon footprint need to be taken based on regional characteristics such as varying age groups, economic conditions, peoples lifestyles etc. instead of going into the

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Importance Of '*Nisarga Sanskara*' In Formative Years Of School

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Abstract: This paper performs the comparative analysis among the students from alternative schools and regular schools. The study investigated the level difference of nature awareness in these two types of schools.

Literature review was done to find out the parameters of nature awareness. The Interviews with the teachers were conducted to find out the philosophy of these two types of schools and the Questionnaire survey method was adopted. Total 86 students from alternative and regular schools were selected from simple random sampling.

The results show the significant difference in their level of nature awareness. It can be concluded that the education given with the nature experience can create the more nature awareness and attachment among the child and this may leads one step forward to save our mother earth.

We need to bridge the gap between regular education type and nature based education type to imbibe the nature awareness from childhood itself.

Keywords: Nature awareness, alternative school, regular school, school philosophy, Child.

1. Introduction:

Shree Rabindranath Tagore, the world famous Indian Poet, writer and philosopher has emphasized on education in the nature and through the experiences in the nature.

Tagore insisted that the education should be imparted in an atmosphere of nature with all its beauty, colour, sounds, forms, and such other manifestation.

In His opinion, education in natural surrounding develops education must enable a person to realise his/her immediate relationship with the nature. He also emphasized that the intimacy with the world and power to communicate with the nature.

India is richly biodiverse country in the world. So our Education, Agriculture, Business, Works should be coherent with it. From the past few years we are constantly exploiting nature with our elevating needs due to urbanisation.

'Nature based education will surely give us the Brighter Future.' *Mr.Prakash Gole,Ecological Society.'*

2. Need of the Topic:

However, there is a huge lack in awareness regarding nature and its conservation in our Country. Human wellbeing is completely dependent on Nature's prosperity. It is very much needful to make people aware about nature, its conservation and eco-friendly lifestyle. *' Nisarga Sanskara'* should be done in human life from the childhood itself.

Our regular teaching methodology talks much on the human and economic growth through urbanisation but highlights it's very less impact on the nature. The awareness may create among kids through education; via observations and activities in the nature. Such type of outdoor education should start from the schools itself so the children will interact with the nature and may start to take the interest from their young age. Through such nature based school activities the child will be introduced with the surrounding nature, natural resources, biodiversity, and this will eventually create the awareness about nature conservation. The child will develop a bond with nature and grow with the deeper understanding of environment around him/her. The child may learn to live by giving minimum stress on nature and natural resources by using alternative sources.

This will change the behaviour and attitude of kids towards the nature. Also, this will help students to learn about the issues that will enhance their abilities to make the decisions.The Outdoor experiences have the potential to impact students in both cognitive and affective domains. (Crompton and Seller, 1981)

3. Aim and Objective:

3.1 Aim:
The research paper aims to Study and analyse the need of nature awareness in the students from regular schools and alternative schools at urban & regional level.

3.2 Objective:
1. To understand the teaching Philosophy of alternative schools and regular schools.
2. To analyse and understand the ways of nature awareness among students.
3. To understanding the parameters of nature awareness.
4. To offer a few suggestions in regular schools to improve the nature awareness factors among kids.

4. Methodology:
The study is based on primary and secondary source of the data.
1. Primary source of data is collected through the interviews with school teachers and principals of alternative and regular schools to understand the teaching philosophy.
The samples were selected via simple random sampling. It consists of total 86 students with the age group 11 to 13 years, from alternative schools and regular schools in Pune.
43 students from regular schools: New India School, Balshikshan School, Paranjape School, Abhinav School.
43 students from alternative schools: Aksharnandan School, Gram Mangal, Swadhaa Waldorf Learning Centre, DLRC Learning and Resource Centre.
The questionnaire was constructed on the basis of nature awareness factors and circulated in these schools.
2. Secondary sources of data is collected through literature study to find out the parameters of nature awareness.

5. School Types and Parameters:

5.1 Philosophy of Alternative School:
The limited number of students so as to give personal attention towards each student. The schools are firmly rooted with the culture and the learning spaces are closely integrated with the world outside which create the connectivity with the nature.
Few of the alternative schools don't have any artificial walls of standards, age groups and they have created the green spaces so that the child can easily connect with the nature and can observe its importance very closely in the school campus only.
Here the learning is engaging, mutually inspiring and an explorative process of discovery of the inner self and they believe the learning is knowledge and emotions gained through experience.
In these schools, the holistic education is given to the child to develop not only the intellect but the whole human being to be the active and responsible citizen. Through this way of learning the child can discover his strengths and develop the ideas those can create the values for society.

5.2 Philosophy of Regular School:
The regular schools are comparatively larger in terms of area and number of students, than the alternative schools. The education type consists with the curriculum so as to sustain and succeed in this cut throat competition era and also to match with the advancement in technology and globalization.

These schools try to give the integrated education to the child for successfully facing challenges and to develop into sensitive and responsible citizens via various subjects in the curriculum.

5.3 Parameters of Nature Awareness:

1. Natural Resources: Natural materials which exists without any human action e.g. fossil fuels, soil, water, and coal etc.
2. Nature Pollution: Non-biodegradable materials like plastic, polythene, silver foils are the primary source of nature pollution etc.
3. Awareness about Biotic Components in the Ecosystem: plants and animals are the biotic components which plays the vital role to maintain the ecosystem balance.
4. Overall awareness of surrounding nature: the awareness that comes along with the attachment towards nature.

The person can create the awareness in the society, due to this attachment and observations in surrounding nature.

5.4 Results:

Taking in to account the above parameters following surveys were conducted among alternative & regular schools.

Table1. Presents the awareness about Conservation of Natural Resources.
Table2. Presents the awareness about Nature Pollution.
Table3.Presents the awareness about conservation of Biotic Components in the Ecosystem.
Table4. Presents the overall Awareness about Surrounding Nature.

Figure 1. DLRC learning and Resource Centre, Pune
Source – DLRC School Website

Figure 2.DLRC learning and Resource Centre, Pune
Source – DLRC School Website

Figure 4 .Outdoor area of Bal Shikshan Mandir School Pune.
Source – Bal Shikshan Mandir school website.

Figure 5. Outdoor area of New India School Pune
Source – New India School website.

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Figure 3. Swadhaa Waldorf Learing Centre,Pune
Source – Swadhaa learning centre website.

Table 1. Awareness about Conservation of Natural Resources
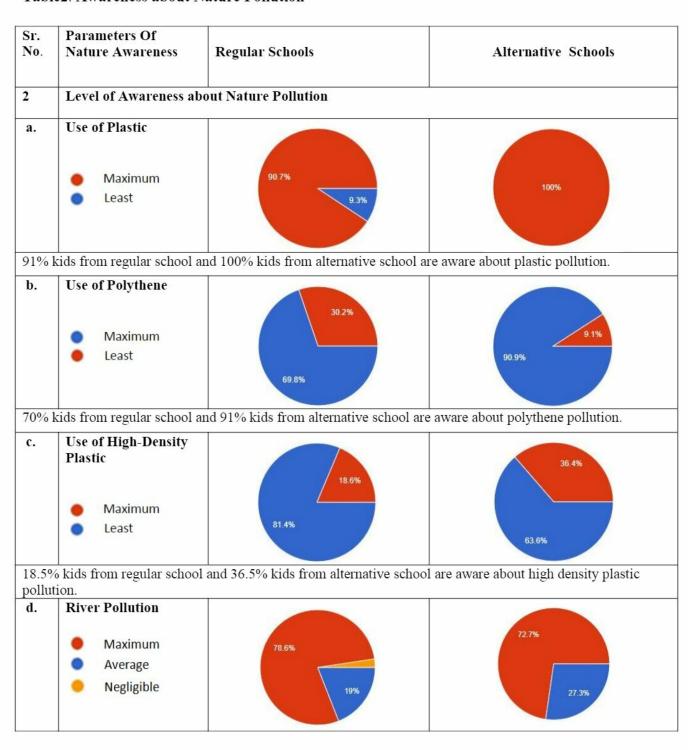
Sr. No.	Parameters Of Nature Awareness	Regular Schools	Alternative Schools
1	**Level of Awareness about Conservation of Natural Resources**		
a.	**Fuel** ● Maximum ● Maximum ● Average ● Least	Maximum 37.2%, Maximum 27.9%, Average 30.2%, Least	Maximum 65.9%, Maximum 34.1%
	65% kids from regular school and 100% kids from alternative school are aware about fossil fuel conservation.		
b.	**Electric Energy** ● Maximum ● Least	Maximum 60.5%, Least 39.5%	Maximum 81.8%, Least 18.2%
	60.5% kids from regular school and 82% kids from alternative school are aware about electric energy conservation.		
c.	**Water** ● Maximum ● Least	Maximum 81.4%, Least 18.6%	Maximum 90.9%, Least 9.1%
	81% kids from regular school and 91% kids from alternative school are aware about water conservation.		
d.	**Soil** ● Maximum ● Average ● Negligible	Maximum 18.6%, Average 46.5%, Negligible 34.9%	Maximum 20.5%, Average 52.3%, Negligible 27.3%
	35% kids from regular school and 27% kids from alternative school are not aware about soil conservation.		

Result 1:

In Alternative school children the awareness of Natural Resources conservation is seen comparatively in larger number than the regular school children.
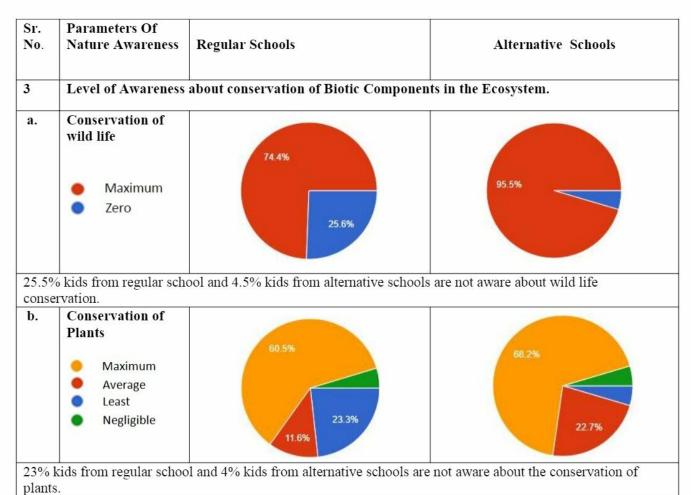
Table2. Awareness about Nature Pollution

Sr. No.	Parameters Of Nature Awareness	Regular Schools	Alternative Schools
2	**Level of Awareness about Nature Pollution**		
a.	**Use of Plastic** 🔴 Maximum 🔵 Least	90.7% / 9.3%	100%
	91% kids from regular school and 100% kids from alternative school are aware about plastic pollution.		
b.	**Use of Polythene** 🔵 Maximum 🔴 Least	30.2% / 69.8%	9.1% / 90.9%
	70% kids from regular school and 91% kids from alternative school are aware about polythene pollution.		
c.	**Use of High-Density Plastic** 🔴 Maximum 🔵 Least	18.6% / 81.4%	36.4% / 63.6%
	18.5% kids from regular school and 36.5% kids from alternative school are aware about high density plastic pollution.		
d.	**River Pollution** 🔴 Maximum 🔵 Average 🟡 Negligible	78.6% / 19%	72.7% / 27.3%

3% kids from regular school are not aware bout river pollution.			
e.	**Pollution due to Metal Foil** ● Maximum	100%	100%
100% kids from both the school types are aware about pollution caused by metal foil.			

Result 2: In alternative school children the awareness of Nature Pollution is seen comparatively in larger number than the regular school children

Table 3. **Awareness about conservation of Biotic Components in the Ecosystem.**

Sr. No.	Parameters Of Nature Awareness	Regular Schools	Alternative Schools
3	**Level of Awareness about conservation of Biotic Components in the Ecosystem.**		
a.	**Conservation of wild life** ● Maximum ● Zero	74.4% 25.6%	95.5%
25.5% kids from regular school and 4.5% kids from alternative schools are not aware about wild life conservation.			
b.	**Conservation of Plants** ● Maximum ● Average ● Least ● Negligible	60.5% 11.6% 23.3%	68.2% 22.7%
23% kids from regular school and 4% kids from alternative schools are not aware about the conservation of plants.			

c.	Conservation of Birds ● Maximum	100%	100%
100% kids from both types of schools are aware about water conservation.			

Result 3:
In alternative school children the awareness of Nature conservation of Biotic Components is seen comparatively in larger number than the regular school children.

Table 4. Overall Awareness about Surrounding Nature

SR. NO.	Parameters Of Nature Awareness	Regular Schools	Alternative Schools
4	Level of Overall Awareness about Surrounding Nature			
a.	Awareness about Changes in nature ● Maximum ● Least	37.2% / 62.8%	70.5% / 29.5%
37% kids from regular school and 70.5% kids from alternative schools are aware about the changes in nature.			

b.	**Awareness about Existing Ecosystems** 🔵 Maximum 🔴 Least	*Pie chart: 37.2% Least, 62.8% Maximum*	*Pie chart: 25% Least, 75% Maximum*
	62% kids from regular school and 75% kids from alternative schools are aware about the natural ecosystems.		
c.	**Attachment towards Nature** 🔵 Maximum 🔴 Least	*Pie chart: 18.6% Least, 81.4% Maximum*	*Pie chart: 14% Least, 86% Maximum*
	81% kids from regular school and 86% kids from alternative school shows attachment towards nature.		

Result 4:
In Alternative school children the overall awareness of surrounding Nature is seen comparatively in larger number than the regular school children.

6. Conclusion and Suggestions:

6.1 Conclusion:
This study has shown the significant difference about nature awareness among two types of school children.
The study has found that the maximum number of alternative school children has more attachment and awareness towards nature than the regular school children.
The education type which is closely integrated with the nature helps to create the nature awareness and strong bond with the surrounding.
This philosophy can be implemented in education system at the regional level.

6.2 Suggestion:

Every School should conduct the outdoor nature based activities and bridge the gap between regular school and alternative school to create the nature awareness among children.

Regular schools having ample grounds can easily develop the partial area from there open areas for such nature based activities. Such areas can introduce the child with the native species and interdependency of flora and fauna. Thus the child will get to know the importance of ecosystem.

School can arrange periodical outdoor visits for the same.

The landscape elements in such areas can be as listed below:

1. Native species to promote pollinators.
2. A big tree par (Native tree) and crop beds to perform different activities.
3. Eco pond with bollards.
4. Native grasses area.
5. Medicinal plants area.

Also the visiting sessions of the experts can be conducted in the schools for better and right knowledge about nature.

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Ecovillage- Just another Tourism Strategy in India?

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Abstract: Developed in 1991, the concept of ecovillage by Robert Gilman has gained popularity in recent times in India. Though the main principles of establishing an ecovillage are very similar to the traditional community setting of our country, parameters such has tourism and economics are now involved with it. Recent times have seen development of many eco-villages across India. Global Ecovillage Network (GEN) describes ecovillage as an 'intentional or traditional community using local participatory processes to holistically integrate ecological, economic, social and cultural dimensions of sustainability in order to regenerate social and natural environments.' GEN has also encouraged the development of ecovillages across globe to empower communities to develop their own pathways towards sustainable future.

But when we dive deeper, we understand that tough few villages are developed as a contribution to humanity and nature out of humility, others are developed to uplift the local community on the basis of their unique culture and art. Be it for any reason these ecovillages have developed as a hub of tourism. What needs to be understood is that are these equipped to withstand and absorb this influx of tourists or are they developed respect the nature. This paper talks at length about various parameters and strategies on which an ecovillage is developed through case studies at National and International level. Various working models of ecovillage are studied to understand their sustainability benchmarks. Further the ways in which these Ecovillages contribute to nature is discussed. Tourism activities in these areas are analyzed and a conclusion is drawn whether or not an ecovillage is developed solely for tourism purpose or it serves a larger purpose of the environment.

Keywords: Ecovillage, Tourism, Environment, Sustainable development

1. What is an Ecovillage?

With this growing and unending pandemic people are looking for various holiday options which are secluded and unexplored. They have to get out of their homes, visit new places but also want to maintain social distancing. To the rescue of such people is where the tourism in ecovillages is increasing. Eco village in Indian context is a settlement away from urban hustle yet provides all the facilities city people need. Be it uninterrupted internet connection or transportation and infrastructure. But what needs to be reflected upon is the intent of establishing an ecovillage is solely for tourism purpose or they have a greater purpose and responsibility towards environment. The concept of ecovillage (Mohan, Dahiya, Velvizhi, Reddy, 2017) was established and further recognized by Gaia foundation's funded study of sustainable communities conducted by Robert Gilman and Diane Gilman in 1991 where he defines ecovillage in following 5 ways (Boonkaew, Roongtawanreongsri, 2018):

I. which is human-scale (Smaller scale settlement)
II. which is full-featured (Balanced living)
III. in which human activities are harmlessly integrated into the natural world (Integration with environment)
IV. in a way that is supportive of healthy human development (Physical and Mental health of individual and community)
V. which can be successfully continued into the indefinite future (for long lasting positive impact)

This study led to establishment of Global Ecovillage Network (GEN) with an aim to empower communities to sustainable future and to build bridges of international solidarity. To this day GEN continues to be an international organization that connects a highlydiverse range of sustainable communities and initiatives worldwide that are dedicated totransform to a sustainable future, making GEN a influential body for sustainability.

According to GEN there are 4 dimensions of sustainability which are considered for establishment of eco-village
  I. SOCIAL: this focuses on people's collaboration to cultivate and inclusive relationship and participatory approach for planning
 II. ECONOMY: sharing and developing of resources to build strong economy, strengthening the local markets and establishing less reliance on external markets and resources.
III. ECOLOGY: interdependence with nature, use of renewable energies, organic way of food production and minimize waste generation.
IV. CULTURE: restore traditional and vernacular art and dance forms and implementation of low impact lifestyle
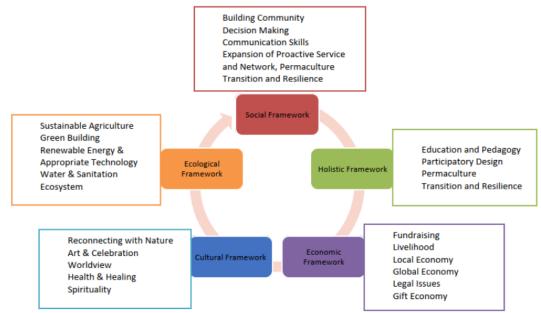
Figure 1: Ecovillage Framework (Database of Global Ecovillage, 2015)

2. Eco village v/s Traditional Village
The comparison of traditional and ecovillage(Shekhawat, 2017) is given in Table 1.

Table 1: Comparison between Traditional Village and Ecovillage.

Traditional Village	Eco Village
Decisions are taken by the head of the village	Decision is taken by group in democratic way
Resources are not shared equally	Resources are shared equally among all residents
Residents live on basis of various ideologies, may not unite for environmental actions and objective	Like minded people come together with an aim to regenerate the natural environment.

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Common spaces not equally divided with females and children	Space planning is done for all the diverse group of people
People aspiring to move to cities and nearby towns	People from cities with broader vision create social cohesion of achieve the main aim of ecovillage

In view of current scenario, it is very important to every individual irrespective of its age, gender, location to understand the relevance of ecovillages on grounds of giving back to nature. With the climate change, rising temperatures and decreasing oxygen levels taking care of our Mother Earth in order to survive healthy on the planet is obligatory. Development of ecovillage will lead to balanced resources, a responsible and educated community, stable economy and each person will live a successful life in co-existence with the nature. Other intangible impacts of ecovillages are: improved air, water and soil quality, regeneration of bio life, increase in bio diversity, lower use of chemicals for food production and decrease in need of mode of transportation hence creating a community which does not rely on any external resources.

3. Current Challenges

With changing world scenarios more and more of traditional villages are undergoing a transformation to upgrade itself as tourism village. Similarly, eco villages are also developed as prime tourist spots to increase tourism and allow economic growth of the area. But as we discuss in paper, we know that main aim of establishing ecovillage is to integrate with nature and give as much possible back to nature. Few tangible positive impacts of tourism in village are development of economy, community welfare, employment generation but the negative impacts are quite intangible and leave long lasting imprints on environment. With growing tourism in smaller areas other environmental negative impacting activities can be witnessed like solid waste of plastic water bottles, chips packets, increased transportation, making international cuisine available instead of promoting the local food, steep increase in construction activities- malls, food outlets, guest house etc. All these activities degrade the current environment by growing the building and human footprint. Many such negative impacts of tourism are widely discussed by residents of tourist places like LehLadakh, Jammu and Kashmir, Kerela and international Southeast Asian islands and European countries (Pantiyasa, Rosalina, 2018). Such situation calls for tourism management in these areas where the visitors entry and stay is organized and controlled based on the availability of resources.

Writer Mukhtar Dar (Dar, 2021) in his article on "The way ecofriendly tourism is through rural tourism" written for Jammu Kashmir Policy Issue states the example of Dal lake. As per a survey by Centre for Science and Environment, Dal lake location covered an area of 75 sq km in 1200 AD. By the 1980s, the area was reduced to 25 sq. km and today it has drastically reduced to 12 sq. km. The depth has also reduced from 45 feet to 4 feet. The writer is concerned about such environmentally fragile places are now vulnerable to huge rush of people resulting in the accumulation of huge plastic and other solid waste. As it is rightly said "tourism destroys tourism", deterioration in environment of these tourist spot will eventually decrease the tourism activities hence disturbing the economy. As a measure these places should be opened up for strategic environmental planning taking in consideration its load bearing capacity with respect to sustainability and waste management. Now let us look at few examples where ecovillages are developed with aim to establish an ecological balance and return back what is taken from the nature.

4. Methodology

This research has adopted a case study method to study the working of various ecovillages, their sustainability benchmarks and how they contribute to nature. Secondary data from various news articles and from official websites of ecovillages is collected to analyze the main aim and objective of

establishing them and how significant are tourism activities in these areas. Based on the data gathered, an analytical comparison is drawn from the case studies focusing on the tourism and environment. The main conclusion is drawn to judge whether these eco-villages are an environmental strategy or a tourism strategy.

5. Limitation

Out of 10,000 known ecovillages across globe as per Iberdrola website,20 villages were selected preliminary on the basis of popularity and years of establishment.

Out of these 20 villages few villages were discarded as these were setup in urban context. Out of remaining villages few were filtered out as they are still in their preliminary stage of establishment or development. Due to time constraint the eco-village which showed development and contribution in terms of ecological frame work is considered and rest all are filtered out. Table 2 explains the reason to omit the ecovillage.

Table 2: Explaining the reason to omit ecovillages for case study

Sr. No.	Eco village name and place	Reason to omit from study scope
1	Earthsong, New Zealand	Urban co-housing development
2	Crystal waters, Australia	Based on Permaculture
3	**Findhorn, Scotland**	*X (considered for International case study)*
4	Tamera, Portugal	Peace research village. No environmental parameter for establishment
5	**Sekem, Egypt**	*X (considered for International case study)*
6	Bedono, Indonesia	Undeveloped
7	Siddharth Village, Orissa, India	Based on tribal tourism and their upliftment
8	**Auroville and sadhana forest, India**	*X (considered for National case study)*
9	**Ithaca ecovillage, USA**	*X (considered for International case study)*
10	Shaam-e-sarhad, Bhuj, India	Established exclusively for tourism
11	**Khonoma, Nagaland,India**	*X (considered for National case study)*
12	**Govardhan ecovillage**	*X (considered for National case study)*
13	Trans Indus ecovillage, Bangalore, India	Undeveloped
14	Solarsiedlung, Germany	Based on community planning at urban scale
15	BedZED, UK	Urban planning and real estate
16	Fuji Eco Park, Japan	Established for tourism enhancement
17	Sagg eco village, Kashmir, India	Developed for of upliftment of culture and tourism
18	Chambok, Bali, Indonesia	Community based tourism parameter considered for establishment
19	Vaishnav Dham, Washim, India	Established to help tribals to develop their village and maintain at lesser costs.
20	Aranya eco village Tamil Nadu	Based only on Agriculture development

At the end of this study 3 national and 3 international eco villages are considered to study their evolution, parameters of functioning, tourism in village and sustainability practices.

6. Case studies

6.1 Findhorn, Scotland

Year of establishment: 1962

*Aim of establishment:*Eradicate degradation of environment with socio-cultural support and living a low impact lifestyle

History: First serious intentional settlement on basis of all sustainable parameters.

Features of ecovillage:

1. Energy efficient and climate responsive buildings such has placing south facing windows to allow maximum heat ingress in the rooms to naturally heat them and minimize windows on north facade to block any heat leakage
2. Buildings with zero carbon footprint
3. Using of natural and non-toxic material to develop a breathing wall
4. Use of building materials for insulation
5. Taking advantage of brownfield site to provide 20 passive solar designed and highly insulated houses
6. Experiments with strawbale construction and recycled car tires
7. Incorporation of Solar panels for hot water
8. Harnessing wind energy through wind turbines which have capacity of 750kW has generated electricity to supply 100% of community's electrical needs
9. Triple glazed glass with low emission window coatings to allow heat to be trapped inside the room
10. Development of sustainable harvested wood land
11. Elimination of use of coal for space and water heating
12. Encouraging the use of Solar wind and wood for energy efficiency in buildings
13. 28% of total non-transport energy is from renewable sources
14. Experiencedresidents are now consultants for ecovillage establishment across world

6.2 Ecovillage at Ithaca, New York, USA

Year of establishment: 1996

Aim of establishment: To create positive change in social, economic and environmental issues of the planet.

Area: 175 acres

History: Created to exemplify the sustainable ways of living and promote integrated approach.

Features of ecovillage:

1. Setup for healthy and socially rich lifestyle
2. Minimize ecological impact of human
3. Agricultural farms
4. Passive solar and super insulated houses reducing energy consumption by 90%
5. Photovoltaic panels and solar hot water heating 50kW system providing 50% of electrical supply
6. More than 85% of site is left unused intentionally; it is set aside for farming and other agricultural activities.
7. 71% of reduction in water use
8. 2 residents-owned farms to supply the agriculture stock
9. All non-meat waste is composted at home level and overall waste generation is reduced by 75%
10. Integration of universal design
11. Hands on education in collaboration with Ithaca college on topic of community sustainability and green building techniques

6.3 Sekem Eco village

Location: Desert land in belbes, 60 km northeast of Cairo, Egypt

Year of establishment: 1977

Aim of establishment: Sustainable development and giving back to the community

History: Founded by Dr. IbrahimAbouleish, Sekem means Vitality in Egyptian hieroglyph. It is based on 4 long term dimensions of sustainability: social, economic, cultural and environment.

Features of ecovillage:

1. Abundant textile, natural medicines and tea business supplied from 2800 hectares of village green crops
2. Generates employment for over 2000 people
3. Follows a holistic approach and participatory planning strategy
4. Awarded the Alternative Nobel Prize, The Right Livelihood Award in 2003
5. Adoption of organic farming to improve soil structure, maintain water quality and increase soil organic matter
6. Holistic education and medical care
7. Use of organic matter and compost tea as organic fertilizer
8. Use of Horn manure (cow manure filled in cow horn and buried in soils during winters) and Horn silica (silica filled in cow horn and buried during summers). Both are used as crop sprays against pest infest
9. Processing of agricultural waste instead of burning them
10. Waste water is reused as irrigation water for trees
11. Use of Solar energy for energy savings

6.4 Auroville, India

Year of establishment: 1968

Aim of establishment: Based on spiritual grounds and with an aim of developing a settlement integrating with nature and balancing all the human footprint.

History: Auroville (city of Dawn) is founded by Mira Alfassa, commonly known as Mother. It is an universal town for all men and women whoare willing peace andprogressive harmony.

Features of ecovillage:

1. Planning of this settlement is such that outer ring is the green belt of 405 hectares. This area is transformed from wasteland into a green ecosystem
2. Green belt comprises of organic farms, diaries, orchids etc.
3. Extensive use of solar energy for water and electricity
4. Demonstrative site of Wind and Bio gas uses
5. World leader in compressed earth building techniques
6. Plant based sewage treatment
7. Dry composting toilets and grey water system
8. Buildings consume less energy
9. Aquaponic techniques to use recycled water to rear fish and grow food
10. Reforestation and water conservation in Sadhana forest
11. Agriculture strategy of Solitude Farming
12. Various educational programs are hosted by the community to let people come and stay there and learn about sustainable building techniques and lifestyle
13. Local villagers are employed to produce fabric using natural dye

6.5 Khonoma, Nagaland, India

History: First green village developed by joint efforts of local residents, Government of Nagaland and Government of India through the launch of Green village Project of INR 30 million in 2005. This village practices sustainable development in term of agriculture, waste management, efficient planning, energy conservation, balancing the ecology and rain water harvesting.

Features of ecovillage:

1. Balancing ecology and ban on hunting and cutting trees has helped to save the endangered species of grey bellied tragopans
2. Safe drinking water and sanitation by construction of community water tank at various locations
3. Rain water harvesting, reuse of water and underground water recharge is practiced
4. Animal husbandry
5. Self-sufficient residents who grow their daily use vegetables and medicinal plants in front of their houses in a small garden
6. Organic techniques of cultivation and terrace cultivation
7. No use of pesticides or fertilizer for cultivation instead organic manure made from sewage and trees is used
8. Efficient space planning for residents
9. Energy conservation as village uses CFL or LED lights, no Air Conditioner used by any villager. Also, street lights are provided by clean solar energy
10. Waste management by mandating every household to have a dustbin
11. Once a month sanitation drive
12. Ban on open defecation
13. Toilets are constructed under Swachh Bharat scheme
14. Segregation of waste at source and appropriate disposal
15. Participatory approach by the council and residents to develop 1st ever community led conservation project- Khonoma sanctuary
16. Traditional practice of cooking food at centre of house so that the fumes kill all the pests and insects and the wooden structure remains intact for ages. This technique also helps to keep interiors warm
17. All the structures are made from locally available wood, stone and bamboo.

6.6 Govardhan ecovillage

Year of establishment: 2003

Aim of establishment: Simple living and high thinking- live in harmony with divine and nature.

History: Established in Palghar India by monks from International Society for Krishna Consciousness (ISKON) and under guidance spiritual activist Radhanath Swami. The village is led by the principals of humility and sustainability.

Features of ecovillage:

1. Efficient space planning after proper hydro-geological survey
2. Waste water recycling- 95% of sewage water using a green sewage management technology called Soil Biotechnology, which is used for landscaping
3. Renewable source of energy- Solar PV panels of 39KW capacity, Solar water heaters of capacity to meet 100% hot water needs, Biogas plant processing the food wastes and animal waste and producing up to 30cu.m gas
4. Low energy lighting
5. Passive solar design for accommodation facilities
6. Rain water harvesting
7. Building located on higher contours to receive adequate sunlight and air
8. Small designed semi-cover spaces connecting the indoors and outdoors for community interaction
9. Rammed earth walls, stabilized mud wall blocks, pre cast roofing techniques used for building construction
10. Timber, bamboo and mangalore tiles are used as building materials. Use of mangalore tiles as roofing material also provides insulation
11. Cow dung from goshalais used as natural manure for organic farming and for bio gas generation

12. Waste segregation, recycling and disposal carried out step wise- Wood dust forms an ingredient along with cow dung, in making of dhoop sticks or chemical free incense sticks

13. Govardhan school of sustainability is established with aim to transform minds towards sustainability with their various outreach programs on ecology and self-learning

7. Analysis

As we have seen from the above case studies, ecovillage with an aim of sustainability and to balance the ecology are established across the globe. All these mentioned places are also a place of tourism. People visit the place and stay for minimum of 2 days to maximum of 6 months as in case of Auroville. But staying here makes them more responsible towards environment and Mother Earth. Various educational courses are also responsible for this change in mentality of tourist at such places. Govardhan eco village, Ithaca Ecovillage, Auroville conduct courses of sustainability related to construction, health and lifestyle. Visitors actively participate in these programs to gain knowledge on sustainable living. Residents from Findhorn or Ithaca eco villages are advisory board members for new establishment of eco village under Global Ecovillage Network. On the other hand Govardhan Ecovillage (GEV) has taken a conscious step towards green future and set up a sustainablity benchmark by rating the village under GRIHA (India based Green Rating Integrated Habitat Assessment). Few sustainable practices under GRIHA such as 57% reduction in energy consumption compared to GRIHA benchmark, 90% of building material sourced from a 100km radius, in house biogas plant, use of agriculture waste as building material etc. The authorities from GEV have also signed a Memorandum Of Understanding (MOU) with GRIHA body.

These villages know how to balance the increase of tourists yet adhere to their sustainability principals. With appropriate tourism and environment management plans, by planning and organizing the use of resources and with conscience to give back something to nature many such ecovillages can be developed across our country to confirm a sustainable future.

8. Conclusion

Thinking about developing smart and sustainable villages is need of hour instead of smart cities. With establishments comes the monetary factor which is then solved by introducing tourism strategies. But what needs to be considered is the tourist or public load on eco-sensitive areas and the negative impact of tourism.

Another important aspect that comes when establishing a new ecovillage is participatory approach, where community members are involved by the authorities at every stage of discussion. This will help people to recognize their own potential and shortcomings. Activities of group discussion, SWOT analysis can be conducted to derive a better outcome. It is very important to assure these people of what is in future for them and how this development will benefit them economical and environmentally. Participatory approach also allows the authorities to look into the cultural side of the community which can form basis of some tourism activity in the village and in turn generate employment and upgrade economy. Once the eco village is established, various training and implementation programs can be conducted for the community residents with an objective to enable them to further develop and transform the community and govern it effectively. Activities of brain storming, group drawing, basic tourism management planning, knowledge sharing can be conducted in order to get maximum participation. Engaging and educating local residents in planning and implementation of ecovillage can reap beneficial outcomes in term of aligning common vision of sustainable ecology, economy, culture and society in them.

Few villages in India are conscious of current climatic situation and know the power of villages for development of the country. Residents in these villages have come together for developing their

community focusing on any one of the green village parameters for a sustainable future. Few of the examples of such villages are:

1. Shikdamakha, Assam- Cleanliness and no open defecation.
2. Piplanti, Rajasthan- plantation on 111 trees every time a girl child is born.
3. Mawlynnong, Meghalaya- ban on plastics, spotless paths, bamboo dustbin stands. Known as cleanest village in Asia.
4. Dharnai, Bihar – 1st village in India to completely run on solar power.
5. Payvihir, Maharashtra- barren 182 hectare land turned into forest.
6. Hiware bazaar, Maharashtra- water conservation measure leading to recharge of ground water.
7. Odanthurai, Tamil Nadu- energy self-sufficient by installation of wind and solar farms.
8. Kokrebellur, Karnataka- co-existence of birds and human in complete harmony.

These villages have proved how a determination towards balancing the environment and leading a sustainable lifestyle can help in overcoming the global environment challenges. India is still known as country of villages. In Marathi it is said *'Themb themb tale sache'* which literally means drop by drop a pond fills up. With similar strategy, every village needs to be developed on lines of eco village taking in consideration the utmost important environment factor. Only then we can shift our focus on developing urban areas. With growing media publicity and various social networking platforms, small villages are getting recognized country wide leading to influx of tourist in search of such unique holiday destination. Every village developed needs to have a tourism management plan and which allows them to flourish in all the 4 parameters of sustainability: Environment, Culture, Social and Economy.

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"Case Study Report on IGBC Platinum Certified Eco Village near, Pune"

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Abstract:

Any country's progress is well-defined with rural connections and quality of life in rural and urban areas. There is a strong need to maintain a balance between these regions with proper progress planning. In today's scenario, nationwide infrastructure development, corridors connecting the urban and rural heavy-set ups, have created undesirable impacts leading to pollution, damages, insufficiency, and multiple environmental issues. Urban sustainability has always been in the limelight while rural areas often go neglected due to resource constraints. Intending to target the efficient & effective development of rural areas, while maintaining an ecosystem balance as an important element for sustainable, self-sufficient rural areas; there comes a need for eco-villages. Ecovillages are intentional and traditional communities with the purpose to become effectual socially, economically, culturally, and ecologically. Every village will demonstrate a unique set of issues and probable solutions. The need arises to identify the commonalities for a village region and suggest resolutions to make the village sustainable, hygienic, and self-sufficient in all ways causing minimum or no harm to the environment further improving the quality of life of the inhabitants. The main objective remains to characterize, analyze, and identify problems in the development of the ecovillages and present some solutions to minimize these damages and create movement on sustainable rural development. For this research, the adopted method is based on a questionnaire, interviews, observation, and inquiry for data collection further adopting the CII-IGBC Green Village guidelines and Certification.

This research will also explore the adaptation of certain guidelines by villages that will help to refine the quality of life at the individual and community level, benefitting the mainstreams of the society. This paper highlights a qualitative and quantitative case study of a village abetting Pune city that was intervened with the village level guidelines and aspiring to be an efficient green village.

Keywords: Eco-villages, Rural Development, Ecosystem, Sustainable development, Health, and Hygiene.

1. Introduction:

Sustainability aspects include the improvement in social, economic, and environmental values for urban and rural development leading to improvement in overall quality of life. The implications should include positive impacts on the ecological, cultural, political, institutional, social, and economic components without leaving any burden on future generations. The Urban-Rural associations are of symbiotic nature that involves the exchange of merchandise against resources, from rural-based producers to urban markets further proceeding to local, state, national, and international markets.

The rural population has seen a rise of 32% in the last two decades (1991-2011) with approx 70% of the Indian population residing in the rural zone[1] of the country. The present-day villages aspire the modern amenities and luxuries but often ignore good habitable spaces for improved living quality. For India to progress and sustain itself in odd times, our rural base has to be strong, prosperous and should have access to the latest basic amenities, good healthcare, and education. Today, major challenges faced in villages are scarcity of safe drinking water, open defecation, lack of adequate health care, access to basic amenities & schools, and power storages, therefore arises a need of development of rural villages areas into Ecovillages.[2]

By composing an eco-village, residents benefit from the restoration of natural resources by protecting and preserving them. Native and adaptive plantation further add drought-tolerant species for a landscape that easily adapt to local soil, moisture, climate, and pest conditions benefit to the environment, thus supporting the local flora and fauna ecosystem. The concept also offers access to clean energy, adequate water, basic education, good healthcare, hygienic sanitation leading to economic prosperity and enhanced quality of life, in an environmentally sustainable manner. For economic stability, support of environment for local agriculture, small scale production, use and export of daily essentials also adds to the growth of the region.

The purpose of imbibing the Eco concepts at the village level will set a good example of sustainable development at a small-scale rural development. With the stable rural base, focused migration can also be controlled and the bond between humans and the environment can be strengthened. This paper describes the case study of an EcoEcovillageich can be understood as a model that tackles regional issues and creates an opportunity for the people and nature to benefit from each other.

"A Green Village[3] offers access to clean energy, adequate water, basic education, good healthcare, hygienic sanitation, leading to economic prosperity and enhanced quality of life, in a manner that is environmentally sustainable."

2. Aim, Objective, Scope & Methodology of Study

Aim
This research aims at wholesome development of the rural areas, that enables its residents to live a virtuous quality of life while using maximum natural resources.

Objective
With improved quality of life, the rural areas of the country should sustain with effectiveness and optimized living conditions. The same should be maintained over a long period and relative awareness towards the environment-friendly aspects.

Scope
This case study is restricted to one village in detail. Study of environment parameters at designated village area abetting Pune city. Identification and assessment of the issues related to the quality of life, living conditions, health, and hygiene relating to the criteria defined under Eco-village and IGBC Green village guidelines. and giving relevant solutions to the problems.

Methodology

This study is categorized as a qualitative study under the case study method. The major steps followed include the assessment of the issues for the purpose, suggestive measures, implementation, conclusive analysis. About this study for Eco-village, the variables for assessment are referred from IGBC Green Village Guidelines. The list of variables are as follows:

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[1]Ref- IGBC Green villages Manual
[2] Eco Villages – IGBC Manual
[3] Definition by IGBC Green village.

a. Clean Village and Improved Lifestyle
b. Improved Drinking water and Sanitation facilities,
c. Adequate infrastructure for Education & Healthcare,
d. Reduced Potable water demand,
e. EffectiveSolid waste management,
f. Ensure Power security through Clean Energy,
g. Local Economic Development
h. Digital Village Initiative.
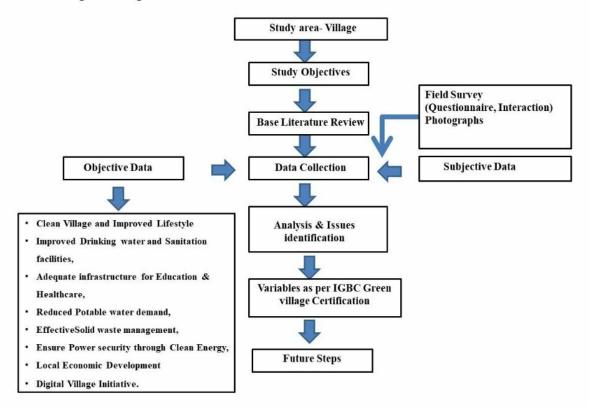
Figure 1: The flow chart of the methodology is mapped below:

3.   Parameters of Eco-Villages:

Ecovillages are communities that integrate ecological, economic, social, and cultural elements of sustainability with human participation as a continuous part of a balanced ecology. These committees can be formed into a village with high technology to be dependent upon environmental conditions. There should be a deep connection between nature and humans as an integrated part of a natural cycle. These villages once formed support their surrounding environment and feel responsible towards it. It creates a deep feeling of belongingness amongst them. People in the village feel secure, powerful, and being able to participate in taking decisions for society and themselves by creating self-reliant and participative communities. The parameters that are essential for an Eco-village formation are stated below:

3.1 Environmental parameter:

The bond between people and the environment can be noted as an environment parameter including the aspects that have a direct impact on the environment through human actions. Important elements here are renewable energy generation, energy storage, waste recycling using methods that have a low emphasis on the environment, and establishing ecological buildings. Major highlights are:

- Growing organic food within the community
- Constructing houses with local and natural materials

- Recycling the grey and black waste, reducing dependency on natural resource
- Using of renewable sources for energy generation
- Protecting water, air, soil pollution via correct management of natural resources
- Preserving biodiversity and natural non-habitable areas

3.2 Social parameter:

An important part of sustainability is that creates communities where people feel supported and responsible to those around them and the environment. In this, each one can participate in decision-making. Major inclusions are:
- Providing community for children, elderly, and minority
- Recreational spaces for cultural interactions.
- Promoting permanent education and growth
- Maintaining one's identity

3.3 Economic parameter:

To sustain and progress, local groups and communities should generate their finances within their community. Major parameters include:
- Self-reliant economy.
- Community-saving through local employment generation.
- Local production, regional distribution
- Local income production.

3.4 Cultural parameter:

This parameter shares creativity, artistic expression, cultural activities, rituals, and celebrations irrespective of any culture/caste. Major inclusions are:
- Development of religious rituals and the festivals
- Emphasis on creativity and art of the village
- Expressing a spiritual worldview by global relationship
- Respecting different cultural rules
- Interrelation improving among the people
- Facilitation of individual growth

4. Description of Case Example: Eco-Village

This case study is a village established in 1952, housing 2000 residents and located at a distance of 13km from Pune city at the banks of the Mutha river. The Pune climate stands more on the moderate side, but this rural belt experiences enhanced warmth and cold compared to the urban region. The village has a high contour and the slope is towards the river. The approx. area of the village is 40 acres that hold approx. 450 houses, Grampanchayat office, hospital, multipurpose areas, cremation area, and school with 325 students and 9 teachers.

On preliminary observations, site visits, and discussions, the major challenges that came forth in the village area were - open defecation, drinking water scarcity, lack of adequate health care, access to basic amenities & learning facilities, and power cuts.

With the support of Grampanchayat and local NGOs active in the region few strategies were proposed, evaluated, and implemented that helped elevate the village status to Eco recognition. Further, the village was registered with Indian Green Building Council (IGBC) for their Eco Village certification program. The village was assessed for the parameters and after the visit and actual verification of the applicative strategies, the council awarded the village with Platinum rated certification that stands the optimum appreciation in that category.

Below is the location detail of the village with its abetments and setting.

Figure 2: Setting of the Village

4.1.   IGBC Green Village parameters:

Indian Green Building Council (IGBC) is a national body that propagates and certifies construction projects under many typologies including the unique Village category. The aim of IGBC highlights that the green villages will adopt a holistic approach to sustainability and will set an example for the villages in the country to adopt green principles.

This village opted to get certified by IGBC and assess parameters implemented based on this standard guideline. The variables were considered from this manual and the village was upgraded for the missing aspects to match the certification program compliance.

This village stands blessed with a few interesting and beneficial features such as good connectivity with the city Pune, a water body adjacent to the site, and educated people assisting the village development. Apart from basic needs, the amenities to improve the quality of the villagers were also considered during the development of this village.

This active initiative of developing the village was noticed and initiated by three agencies including the Sarpanch with Grampanchayat team, an NGO, and an Environmental Architecture firm to bring the village on a perfect platform. IGBC being the best possible stage to appreciate these kinds of sustainable programs, the sarpanch and the green facilitator's team were eager of achieving the desired rating for the Village.

The following features of the village considered for the rating of IGBC Green Village certification variables:

- **Clean Village** – The identification of soiled areas was treated with properly planned waste management strategies and regular cleaning of village common areas was initiated. This is a regular practice the village is following and the defaulters are penalized to maintain the hygienic condition.

- **Improved Lifestyle** – The overall quality of life was assessed and the provision of alternative employment opportunities for enhancing the income was explored. Additionally, the sale of

manure, nursery plants, seed balls, idol-making, bidi-making, agarbatti making was encouraged and enhanced.

- **Improved Drinking water** – Awareness for clean drinking water was noted to every household and proper repairs were done in the pipes that helped supply potable water. Sufficient quantity and regular check of water quality before the supply was ensured.
- **Sanitation facilities** – Provision of sewage network to collect wastewater and treat it further. Use of toilets was encouraged for at each household in the village. All the common toilets in the village were installed with a sanitary incinerator to dispose of the sanitary napkins.
- **Infrastructure for Education & Healthcare** – Adequate number of schools and hospitals are made available for the ease of the villagers
- **Adequate health care** - People in the village are more likely to have to travel long distances to access healthcare services, particularly subspecialist services. It's a significant burden for people in terms of travel cost and time. Storages of trained and proficient doctors in the village were missing and hence were added to the list.
- **Effective Solid waste management** – Solid waste collected wasn't segregated at the source. There were no regular waste collection services, poor waste management infrastructure, low quality of waste management. With effective strategies, now solid waste is segregated at the source, collected separately, and treated individually
- **Local Economic Development** – Promoting local businesses such as idol-making and "papad selling" have encouraged the villagers to improvise their social and economic status.
- **Digital Village Initiative** – Provision of Facilities such as e-learning and e-Administration helps to make this village to be recognized as a holistic model for the current growing digital environment.
- **Basic amenities** - The village occupants now had access to the basic amenities like medical stores, ATMs, General Stores, schools, etc from the urban zone. This increased migration added to the harmful impacts on the environment associated with pollution and poor air quality. Hence, proper care was taken and awareness was created to avoid harmful aspects related to this especially during pandemic times.

An NGO has been active in the region who initiated the implementation of the suggestive features and helped this village in its development. This NGO continues to support and maintain the implemented strategies and display a strong operation & management base in the village training the locals for the same by providing training, facilities, and funds. In addition, this social working team assists the riverfront development and maintenance. A wastewater treatment expert had lent a hand to support the NGO in the development of this place by giving a service of the sewage treatment plant to treat the wastewater before letting it into the river.

With all the above initiatives, the village could achieve the platinum rating with 86 points on the scale of 100 pointers as per the checklist mentioned in the IGBC manual for Green Villages.

5. Eco Village Strategies:

The IGBC set of guidelines was followed and evaluated for the applicable areas and mitigating the gaps identified at the village site. These applications were assessed based on the location of the village, setting of the site, resources, people, initiatives, government or management support, funds, etc. The applied strategies are listed as per the segregated variables under the categories described by IGBC Green Village and are highlighted below:

5.1. Health and Hygiene

- The village followed a comprehensive Waste Management System. The waste collected was properly planned and executed on regular basis.

- Common areas were provided with labeled trash bins which are cleaned on daily basis.
- The bins were provided at regular intervals of (500 m) on the roads for easy access to the villagers.
- Wet and Dry wastes were segregated & collected separately at the doorstep by the local waste collecting vehicle. This collected waste should be disposed of as follows: • Dry waste was sent to recycling, to the local vendor, wet waste to the vermicomposting pits, E-waste is handed over to the responsible party ensuring no contamination of the natural resources.
- Use of smokeless chulhas or cleaner fuels (LPG gas) for every household.
- 100% of households had provision of individual toilets.
- Sufficient public Toilets (male-female separately) should be provided and the cleaning is done on the daily basis to avoid health hazards caused by filthy, stinky, and unhygienic public toilets.
- Well-designed sewage system should be designed in the village so no Septic tanks and pit latrines are needed and found in the entire village.
- Healthcare center to be run by Grampanchayat to facilitate healthcare facilities for villagers at affordable cost.
- The healthcare center should provide regular medical treatments but also host polio camps, Anti-epidemic programs, Birth control programs, Emergencies. The campus shall display healthcare signage's which is informative to visitors and patients in waiting areas.
- The management should take all necessary steps to ensure biomedical waste is handled properly. The collection of biomedical waste includes the use of different colored containers for example Yellow- infectious waste, bandages, Blue- Glass bottles, broken glass, etc. Green- Plastic waste such as catheters, injections, syringes, etc.
- Provision of covid 19 wards to avoid the contact of these patients from others. Additionally, Awareness signage should be displayed all over the village.
- Clean cooking measures to the adverse health, social, and environmental impacts of solid fuel usage.
- Initiative to convert garden waste organic fertilizer at multiple common areas. This waste can further be collected and is converted into manure.
- Avoiding exposure of human waste in open and common areas of the village such as roads, open fields, river beds, and other common spaces. Signages showing Prohibition of open defecation be displayed at strategic locations in the village.
- Allotment of space for physical activity and social gatherings, which would have positive effects on physical and mental health maintenance and disease prevention.

5.2. Village Infrastructure development

- The village occupants within the village boundaries should have easy and quick access to basic amenities and ultimately reduce their migration activities and reduce the associated environmental impacts.
- Certain provisions to ensure a well-connected bus transport system with inter and intra-village bus services. This has contributed towards a more functional and economical approach for the user.
- Provision of an adequate number of small-sized cattle sheds that produce and distribute milk to the local milk dairies. This will encourage the use of milk and local milk products and their distribution.
- Gram-Panchayat should appoint a Gram Vikas Adhikari who will serve as an emergency contact.
- Signages showing prohibition of water contaminations are provided along riverside.No felling of trees is allowed near water reservoirs.
- Periodic Monitoring of water supply network to detect leaks, cleaning, and maintenance of pipelines and water tanks.
- Provision of efficient stormwater drains and drainage ditches will help in the prevention of flooding, muddiness, sanitary system overflow, and infrastructure damage.
- Protect trees & enhance green cover in the village, has many environmental, health, and social Benefits- Trees produce oxygen, intercept airborne particulates, and reduce smog, enhancing a community's respiratory health. Trees sequester carbon (CO2), reducing the overall concentration of greenhouse gases in the atmosphere. Green cover acts as a natural air conditioner

5.3. Water Conservation and Management

- All the rainwater from road, landscape, hardscape, and terrace should be captured or recharged the stormwater runoff to enhance the aquifer levels and reduce dependence on potable water.
- Provision of a Root Zone treatment system (RZTS) to treat the wastewater. The main benefit of this system is that it is operated with gravity and natural materials. No operating power and no chemicals are needed for this efficient treatment technique.

5.4. Energy Availability and Efficiency

- Energy efficiency measures to be implemented in the village –
- Street lighting demand by LED/ CFL/ T5 lights
- Household lighting demand by LED/ CFL/ T5 lights
- White goods in the household use BEE star labeled appliances
- Use Solar Water Heating Systems for household water requirements to reduce fuel usage.

5.5. Material and Resources

- Use of locally available materials like Fly ash Block, Mangalore tiles, Stone flooring, harvested wood, Thermo Mechanically Treated (TMT) bars.
- Local Signage's spread all over the village area to promote awareness about safe handling and proper disposal of plastic waste.
- The Plastic wastes are commonly collected and transferred to the scrap centers.

5.6. Social and Community Actions

- Installation of Green signage at intervals to educate the people and visitors.
- Banners on the main road and common areas about the latest awareness or information. For example, COVID awareness posters and banners were installed to state the importance of masks and social distancing.
- The monthly reporting of the maintenance of energy supply, water control and quality, waste management, and other village amenities.
- Introducing the concept of E-learning which includes computer-based, web-based, technology-based learning, and virtual education opportunities. It helps rural students make non-traditional career options for the future.

5.7. Innovation in design

- To provide a solution that would act as a waste collection, and disposal system, a safe disposal solution for sanitary pads.
- A technique of natural farming where all the villagers come together and make Seed Balls. These seed balls are made with red clay from their farmlands.

6. Major Conclusions:

The village case study was realized to be a great working opportunity at the rural level to display sustainable aspects with implementation, audits, and overall experience. The improved lifestyle, awareness, and end-user enhanced quality of life was a satisfying observation. The criteria and variables as described by IGBC Green villages can be directly adopted for any rural area or village in the country to achieve the tangible and intangible benefits concerning the environment, social, and economic upliftment of the village people. The formation of the Ecovillage stature helps resources of water, energy, and immediate nature with its interrelationship to the immediate environment.

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Analysis of Chhari Dhand wetland and Banni Grassland, Bhuj, Gujrat and its impact on local communities.

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Abstract

The Banni grassland in Gujarat's Kachchh district is one of the largest grasslands in the Indian subcontinent. The area is flat with an altitude of 3-5m above MSL with high salinity. It is a region that is both socio-culturally unique and ecologically valuable. Ecologically the Banni is a "unique" grassland ecosystem because large parts of it are "inherently saline". It hosts rare grass species which support many endemic and endangered species and thousands of migratory birds. It has been home to more than 20 ethnic semi-nomadic communities.

Domestic animals like cows, buffaloes, goats, sheep and camels as well as wild herbivore thrive on these rare grass species. For four centuries Maldharis have been practising pastoralism (breeding cattle, buffaloes, goats, sheep and camels) and trading livestock not only all over India but outside India also.

Chhari Dhand is the largest natural salty wetland in Banni and is a Ramsar site. This is a seasonal desert wetland and only gets swampy during a good monsoon, receiving water from the north flowing rivers as well as from the huge catchment areas of many surrounding big hills. Chhari-Dhand is a Bird sanctuary. Nearly two lakh birds which are migratory and endangered, flock into the area in thousands during monsoon and winters.

Due to damming of rivers, frequent droughts, invasive species, climate change these areas are under constant degradation. Causes of degradation are natural as well as anthropogenic.

The aim of paper is to analyse the changing trends causing degradation vis-à-vis the earlier status of this area and its impact on the local community. It also aims to propose guidelines for restoration and prevention of further degradation, based on similar case studies carried out elsewhere.

Keywords: Grassland, wetland, Local communities, Degradation.

1 Introduction

Grasslands can be defined as terrestrial ecosystems dominated by herbaceous and shrub vegetation and maintained by fire, grazing, drought and/or freezing temperatures.Grasslands are one of the major terrestrial ecosystems of the world, and cover about one-third of the Earth's terrestrial surface. (BENGTSSON). Worldwide, grassland ecosystems are predominant in the areas of low-moderate annual precipitation, relatively thin soil (WHITE, 2000). The grassland biome is made up of large open areas of grasses and cover about one-third of the Earth's terrestrial surface.Types of grasslands include savannas and temperate grasslands (Bianca O. Andrade a, 2015) . Grasslands encompass the savannas of Africa, the grasslands of Australia, the cerrado and campo of South America, the prairies of North America, and the steppes of Central Asia (KEMP, 2007). Grasslands are among the ecosystems with highest species richness in the world and they provide a wide range of ecosystem services. Grasslands play an important role within the global carbon cycle, as 90% of their biomass is belowground, accumulation rates are high, and decomposition of organic material slow. As main forage resource for livestock, grasslands are important for human well-being in many regions. They facilitate infiltration of water into the soil and thus to the maintenance of hydrological cycles. Finally, grasslands contribute to the landscape beauty of many regions. Thus, they are multi-functional systems but at the same time subjected to unsustainable use and conflicting interests (Bianca O. Andrade a, 2015).

1.1 Significance of Grassland Ecosystem

Grasslands are among the most widely distributed ecosystems in the world, provide diverse ecological services essential for human populations within and beyond grassland regions.The concept of ecosystem service (ES) provides a crucial bridge between biodiversity/ecosystem function and human well-being (J Sarukhán). Grassland ecosystem services refer to all the benefits (including products, resources, and environment) provided by biodiversity and ecosystem structure and function of grasslands to meet the needs of human survival, life, and well- grasslands also provide important non-physical services, e.g., climate regulation, erosion control, recreation and tourism, and inheritance of national culture, to human beings along with its biodiversity (Wu). However, over the past 50 years, approximately 60% of the studied ESs have been degraded due to increases in global population and economic growth, especially in drylands. The Millennium Ecosystem Assessment (MA) by the United Nations also emphasises importance to adapt the ESs concept to the understanding of grassland degradation and restoration (J Sarukhán).

The Grassland Ecosystem Services are classified into three categories namely, provisioning services, Regulating services, and Cultural services. Provisioning services refer to the basic materials that ecosystem provides for maintaining human survival and life. Grasslands provide food, fresh water, fiber, and bioenergy, as well as ornamental plants, a genetic library, and habitat for animals and plants. Grasslands provide numerous regulating services, including climate regulation, carbon sequestration, erosion control, water regulation, air quality regulation, soil formation, pest control, waste treatment, and pollination services. Additional regulating services provided by grassland are air quality regulation, biological invasion and pest outbreaks control, waste treatment, nutrients maintenance, and pollination promotion, intercept pollutants and respirable particulate matters. Cultural services of grasslands include horse riding, bird watching, aesthetic appreciation, and cultural heritage. Grassland ecosystems also have important educational and scientific values because of their unique biodiversity and many rare plant, animal, and insect species. A healthy grassland ecosystem can maintain the biodiversity and inherit the national culture. The nomadic pastoral culture, which heavily relies on rotation grazing to avoid overgrazing, is the basis of the development of the grassland culture. Compared with the farming culture, nomadic pastoralism is conducive to conserving environments, and studies found that the conflict between them had affected land desertification and regional sustainable development (Wu).

1.2 Grassland degradation

The degradation is the reduction or loss of biological or economic productivity in decreased yields, incomes, food security and the loss of vital ecosystem services.Grassland degradation leads to land

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desertification. It is result of human activities (overgrazing, reclamation) and unfavourable natural conditions. Grassland degradation is a complex process that integrates various aspects, including changes in soil conditions, biodiversity, productivity, and socio-economics. Therefore, comprehensive assessment of grassland degradation and restoration is increasingly important (Xuefeng Zhang, 2016). The major modifications done for grassland are conversion of land to agriculture, urbanization/human settlement, desertification, fire, grazing of domestic livestock, fragmentation, and the introduction of non-native species (Wu).

 The effects of grassland degradation include the decline of suitability of vegetation for multiple uses (grazing, biodiversity conservation and recreation), the increase of proportion of less palatable plants, the increase of erodibility of topsoil, and the decrease of root-zone moisture holding capacity (Xuefeng Zhang, 2016). Degradation also affects the hundreds of millions of people who rely on grasslands for food, fuel, fibre and medicinal products, in addition to cultural values. Cost of grassland degradation on livestock production has been estimated at $6.8 billion over the period 2001–2011 with the resulting impact on human welfare being particularly severe in regions where most of the population is below the poverty line. Grassland degradation also creates major environmental problems, as grasslands play a critical role in biodiversity conservation, climate and water regulation, and global biogeochemical cycles (Richard D. Bardgett, 2021).

Grasslands are under severe threat from ongoing degradation, undermining their capacity to support biodiversity, ecosystem services and human well-being. Socio-ecological solutions are needed to combat degradation and promote restoration. (Richard D. Bardgett, 2021)

Within terrestrial ecosystems, more than two thirds of the area of two of the world's 14 major terrestrial biomes (temperate grasslands and Mediterranean forests) and more than half of the area of 4 other biomes (tropical dry forests, temperate broadleaf forests, tropical grassland, and flooded grasslands) had been converted primarily to agriculture by 1990. Roughly 10–20% (low to medium certainty) of current grassland and forestland is projected to be converted to other uses upto 2050, mainly due to the expansion of agriculture and, secondarily, because of the expansion of cities and infrastructure (J Sarukhán, 2005).

1.3 Traditional management of grasslands and wetlands

The anthropologist Claude Levi-Strauss argued that traditional knowledge and scientific knowledge are two parallel modes of acquiring knowledge.Traditional knowledge is often encoded in rituals and in the cultural practices of everyday life while scientific knowledge include systems and documents outside people residing in it. Since 1990's more scientist's are stuying on Traditional Ecological Knowledge due to a recognition that such knowledge can contribute to the conservation of biodiversity,rare species, protected areas, ecological processes, and to sustainable resource use in general (FIKRET BERKES). Various modern management systems are used worldwide which threaten the traditional management practices of grasslands. Understanding existing traditional grassland management could greatly help to improve our ability to preserve biodiversity in traditionally managed farmlands. (Dániel Babai).Millenium Ecosystem Assessment report also lay emphasis on developing local conceptual framework based on local concepts and principles rateher that following the existing framework by report. This will allow local communities to take ownership of their assessment process and give them the power both to assess the local environment and human populations using their own knowledge and principles of well-being and to seek responses to problems within their own cultural and spiritual institution (J Sarukhán).

Fikret Berkes states that this knowledge system is adaptive management of grassland. We have to document the traditional ecological knowledge used by local farmers to manage species-rich grasslands before this knowledge disappears forever. According to Lewis, traditional ecological knowledge begins with local knowledge at the level of taxonomic systems and then proceeds to the understanding of processes or functional relationships. Traditional ecological knowledge is a combination of elements of theoretical knowledge, the practical experience, and beliefs. Thus, traditional knowledge provides lessons not in resource management but in dealing with human-environment relations (Berkes).

Some traditional knowledge and management systems use local ecological knowledge to interpret and respond to feedbacks from the environment to guide the direction of resource management.

These traditional systems are form of adaptive management with its emphasis on feedback learning, and its treatment of uncertainty and unpredictability intrinsic to all ecosystems (FIKRET BERKES). The study of temporal dimension of the landscape perspective, i.e., an historical landscape perspective is very important. Landscape history consider a time-depth study in the ecological processes that affect species, communities and landscape structure, history of the human culture. Other historical perspective in studies which need to be considered are long-term changes in species distributions resulting from climate change, study of different time-scales associated with different ecological patterns and processes, evolutionary processes acting over shorter or longer time periods (Ove Eriksson, 2014).

The research in historical ecology integrates both historical and ecological phenomena as they have changed over the course of time. It is known that present-day patterns of species richness, particularly in grasslands, may reflect long-term management history. The use of history to set up conservation and restoration goals can be considered as "applied historical ecology" Historical ecology provides information when we want to consider valuation in conservation biology in terms of "heritage", "tradition" and "identity", which are components of cultural ecosystem services (Ove Eriksson, 2014).Local people who possess knowledge can transfer this historical review of grasslands while doing sustainable management of Grasslands.

The present study was undertaken with following objectives: To analyse and evaluate various studies regarding restoration of wetland and grasslands within the Banni area and elsewhere w.r.t. traditional knowledge and traditional management systems.Keeping in view the general principles of restoration(here the principles laid down by the environmental Protection Agency,US regarding wetland restoration are considered),identification of those results and recommendations put forth in the above studies which align with these principles.To suggest comprehensive guidelines for restoration of the Banni and Chhari Dhand areas based on these general principles and recommendations derived from above studies.

2 Materials and Methods

2.1 Study area

Kachchh district in the state of Gujarat is characterized by having vast stretches of saline desert, salt marshes and 2 grasslands. The grasslands in this district are popularly known as 'Banni' which are spread over an area of 2618 sq.km and account for about 41% of the geographical area in the district. Banni is the western-most end of the Gujarat state, as well as India. Banni was derived from a Kachchhi word "Bani", which means "Banni hui" in Gujarat (made up); It signifies the land that has been formed by detritus and sediments brought down by the rivers such as Indus, Luni, Banas and Saraswati.The Banni grassland, once referred to as Asia's finest grassland, accounts for approximately 45% of the permanent pasture and 10% of the grazing ground available in the state

The climate of Banni is arid. Therefore, the temperature is high most of the time, and it reaches a maximum of 48°C–49°C during May and June (the hottest months). The winter temperature goes down to 10°C, with January and February being the coldest months. The total annual rainfall, occurring through the southwest monsoon between June and September, is very low with an average of 317 mm per year with a coefficient of variation (P. N. JOSHI).
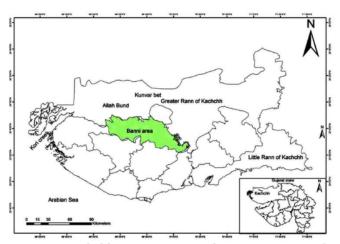
Figure 1. Kachchh District – Map Showing Location of Banni Grassland

Banni region has a very fascinating history, geography, biodiversity and culture. Altogether, 13 different communities inhabit the area and vast majority belongs to the Maldharis who reside in 48 villages or 'wandh'. There is a traditional form of human-livestock-grassland interaction, which is still predominant in Banni. Maldharis have inherited traditional fresh water harvesting system known as Virda, traditional knowledge of medicinal plants and breeding drought tolerant highly productive livestock. The herders, especially the Maldharis of the area keep animals of superior breeds, supplying them to various parts of the state and even to other neighbouring states. However, due to establishment of milk cooperative societies, the people of Banni are inclined towards selling the animal products such as milk and butter. The Livestock of Banni area include cattle, buffaloes, sheep, goats, horses, donkeys and camel. There are two breeds of cattle, viz., Kankrej and Gir, of which Kankrej is the heaviest breeds of the Indian cattle and known for excellent drought resistance capacity.

Banni grasslands consist of two ecosystems in juxtaposition, viz., wetlands and grassland. They provide habitat for resident as well as migratory birds, ideal conditions for many soil fauna and important habitat for typical grassland ungulates such as chinkara and blue bull. The vegetation of Banni grasslands is dominated by grasses, few herbs, fewer shrubs and trees. there are at least 192 species of vascular plants. It was found that total productivity was 3096.16 kg/ha of which only 33.06 per cent (1023.66 kg/ha) was of palatable, while rest was unpalatable. Of this, the productivity of palatable grass species was 483 kg/ha. Total 262 species of birds were recorded in Banni during the period between 2009 and 2011. Among the recorded birds, 118 were resident to Banni, 76 species were resident and rest of 68 species were migratory. Banni grasslands include five species of amphibians and 13 reptiles belonging to 13 families. A total of 12 species of mammals belonging to 9 families were recorded in Banni area. The livestock owned by Maldharis generally graze within or around the vicinity of village and have definite grazing routes. Cattle mainly feed on grasses in low to moderate saline areas while buffalo sustain with in high saline areas. Livestock and wild herbivores share the same habitat for grazing which may overlap at some places (V. Vijay Kumar).

In case of extreme climatic events like drought,flooding the resilience of grassland species is useful for restoration than resistance. The presence of a dominant species capable of rapidly recruiting new individuals and restoring function after an extreme climatic event underpinns high ecosystem resilience of any grassland. The knowledge of the traits that influence dominant species responses to and recovery from climate extremes will be key for predicting ecosystem dynamics and function in a future with more extreme events (DAVID L. HOOVER, 2014).

Some of the locally highly preferred grass species were also considered to be declining in the local environs; they included Dichanthium annulatum (Jinjvo), Cenchrus ciliaris (Dhaman), Sporobolus fertilis (Khevai) and Chloris barbata (Siyarpuchha) (P. N. JOSHI). These are key species which help to restore ecosystem after extreme climatic events, These grasses along with some thorny trees with edible fruit and are protected and conserved by local people.

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Kachchh district has highest wetland (51.72%) area among all districts of the Gujarat state. Human - wildlife conflict zones are increasing day by day around the wetland ecosystem areas with human intervention and habitat disintegration. Many threatened floral species along with Threatened birds,reptiles and mamals are identified in these conflict zones.

However, unregulated grazing coupled with frequent droughts has led to degradation of Banni grasslands in recent decades. Several authors have raised concern over habitat degradation, desertification and increased salinity in and around Banni grasslands, Currently Kachchh district supports ca. 1.7 million heads of livestock which has increased from 9.40 lakh in 1962 to 17.02 lakhs in 2007. This implies that these grasslands are the key to socio-economic growth in the state (V. Vijay Kumar).
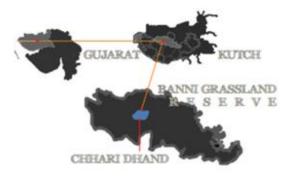
Figure 2: Map of Chhari Dhand wetland

Chhari Dhand is the largest natural salty wetland in Banni and is a Ramsar site. This is a seasonal desert wetland and only gets swampy during a good monsoon, receiving water from the north flowing rivers as well as from the huge catchment areas of many surrounding big hills. Chhari-Dhand is a Bird sanctuary. Nearly two lakh birds which are migratory and endangered, flock into the area in thousands during monsoon and winters.

2.2 Methods

For the purpose of this paper the following methodology has been adopted:

The changing trends of grassland degradation have been documented through various research studies in the study area.

The previous research projects carried out in the study area of Banni villages have been documented, analyzed and assessed based on the degradation and restoration methods suggested for the same.

The research projects by various authors and government agencies, NGO's etc. have been analyzed from local /Traditional management perspective of grasslands.

Relevant national and international case studies which emphasize the need for integrating the traditional systems along with existing scientific knowledge systems have been presented so as to arrive at actionable guidelines that may be followed to achieve sustainable restoration of this area.

The general guiding principles for restoration recommended by Environment Protection Agency,US (Agency.)are used as a measure to study how the recommendations and findings of the selected case studies fit into them and these recommendations are suggested herein as guidelines for restoration of Banni grasslands. The recommendations which did not explicitly fit in any of the above principles have been enunciated as additional guidelines so as to have a comprehensive picture of the measures to be taken for restoration of Banni grassland area.

3 Results and Recommendations

3.1 Case studies highlighting Traditional management of Grass lands and wetlands

3.1.2 Case study 1

P.N.Joshi, V. KUMAR, M. KOLADIYA, Y. S. PATEL, T. KARTHIK studied the local perception of grassland and conservation strategies for conservation of grassland of Banni.

Objective: To investigate the local perceptions of grassland change, regeneration potentiality, socio-economic status and factors that cause degradation of the vegetation resources in Banni

Approaches used : Participatory Rural Appraisal (PRA) was employed to generate the socio-economic profile of interviewed villages or hamlets. Interviews with 51 elderly maldharies (pastoralst) and local inhabitants living in 31 villages in Banni are carried out.

Results and observations : Local knowledge has the potential to be a reliable source of information about local vegetation characteristics with regards to developing sustainable grazing and restoration startegies. Local inhabitants explained strongly that poor rainfall, constitutive drought, and plantation of invasive species were the main causes of the decline of grassland, and only a few believed damming on rivers was a major cause. Logging and overgrazing, furthermore, enhanced the degradation process.

The solutions forwarded by the respondents to conserve the grassland habitats were formation of control and management grazing systems, fodder tree planting, solving the problem of the land, maintenance of healthy grazing sites, allocation of a budget to the villagers and to train them, and development of ecotourism.

The complex process inherent in communal grassland functioning needs a holistic approach, involving resource users and a set-up of the Household Responsibility Contract System (HRCS), scientists and policy formulators for improved management of grasslands, pastoral animal husbandry, and native biodiversity.

Recommendations:

Strategies are needed to ensure that all pastoralist communities and poor households are able to benefit equally from the native grassland of the Banni region. However, development plans aimed towards these communities need to blend policies and technologies with indigenous knowledge systems held by the communities. Past grassland development or restoration efforts in the Banni region that were imposed by the government through various agencies in the 1990s collapsed shortly after implementation due to the lack of ownership as the communities were never involved during the planning stages (P. N. JOSHI).

3.1.2 Case study -2

Ecology and Management of Banni Grasslands of Kachchh, Gujarat studies was published by ENVIS and authoured by V vijay Kumar, Arun Kumar Roy Mahato, Rohitkumar Patel.

Objective : This article provides a review of current status in terms of biophysical features, land use practices, threats and long term management strategies of these grasslands.

Approaches used: Review of data and literature.

Results and observations : The degradation of Banni grasslands is largely attributed to breakdown of traditional resource management system which had helped in the maintainance of equilibrium between environmental system and human activity since several centuries (National Research Council, 1986). Recent interventions such as introduction of P. juliflora, introduction of additional livestock have led to reduction in carrying capacity of these grasslands.

Recommendations:

Control of soil salinity is the core issue.So the strategies like drain to leach the soil and consrvation and restoration of saline tolerant native grasses,trees,herbs should be adopted.

To reduce the pressure on grassland and maintenance cost of the animals and to generate a sizeable income for the Maldharis, it is essential to maintain fewer and better breeds of livestock to avoid over grazing.

Appropriate management plan for managing P. juliflora as an alternative livelihood options and employment generation in Banni and Kachchh.

Development of grassland area for fodder security and grazing regulations are essential for maintaining the grassland in a sustainable manner.

Permanent solutions in form of Appropriate disaster management for fodder problems, shelter problems, various diseases in case of droughts and heavy rainfall shuold be provided by government agencies.

Grassland development programmes initiated by GUIDE, GEC and GSFD need to be strengthened to cover more areas under restoration and undertaken through active participation of local villagers.

The grassland degradation in Bannis is largely due to lack of management policy or failure of the policy. It is a prerequisite that the planning and policy needs to be integrated using the scientific and local knowledge for developing and utilizing the resource in a sustainable manner (V. Vijay Kumar).

3.1.3 Case study -3

J.P. SHAH, A.M. PATEL AND P.N. JOSHI of Gujarat Institute of Desert Ecology (GUIDE) published a research paper on Participatory natural resources mapping(PNRM) case study of Bhitara Panchayat in Banni grasslands.

Objective: To demonstrate the integration of field data and remotely sensed data under GIS domain, identify natural resources (land and water) and infrastructure facilities in and around the selected villages, to assess the land use and land cover of Bhitara Panchayat using people's participation methods and to understand the dependence of the local people on the surrounding natural resources for various requirements such as fodder, fuel, water, etc. and their accessibility.

Approaches used: Nine months of field survey at Bhitara Panchayat villages.
Series of meetings were held at various levels with local stakeholders to collect the data on natural resources like existing natural resources and their distribution, grassland status with salinity classes, participatory restoration methods and socio-economic status of each family.

Based on participatory exercise (or participatory rural appraisal) with various groups, The conclusion was drawn to recommend site specific strategies for conservation and sustainable utilization of natural resources.

Results and observations: Jat muslims is the most dominant community in selected Panchayat villages with livestock rearing activities as the main occupation. Local inhabitants were using charcoal as main source of energy to fulfill their daily requirement as well as had also adopted Prosopis-based charcoal making as business to earn surplus money for their livelihood.

Natural habitats have been lost through invasion of Prosopis juliflora (locally called Ganda Bavar) and had resulted in significant loss of wetland area, degradation of remaining natural resources and a consequent decrease in the diversity of native land use type and species.

People lacked the knowledge of government developmental schemes and programmes so couldn't avail their benefits.

The resource use potential of local people has not been planned scientifically for sustainable development of the Banni region.

Recommendations:
Development efforts need to incorporate indigenous knowledge, local systems of knowledge, and the local environment, to achieve their desired objectives (J.P. SHAH, 2010).

3.1.4 Case study -4

Ajoy Das, Shital H. Shukla, Pankaj N. Joshi, Pradeep P. Prajapati done the research on Wetland ecosystem sustainability over human wildlife conflict in and around Lakhpat taluka, Kachchh district, India.

Objective: This study attempts to identify bioregion and threatened region by using multi criteria-based model through geospatial technology. To analyze the water efficiency around the study area. To identify the suitable and threatened zone for the wildlife. To find out the human-wildlife conflict areas of the wetland ecosystem region.

Approaches used: Toposheets from Survey of India (SoI) website, for physical survey of wetland area ,Satellite imaginary and Census of India & District Census Handbook. The focus group discussion was also conducted during the field visit with local people/ Maldhari community to collect the information. Multi criteria-based model through geospatial technologies are used.

Results and observations: The environmental degradation and the human wildlife conflict are adversely affecting not only the physical environment, but also the quality of life.

Temporal variation in wetlands were mapped and a suitable habitat with threatened zones or eco sensitive areas were identified for Lakhpat taluka.The disturbed wetland ecological area as well as the suitable habitat zone was also identified.

Invasion of Prosopis juliflora is resulting in habitat disintigration.

Various stresses like land use changes in the catchment area, Encroachment of reservoir area for industrialization, excessive diversion of water for agricultural practices, became the disturbed or threatened wet-land ecosystem. Lack of good governance and management are also main reason for the wetland ecosystem disturbance.

Major cause for the loss of floral diversity is habitat disintegrations. The ecosystem of this region is being affected adversely due to temporal variation in climate, change in physiological set up and legal and illegal mining by the people.

Recommendations:

The database generated in this study would be very useful for doing biodiversity conservation management plan from the grass root level for the Kachchh district; especially for the Gujarat Government. It will help to take any conservative decision for the development of any part of the Kachchh district. This attempt will be more useful for future planning through this study. (Ajoy Das)

3.1.5 Case study- 5

Dániel Babai , Zsolt Molnár have done the research on Small-scale traditional management of highly species-rich grasslands in the Carpathians,Romania,Europe.

Objective: To study the management of species rich man made grassland and the related traditional ecological knowlwdge.

Approaches used: Methods of ecological antrhopology eg. Participatory field work,semi-structured interviews (33 numbers) and free listings.

Results and observations: The study shows that extensive farming cannot be replaced by conservation treatments. Maintaining traditional land management can be a key factor to conserve biodiversity, because traditional ecological knowledge and the associated informal institutions are more effective than direct conservation measures. Direct conservation measures require considerable financial spending in the absence of effective production and economic interest, which makes conservation-based grassland management unsustainable on the long run. The study also states that biocultural diversity in the Alps could be managed most productively by conserving the cultural processes and diverse local communities of resilient humans who created these landscapes in the first place.

Recommendations: The solution may be a new system of regulations that is adapted to local conditions, and thus is capable to promote the maintenance of extensive land-use systems that are rooted in the past. It is important for subsidy systems to incorporate the notion that systems of extensive land use were capable to create and maintain diverse semi-natural grasslands over centuries, and they are suitable for continuing this in the future given that regulations provide the conditions needed. The paper also argued that conservation policy in traditional farmlands should consider not only the "land-use link" between the people and landscape (i.e. farmers are paid to clean the pastures) but also the "ecosystem services link" too (e.g. farmers clean the pastures because they want high quality ecosystem service: they learned what is the best pasture management to have high quality pasture). Policies need to promote farmers motivation to learn and monitor the quality of the ecosystem services provided by the ecosystems, as traditional landscapes (Dániel Babai).

3.2 Guidelines

3.2.1 Principles and Guide lines

Principles are based on United States Environmental Protection Agency's document on Principles of Wetland Restoration. The relevant recommendations from above case studies are evaluated to form guidelines (Agency.). The principles of restoration are enumerated in the points below and the recommendations from the above case studies which match or fit into these principles are described herein below the relevant principles.these will serve as guidelines for further restoration projects in the area.Other recommendations from these studies have been included as "additional Guidelines".

1.   Restoration, protection of resources and preservation of biodiversity are complementary activities. The primary aim of any restoration activity should be to prevent further degradation.

2.   Restoration of the ability of the ecosystem to maintain its organisation in the face of changing environmental conditions i.e. ecosystem integrity is of primary importance.

3.   Restoration of natural structure, physical characteristics and function is essential. The area to be restored should be brought as close as possible to the natural structure that it was in before degradation.

4.   Restoration projects can be taken up in localised areas but for them to be effective, the entire area in the broader content should be targeted suitably.

5.   Establishing restoration goals for an area requires knowledge of the historical range of conditions that existed on the site prior to degradation and what the future conditions might be. This information can then be used for determining appropriate goals for the restoration projects.

Case study recommendations (Guidelines): Strategies are needed to ensure that all pastoralist communities and poor households are able to benefit equally from the native grassland of the Banni region. However, development plans aimed towards these communities need to blend policies and technologies with indigenous knowledge systems held by the communities. Past grassland development or restoration efforts in the Banni region that were imposed by the government through various agencies in the 1990s collapsed shortly after implementation due to the lack of ownership as the communities were never involved during the planning stages (P. N. JOSHI).

6.   It is essential to identify and eliminate or remediate ongoing causes of degradation.

7.   For restoration, clear, achievable and measurable goals are required. The chosen goals should be achievable ecologically given the natural potential of the area and socioeconomically, given the available resources and extent of community support for the project. also, all parties affected by the restoration should understand each project goal carefully to avoid subsequent misunderstandings.

Case study recommendations (Guidelines): Appropriate management plan for managing P. juliflora as an alternative livelihood options and employment generation in Banni and Kachchh. Development of grassland area for fodder security and grazing regulations are essential for maintaining the grassland in a sustainable manner. To reduce the pressure on grassland and maintenance cost of the animals and to generate a sizeable income for the Maldharis, it is essential to maintain fewer and better breeds of livestock to avoid over grazing (V. Vijay Kumar).

8.   The restoration project should be scientifically, financially and socially feasible. Solid community support for a project is needed to ensure its long-term visibility. Ecological feasibility is also critical. For example, a wetland restoration project is not likely to succeed if the hydrological regime that existed prior to degradation cannot be re-established.

9.   Use a reference site: Reference sites are areas that are comparable in structure and function to the proposed restoration site before it was degraded. As such, reference sites may be used as modes for restoration projects, as well as a yardstick for measuring the progress of the project.

Case study recommendations (Guidelines): The study identified a close coincidence between the interest in conserving tree species diversity nearby the natural water resources and priorities of local inhabitants, which included protection of plenty of large trees including many fruit tress, improvement of woody fodder tree and grass species regeneration. These conserved sites and local knowledge by local people can become a reference site (P. N. JOSHI).

10.   Anticipate future changes: The environment and our community are both dynamic. Although it is impossible to plan the future precisely, many foreseeable ecological and social changes can and should be factorised into restoration design.

Case study recommendations: Since last few decades, Banni area which is traditionally semi-arid is experiencing frequent droughts and high rainfall patterns. These climatic extreme events should be considered while planning any restoration plan. Many key species which help to restore ecosystem after extreme climatic events. These grasses along with some thorny trees with edible fruit and are protected and conserved by local people (P. N. JOSHI) (DAVID L. HOOVER).

11.   Involve the skills and insights of a multidisciplinary team.

Case study recommendations (Guidelines): Universities,government agencies and private organisations through collaborations may be able to provide useful information and expertise to help ensure that restoration projects are based on well balanced and thorough plans. The solutions forwarded by the respondents to conserve the grassland habitats were formation of control and management grazing systems, fodder tree planting, solving the problem of the land, maintenance of healthy grazing sites, allocation of a budget to the villagers and to train them, and development of

ecotourism (P. N. JOSHI). Grassland development programmes initiated by GUIDE, GEC and GSFD need to be strengthened to cover more areas under restoration and undertaken through active participation of local villagers.The grassland degradation in Bannis is largely due to lack of management policy or failure of the policy. It is a prerequisite that the planning and policy needs to be integrated using the scientific and local knowledge for developing and utilizing the resource in a sustainable manner (V. Vijay Kumar).

12.   Design for self-sustainability: In addition to limiting the need for maintenance, designing for self-sustainability also involves favouring ecological integrity, as an ecosystem in good condition is more likely to have the ability to adopt to changes.

Case study recommendations (Guidelines): Drains to leach soil salinity and restoration of saline tolerant grasses,herbs,trees should be planned.Maintain fewer and drought resistant native breeds of livestock.Involve local people in participatory management.Along with pastoralism,encourage local people to undertake business based on utilisation of P. Juliflora. E.g. to prepare furniture and charcoal etc (V. Vijay Kumar).

13.   Use passive restoration when appropriate: Before actively altering a restoration site, determine whether passive restoration i.e. simply reducing or eliminating the courses of degradation and allowing recovery time, will be enough to allow the site to naturally regenerate.

14.   Restore native species and avoid non-native species.: Many invasive species outcompete natives because they are expected colonizes of disturbed area and lack natural controls.

Case study recommendations (Guidelines): In case of Banni,the problem created due to the non-native species P.juliflora needs to be addressed.

15.   Monitor and adopt where changes are necessary: Monitoring before and during the project is crucial for finding out whether goals are being achieved. If they are not

16.   "mid-course "adjustment in the project should be undertaken. (Agency.)

3.2.2 Additional guidelines

1.   Grass species and thorny trees with edible fruits and some large trees which are protected and conserved by local people considered as climate resilient in case of extreme climatic events like drought, flooding etc. Management strategies to conserve and restore these species is of prime importance.

2.   It is vital to maintaining fewer and better breeds of livestock to avoid overgrazing thereby reducing the pressure on carrying capacity of land. This will also yield sizable income to local people.

3.   Due to damming of rivers the detritus deposition and leaching of salinity of soil has stopped. This reduced the nutrient supply to soil and increased the salinity. Thus, restoring the soil back is of prime importance for thriving of native species. Traditional practise of mixing livestock manure in soil added nutrients and reduced the salinity.

4.   Integration of scientific knowledge systems along with traditional knowledge systems are utmost important for sustainable management of this ecosystems.

5.   Conservation policy in traditional farmlands should consider not only the "land-use link" between the people and landscape (i.e. farmers are paid to clean the pastures) but also the "ecosystem services link" too (e.g. farmers clean the pastures because they want high quality ecosystem service: they learned what is the best pasture management to have high quality pasture)

4 Conclusions

This paper analyses existing traditional knowledge systems and role of local communities in restoration of the grassland.After evaluating the existing case studies, the need for integration of scientific knowledge systems along with traditional knowledge systems was underlined for sustainable management of grasslands. The paper also reveals the prime role and impact of local people in restoration and sustainable management of grasslands.

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STUDY OF INDUSTRIAL DEVELOPMENT
A CASE STUDY – JALGAON

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Abstract: India is a developing country and industrialization is rapidly happening in this era. Due to the industrialization urbanization is increasing in medium level towns also. Industries provide job opportunity and an earning tool to the people even they are not residing in the same city/ town. So, in search of job, in-migration or out-migration takes place affecting the various parameters of the city like- socio-economic, socio-cultural, transportation, physical sprawl, etc. Nowadays, medium scale towns have a good potential to setup an industry. Because Government is providing many special incentives or schemes to motivate the people to setup an industry. In this background, I have chosen a study area of medium level town with a corporation named as Jalgaon. It is the Headquarter of Jalgaon District with good connectivity by all means of transport as it is situated centrally in the district. It is very reach in natural resources required as a raw material for industries. Jalgaon has a big MIDC area and co-operative industrial area too. There are some large-scale units which are established in 80's and 90's. It is observed that after these decades, industrial development is not as expected though the required transportation and incentives to promote the development is available. So, this study will give emphasis on how the industrial development happened in the town.

Keywords: migration, counter-magnet, balance development, economic base

Need of study:

Industrialization tends to social and economic change that transforms a human group from an agrarian society into an industrial one. It is a part of a wider modernization process, where social change and economic development are closely related with technological innovation. Industrialization in a city plays an important role in hiking the economy of that city affecting the various factors of planning. Industrial development has positive and negative impacts on growth of the city. When the industrial development happens in a city, it becomes like a counter-magnet for entrepreneurs and people from rural areas in search of job. The good infrastructure and transportation facilities are the pre-requisites of industrial development.

The efforts and skills which are put in by man to produce something useful from primary products are known as industry. Industrialization has to play a significant role in the economic development of any region. It not only strengthens the economic base and generates employment, but also adds to the income and productivity. In the context of regional planning, it has a special significance in that, it brings about a balanced development of different parts of region through extension of benefits of economic growth to less developed areas and widespread diffusion and dispersal of industries. To sow the seed of industrialization, it is necessary to create suitable industrial climate, through provision of economic and social overheads. The objects of economic development can be achieved through realizing the benefits of industrial exploitation of existing resources.

CASE STUDY- JALGAON CITY

1. National and Regional setting

Jalgaon town is the Head Quarter of Jalgaon District in Nasik Revenue Division of Maharashtra State. It is one of the important Railway stations on Mumbai-Delhi Broad gauge Railway line of central railway and a line of western railway branches off from here. The town is approached by a number of important roads like National Highway No. 6 (Dhule- Nagpur), Aurangabad, Jalgaon- Pachora, Mamurabad state highways. The other major District roads approaching the town are i) Mohadi road ii) Avhane road iii) Asoda- Khedi road iv) Jalgaon- Nimkhedi road. The other district road connecting the town are i) Pimprala- Saokheda road ii) Mohadi road.

Figure 1- Location of Jalgaon District

Source- https://www.google.co.in/search?q=jalgaon+map&oq=jalgaon+map&aqs=chrome..69i57.2140j0j7&sourceid=chrome&es_sm=93&ie=UTF-UTF, Last accessed- 5/10/2014

2. Area and Location

The total area included in Municipal limits 6824.27 Ha out of which the area of extended Municipal limits is 5678.85 Ha and the area of old Municipal limits is 1145.42 Ha. The Jalgaon town is situated at 21°- 01° North latitude and 75°-34° East longitude. It is situated at 420 Kms away from Mumbai, the capital of Maharashtra state and 413 Kms away from Nagpur.

The additional area of Jalgaon town includes the entire area within village limits of Pimprale, KhediBk and Nimkhedi villages and part areas of village Mehrun, Jalgaon, Avhane, Kusumbe, Asoda and Manyarkhede villages.

3. Civic Administration
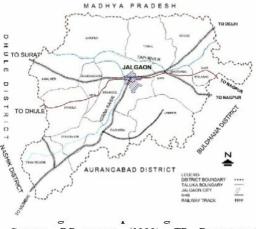
The district consists 15 talukas (tehsils). These are Jalgaon, Jamner, Erandol, Dharangaon, Bhusawal, Bodwad, Yawal, Raver, Muktainagar, Amalner, Chopda, Parola, Pachora, Chalisgaon and Bhadgaon. Jalgaon city is the administrative Headquarters of this district.Presently, there are 11 VidhanSabha (legislative assembly) constituencies in this district. These are: Chopda, Raver, Bhusawal, Jalgaon City, Jalgaon Rural, Amalner, Erandol, Chalisgaon, Pachora, Jamner and Muktainagar. Raver and Jalgaon are the two LokSabha constituencies in the district. There are 13 Nagar Parishad in district.

The location of Jalgaon and Bhusawal strategically important urban centre in the district on National Highway 6 and on the important railway transport route combined with the availability of water, power and other infrastructure provide a large potential for future industrial growth in the district particularly due to DMIC corridor.It becomes necessary to see that the growth of industries, trade, commerce and urbanization in the district expected in the coming decades are properly controlled and

guided so as to have a balanced development resulting into improvement into overall economy of the region as also to

raise the standard of living of the people after living due to consideration to the spatial distribution and allocation of various agricultural non-agricultural uses.
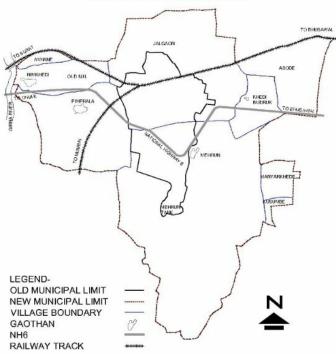
The civic administration of the town is managed by the Municipal Council which was established in the year 1864. Up till 1906, the town was Head Quarter of Taluka only. From 1906, City became Headquarter of the District. It was raised to the status of Municipal Barrough after passing of the Bombay Municipal Barrough's act 1925. Then it has acquired the status of 'A' class Municipal Council, as per the Maharashtra Municipalities Act, 1965.The total area included in Municipal limits is 6824.27 Ha. Out of which the area of extended Municipal limits is 5678.85 Ha. And

Source- DP report (1993), TP Department,

PLAN SHOWING MUNICIPAL LIMITS

LEGEND-
OLD MUNICIPAL LIMIT
NEW MUNICIPAL LIMIT
VILLAGE BOUNDARY
GAOTHAN
NH6
RAILWAY TRACK

the area of old Municipal limits is 1145.42 Ha.

The limits of Jalgaon Municipal Council has been extended under Government notification No. MUB- 1783/ 237/ CR-17/ 83/ UD-8, dt. 11th Sept. 1976, the Additional area includes the entire areas of villages Pimprale, KhediBk and Nimkhedi and part areas of villages Mehrun, Jalgaon, Avhane, Kusumbe, Asode and Manyarkhede. The administration of these villages was managed by the respective Gram Panchayat, till their inclusion in the limit of Jalgaon Municipal Council. Now the civic administration of these villages is being managed by Jalgaon Municipal Council. New extended Municipal limit is shown in Fig No. 3.

Figure 3- Map of Jalgaon Municipal Council Limit
Source- DP report, 1983, TP Department, Jalgaon

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Table 1- Table showing earlier efforts in

Sr. No.	Planning efforts	Sanctioned date & year
1	Master plan of original municipal limits	15th Dec 1958
2	Revised Development (Dev.) plan	16th Dec 1974
3	Municipal council limit extended	August 1976
4	Dev. Plan of extended area	25th Jan 1983
5	Second revised dev. plan	6th Jan 1993

Revised   Development   Plan

Figure 4 - Development plan, 1974

Development plan of Jalgaon (Extended limits) 1983

Figure 5 - Development plan, 1983, Jalgaon

Source- TP Department, Jalgaon

4. Development plan of Jalgaon (Extended limits) 1983-

The Jalgaon town is developing rapidly due to availability of natural resources such as good agricultural lands in the hinter land and the water resources and so also due to the fast growing industrialization, Trade and commerce and convenient communication links. The sporadic development had started coming up around the old Municipal limit. The development within the old municipal limits was being properly controlled by the sanctioned development plan. However, the area in the extended Municipal limits was developing fast without social amenities and for that Development plan for extended limits was necessary. Development plan of 1983 is shown in Fig No. 5.

5. Existing Land-Use map (2015)
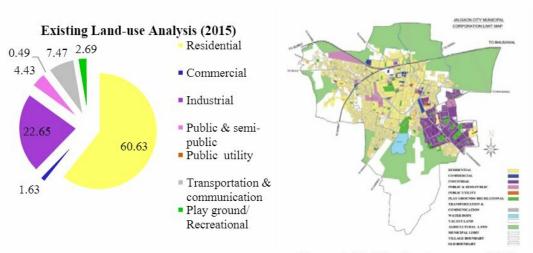
To understand the pattern of growth of the city, existing land use map is prepared. Fig. No. 6 shows existing land use map, 2015.

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Existing Land-use Analysis (2015)

- Residential
- Commercial
- Industrial
- Public & semi-public
- Public utility
- Transportation & communication
- Play ground/ Recreational

Figure 6- Existing land use map, 2015

6. Comparison between proposed land useand existing land use

As per the DP report of 1983, residential area was proposed to be 1966.2 Ha in next 20 years. But in the report of 1993, the existing residential area was 1044.97 Ha which is less than expectation. Again in 1993 residential area proposed to be 2847.01 Ha, but till 2015, it is not fulfilled. The growth of industrial development is quite balanced. Fig. No. 8 shows the existing and proposed residential and industrial land uses with the help of line chart.

RESIDENTIAL AND INDUSTRIAL LAND-USE
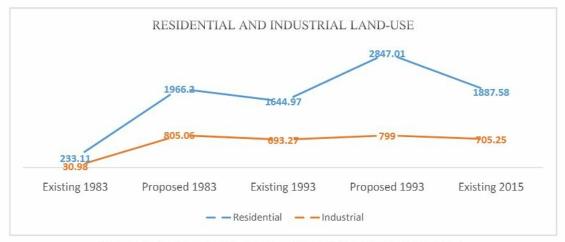
Figure 8- Comparison between proposed land use and existing
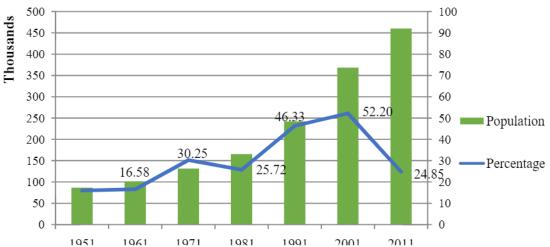
7. Population of Jalgaon City

The population of town (urban) as recorded in 1981 census was 1, 45,335 and the rural population of extended area now included within municipal limits was 20,172. Thus the total population of Jalgaon (Old + Extended) in the year 1981 was 1, 65,507. The growth rate of population is maximum in the decade 1991-2001 i.e., 52.20 following by the decade 1981-1991 i.e., 46.33.

Table 2- Population data of Jalgaon city

Population of Jalgaon City							
Sr. No.	1	2	3	4	5	6	7
Census year	1951	1961	1971	1981	1991	2001	2011
Population	86,704	1,01,080	1,31,652	1,65,507	2,42,193	3,68,618	4,60,228
Growth rate (%)	-	16.58	30.25	25.72	46.33	52.20	24.85

8. Working population

The majority of the workers are engaged in secondary and tertiary activities. As per 1981 census, the total workers in these two sectors are 84.38%. The total percentage of workers in these two sectors during 1991 is 84.68%. This indicate the urban character of the area. From the available data of census 1981, the percentage of workers in primary, secondary and tertiary sectors to total workers are 15.62%, 27.91% and 56.47% respectively and census 1991 14.57%, 26.36%, 58.32% respectively.

Fig. No. 10 shows the share of workers in city to district. It is negligible in Jalgaon City compared to the district. Fig No. 11 shows the distribution of male and female workers in secondary and tertiary sector. The growth rate of female increased from 1991.

The following Fig No. 12 shows the distribution of main and marginal workers. The growth rate of main workers increased from 1981 but marginal worker's growth rate increased from 1991.
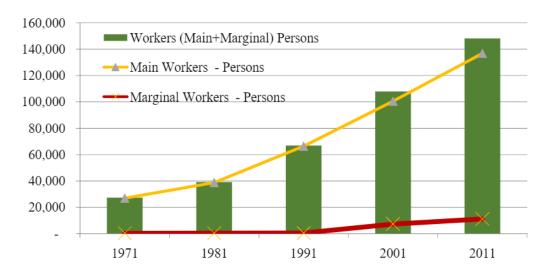
Figure 12 - Distribution of main and marginal workers

9. Industrial Development

9.1 Introduction

The Jalgaon town is situated at the centre of the district and is well connected by central and western railway lines to Mumbai, Delhi, Ahemadabad, Kolkata. It is situated on Dhule- Nagpur Highway No. 6. It is well connected by roads to important places of the state.

The industrial activity is mainly in the area of Maharashtra Industrial Development Corporation. There is also a Co-operative industrial estate on north side of MIDC. These industrial areas are located on Ajintha road near junction of NH6 and Ajintha road. The Co-operative industrial estate is fully developed, while the MIDC is in the process of development. Total area under MIDC and Co-operative industrial estate is 629.09 Ha and 19.03 Ha respectively and the area under scattered industries is 34.48 Ha in the town.
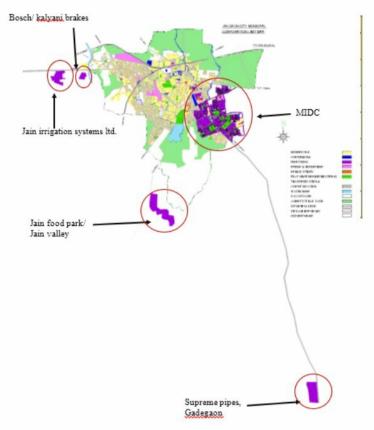
The present industries in the MIDC are chemical, pharmaceutical, engineering and special industries like synthetic fibre paper mill, filling of liquid petroleum gas, VIP, Bharat petroleum, Raymond, tiles factory, MSEB pole factory, Supreme pipes, Ajintha pharmaceuticals, etc. Besides these industries in MIDC, ST workshop, some service industries and small scale industries are also running along NH6. Some large scale industries like Govt. milk federation, Jain irrigation pipe factory, Patel fertilizers and pipe factory etc. are located at Nimkhedi and Pimprala villages.

- MIDC area- 629.09 Ha
- Co-operative industrial estate- 19.03 Ha
- Area under scattered industries- 34.48 Ha

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- Large scale industries like Jain irrigation, Bosch are located in Bambhori village adjoining to additional municipal limit on Western side.
- Industrial area in Jalgaon area is located in Kusumba, Meharun and Manyarkheda.

9.2 Location of MIDC and major industries on ELU

- The following Fig No. 13 is showing the locations of major industrial area on ELU of 2015

Figure 13- ELU of Jalgaon showing locations of industries and MIDC

9.3 Industrial units data

Table No. 3 shows the no. of units registered under DIC in a decade. The growth rate is in negative from 2001. Table No. 4 shows the no. of registered units in the city and district. Fig. No. 14 is showing growth rate analysis of registered units in the city.
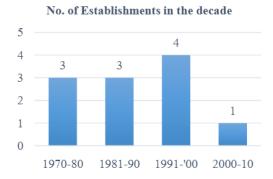
Table 3 - No. of registration of units
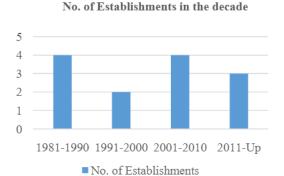
Growth rate of registration of units in City

Year	City	Growth rate
Before '80s	103	45.00%
1981-90	200	48.50%
1991-00	704	71.59%
2001-10	633	-11.22%
2010-14	281	-121.33%

Table 4- Data of registered industrial units

No. of Registered Industrial Units under DIC, Jalgaon

Year	Jalgaon City	Jalgaon District
Before '80s	103	237
1981-90	200	461
1991-00	704	1690
2001-10	633	2148
2010-14	281	746

Figure 14- Analysis of growth rate of registration of units

There was a drop in establishment of small scale units in the decade 1991-2000.

Figure 15- Establishment years of large scale units

Figure 16- Establishing years of small scale industries

Inferences

1. The work participation ratio 23.07% as per the census 1981has been increased to 27.81% in 1991. This is because of growth of industries in MIDC area during this decade.
2. The share of workers in the city to the total in the District is very less. It proves the equitable regional development.
3. The percentage of registration of units in city is decreasing from the year 2000.
4. There is a huge difference between share of total units and total workers of City to District.
5. Though the number of units contributes about 40% till the year 2000 the share of workers is about 5%.

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Architecture: for the people, by the people

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Abstract:

A majority of the total Indian population live in the villages and this rural population comprises the core of Indian society and as well as it represents the real India. India is an agro-based economy and the growth of most of the other sectors of economy is driven by rural demand. For India's economy to be strong, the rural economy needs to grow. Rural areas are still plagued by problems of malnourishment, illiteracy, unemployment and lack of basic infrastructure like schools, colleges, hospitals, sanitation, etc. This has led to youth moving out of villages to work in cities. Our villages need to grow in tandem with cities and standard of life has to improve there for inclusive growth to happen. There are several such areas under the village economy where if attempt is made could turn into gold mine. The concern for economy translates into an architecture which is appropriate, purposive and well-founded only if we can trace the exact problem in that area regarding the economy. This proposed policy will be prototype, which could be modified to suit different site conditions. The strength of this prototype will lie in its simplistic solution and replicability. The aim of the paper is to devise an integrated approach to farmers welfare as an economic & architectural development of a settlement. The objective is to encourage the participatory planning, upholding skill development & enhancement, better resource use, revival of culture, promoting traditional wisdom, ensuring secondary source of income, improve relation between architecture & economy. The research is more than anything, an exercise towards an economic and architectural development of a settlement by taking farmer as a main focal point by address the issue of farmers plight leading to suicide and developing guide-lines for a similar kind of process in any settlement around the country as an integrated approach by 'Architecture for the people by the people.'

Keywords: Agriculture, Rural, Agrarian distress, Famers, Architectural Planning

1. Introduction:

"Farmers" suicides have to be viewed as a national disaster", the statement of the Prime Minister of India, himself a distinguished economist opens our eyes to the agrarian crisis that haunts the country today. The number of farmers who have committed suicides since 1997 has crossed 1 lakhs. These suicides can no more be considered isolated cases of farmer's deaths but a symbol of deepening crisis of indian agriculture. There is a debate regarding causes and number of deaths of farmers in the country. In the initial period of late 1990's when there were sporadic incidents of suicides across the country there was general indifference and apathy towards these incidents. But, when in early 2000 and onwards the number of farmers' deaths started rising fast in Andhra Pradesh, Karnataka, Kerala, Maharashtra and Punjab, the Governments started feeling the pinch of growing public wrath. While some Governments took immediate relief measures, some appointed commissions to probe into the truth of the matter. *(Prof. Siddharth Madare, July 2012)*

"It is very important to take care of roots if we want the tree alive". India is a rural country where farmers form the roots of its economy, culture & most importantly development. Picture postcard imagery with happy farmers dominating large green farmlands, traditional houses in small villages with happy communities have always been central to the idea of rural India. India is a country which has very unpredictable weather conditions & farmers are the ones who suffer at the hands of climate. Architecture is not only in urban cities, rural area are often contrasted from urban but vernacular India is where the soul of architecture & development really lies.

2. Aim:

To devise an integrated approach to farmers welfare as an economic and architectural development of a settlement .

3. Objective

- Encouraging participatory planning
- Uphold Skill Development & Enhancement
- Better Resource use
- Revival of Culture
- Ensuring Secondary source of income
- Improve relation between architecture and economy.

4. Nature: As a soul of Architecture

By the end of the 20th century, the shift from the agricultural age to the industrial age and from industrial age to the technological age has allowed socio-ecological crisis to go faster and farther than anyone imagined at the end of the 19th century. Within this process of human growth is the disappearance of much of the flora and fauna on the planet.

At the beginning of the 21th century will be a time in which we must decide what direction it must go to survive as a whole. Furthermore, a transition will occur in which the human species will shift from a technological age into an age of sustainability.

The thesis attempts to look at the future in a positive light. Furthermore, it makes the assumption that architecture of the present will pale in comparison to that of the future. An environmentally sensitive architecture seeks to rectify contemporary problems by creating a more honest and intelligent dialogue between structure, site, and climate. With this dialogue one can create a superior environment that is much more pleasant than the sealed, energy-efficient prisons found today.

Architecture strives to transform the natural world into a human ideal. It is a most essential human endeavour. However, to create these most extraordinary human niches a variety of natural environmental niches must be sacrificed at their site and beyond. Architectural impact cannot occur without environmental impact.

The concept of sustainability has evolved through the latter part of the 20th century. It is now simply defined as "minimizing the ecological impact of building" However, the size and scope of the definition is immense. One not only must consider the ecology and environment on site, but

beyond where resources are obtained and processed into refined goods. The construction of one building requires several hundred products that have themselves come from several thousand sources around the globe. The acquisition of each source impacts the natural environment. It is a simple definition with global impact.

5.   Product of Nature vs Product of Mind

5.1 Green revolution: as an experiment in development & agricultural transformation

It was designed as a techno-political strategy for peace, through the creation of abundance by breaking out of nature's limit and variabilities. Paradoxically, two decades of the Green Revolution have left Punjab ravaged by violence and ecological scarcity. Instead of abundance, Punjab has been left with diseased soils, pest-infested crops, water-logged deserts, and indebted and discontented farmers. Instead of peace, Punjab has inherited conflict and violence. 3,000 people were killed in Punjab during 1988. In 1987 the number was 1,544. In 1986, 598 people were killed. *(The violence of Green Revolution, Vandana Shiva)*

TWO MAJOR crises have emerged on an unprecedented scale in Asian societies during the 1980s.
1. The first is the ecological crisis and the threat to life support systems posed by the destruction of natural resources like forests, land, water and genetic resources.
2. The second is the cultural and ethnic crisis and the erosion of social structures that make cultural diversity and plurality possible as a democratic reality in a decentralised framework.

5.2 Dying soils
After a few years of bumper harvests in Punjab, crop failures at a large number of sites were reported, despite liberal applications of NPK fertilizers. The Green Revolution has also resulted in soil toxicity by introducing excess of trace elements in the ecosystems.

5.3 Thirsty seeds
The Green Revolution increased the need for irrigation water at two levels resulting in water logged/ salinated deserts:
1. Firstly, the shift from water prudent crops such as millets and oilseeds to monocultures and multi-cropping such as wheat and rice increased the demand for water inputs throughout the year.
2. Secondly, the replacements of old varieties of wheat with new varieties of wheat and rice also increased the intensity of irrigation, which went up from 20-30 % to 200-300 %.

Table 6.1: Comparison of productivity of native varieties and Borlaug varieties of wheat

	Native variety	Borlaug variety
Yield Kg/ha	3291	4690[3]
Water Demand	12"	36"[4]
	5.3 cm	16 cm
Fertilizer Demand	47.3	88.5[5]
Productivity with respect to water use (kg/ha/cm)	620.94	293.I
Productivity with respect to fertilizer use (kg/ha/kg)	69.5	52.99

Figure 1: The violence of Green Revolution; Author: Vandana Shiva

6. The suicide economy of the corporate globalization

The Indian peasantry, the largest body of surviving small farmers in the world, today faces a crisis of extinction. Two thirds of India make its living from the land. The earth is the most generous employer in this country of a billion, that has farmed this land for more than 5000 years.

However, as farming is delinked from the earth, the soil, the biodiversity, the climate and linked to global corporations and global markets, and the generosity of the earth is replaced by the greed of corporations, the viability of small farmers and small farms is destroyed. Farmers suicides are the most tragic and dramatic symptom of the crisis of survival faced by Indian peasants.

1997 witnessed the first emergence of farm suicides in India. Rapid increase in indebtedness, was at the root of farmers taking their lives. Debt is a reflection of a negative economy, a losing economy. Two factors have transformed the positive economy of agriculture into a negative economy for peasants - the rising costs of production and the falling prices of farm commodities. Both these factors are rooted in the policies of trade liberalization and corporate globalisation.

In 1998, the World Bank's structural adjustment policies forced India to open up its seed sector to global corporations like Cargill, Monsanto, Syh genta. The global corporations changed the input economy overnight. Farm saved seeds were replaced by corporate seeds, which needed fertilizers and pesticides and could not be saved. (Farmers Suicide in India - Dr. Vandana Shiva & Kunwar Jalees)

7. **Vision**

The thesis derives a participatory, Interactive, planning-based program which bases its ideas on the literature mentioned above. The thesis is more than anything, an excercise towards an economic and architectural development of a settlement, and developing guide-lines for a similar kind of process in any settlement around the country.

*   **Encouraging participatory planning:**
    By which a community undertakes to reach a given socio-economic goal by consciously diagnosing its problems and charting a course of action to resolve those problems viz. quality of environment, neighbourhood, housing, economic development.

*   **Uphold Skill Development & Enhancement:**
    Architecture as a result of this economy thus becomes an expression of the same and is aimed at sustainable development of settlement as a whole through the means of sustenance of its resource base, technologies & inturn its indigenous economy through architecture. The architecture thus generated is a tribute to the masons who invest their skills in the product and is a documentation of the technique's representatives of the place in itself.

*   **Better Resource use:**
    The main lag of the system is that it perceives the community as an empty vessel to be filled in. The rural community has a vast set of traditional knowledge and resources which should be taken into account while planning.

*   **Revival of Culture:**
    The projects also aim at looking at the culture of the settlement in the perspective of economics and dealing with the culture in the policy as an economic phenomenon.

*   **Promoting traditional wisdom:**
    The project aims at developing a sustainable model of economics, based on / to revive the old organic based agriculture in India towards a sustainable future for agriculture. The ultimate goal to adopt natural farming is not growing crops, but the cultivation & perfection of human beings.

*   **Ensuring Secondary source of income:**
    Farming in the fields and livestock rearing merged together to bring forth the idea of a venture with the mission of "integrating indigenous cow in agriculture" and the larger vision of "making agriculture a preferred choice for youth". By Hence, live-stock based economy will upgrade the quality of live-stock which will become the secondary source of income along with the farming. This is trying to address the other important part of agriculture – income, productivity, and farmer prosperity.

*   **Improve relation between architecture and economy:**
    Architecture being a part of the economy itself the two cannot be viewed as separate and have to be view in relation with each other.

8. **Hypothesis:**
    The present study proceeds to examine the following hypothesis:
    1) Organic farming is eco-friendly therefore more and more farmers are turning toward it.
    2) From economic point of view organic farming requires less inputs save cost, therefore becoming more and more popular.

9. **Strategies & Stages of Research:**

The purpose of the Rural Villages Strategy and stages of research is to look at the villages of the maharashtra and, together with the local communities, provide for the future role of each of them in the settlement network of the maharashtra state. This will be underpinned by:

- To study the traditional/native ways of life. It is important to carefully analyse connections between all settlements of the region, as they determine access to services, employment opportunities, and lifestyle of local communities. also attempt to strengthen these relations by their potential.
- To think about the needs of those villages and communities now and in years to come; how they can contribute to the region and better serve local communities. Establishing priorities guiding future development.
- To establish a long-term partnership between Council and rural communities to integrate all previous strategic work, identify projects and initiatives to strengthen the viability and vitality of rural villages and to set up the framework for working towards those actions.
- Considering needs, including housing needs of different community groups and different incomes as a sustainable architectural planning. also Protect the natural and cultural heritage values of site through architecture.
- Integrated approach to land use and efficient provision of services and infrastructure which will help to enhance economy.
- Identifying options for improved local connections between the rural village. The role of each settlement in the regional network is defined through strategic planning which involves local government and communities and collaborate with those bodies.
- Recognising and documenting the local, unique character of selected village. Recognise and document historical aspects that contribute to local identity. The meeting of basic needs for all people, with access to a wide variety of experiences and resources.
- Building the infrastructure with the participation of the community.

8. Form a base for non-fiscal business:

1. Process (To identify the Problem and involve people into it
2. Program (The Proposed program has to be supported the system; this is the only work the architect has but for that one must think beyond the architecture)
3. Architectural manifestation (It will support the Program. Architecure will come at the end of the system & not become part of the process, so as an architect we should really contribute ourselves throughout the program

Architectural end product will be different in each region according to the social, cultural & natural values of the taken site. which means 'Architecture for the people by the people gets succeed'

COMMUNITY MASON

COMMUNITY → **STHANIK SAMITI** — In collaboration with → **NGO**

Ownership & Structure

Own by the sthanik samiti

Undertakings are funded by the functioning of the Bank

- Local Employee (atleast 10th pass)
- Professional govt. Employee

Need to understand the concept of Sustainable community Development in their action both as citizen and professional, and Create required quality of built environment under the particular condition of community.

The aim is to communicate to the Government bodies & to approach them for the Community Development proposal also ensures the contribution of villagers to it.

1. SEED PROCESSING CO-OPERATIVE SOCIETY / BANK
- A group of committed farmers from the community will work together in a democratic & non-hierarchial fashion.

2. DEVELOPMENT & TRAINING
- Monthly meetings will hold by the community to document the needs of the settlement & to check the capacity of the settlement to satisfy those needs.

3. RESOURCE RECONSTRUCTION
- To preserve the forest, land & water resources.
- Documentation of Biodiversity & traditional knowledge & framing community rules to conserve it
- Make the required profit out of this ecological practices.

4. SKILL ENHANCEMENT
- To Empower the community in the economic & social management sphere.

PROPOSAL

Architect & the Local NGO will also simultaneously work together with the help of government

ARCHITECT ← **GOVERNMENT**

Figure 2: Detail of non-fiscal business; Author

9. Conclusion:

There is a need to arrive at accurate estimates of economic stress related suicides among the farmer and agricultural labourers. This task cannot be performed by in individual or a research institution on its own. This would require support and sponsorship of the Indian government. The government can appoint an expert group to make estimates and analyze causes and suggest remedial measures to prevent this unfortunate phenomenon.

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Changing Character of Peri urban areas: The case of Pune City

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Abstract:

Aim: To review the challenges and issues for peri urban areas around Pune.

Objectives: To study effect of city development on peri urban areas. To understand urbanisation trends, urban growth, and peri urban development in all directions of Pune. To understand changes in demography, socio economic parameters, infrastructure, land use, governance and its impact of transformations. To suggest guidelines for better development of these areas.

Due to urbanisation and expansion of city limits beyond Municipal boundaries, the rural areas are merging in city which results in formation of Peri urban areas. These are the zones of transition with some amalgamation of urban and rural areas, due to their diverse character in terms of land use, livelihood shifts, demographic changes and social transformation. These are the areas generally affected by the expansion of city and tend to have a mix of urban and rural activities. Rather than thought of in negative terms, peri urban area can be looked from the perspective of development opportunities. Most peri urban areas around large metropolitan cities are emerging to a complex character beyond the urban and rural. These areas are neither a part of urban administration and nor rural administration as well.

One of the fastest growing metropolises in India, Pune is a second largest city in the state of Maharashtra after Mumbai. Now, Pune has more geographical area than Mumbai. Pune experiencing rapid growth and transformation process during last few decades. Influence of this transformation reached well outside the administration boundaries of Pune city to the peri urban areas and regions beyond. This paper helps in understanding the term peri urban areas, it's development with respect to planning, the changing character of these areas because of influence of urbanisation and expansion of Pune city. This paper is based on secondary data collected to identify the problems and issues for peri urban area and suggest the guidelines which help to pay attention for better development of such areas.

Keywords: Transition, Diverse character, Amalgamation, Opportunities.

1. **Introduction:**

Peri-urban areas are transitional zones between rural and urban land uses, found between the urban and regional bounds and the rural environment. As rapid urbanisation extends into rural and industrial land, the boundaries of peri-urban areas are permeable and transitory. Peri-urban zones will always be there, irrespective of how the boundaries change. These areas undergo a dramatic transition as a result of population in-migration and the emergence of new income-generating businesses. Increased population densities, changes in land use and employment patterns, diminished farm operations, and the rise of dwellings, commercial, and industrial establishments are all signs of the development of peri-urban regions. For example, with the influx of migrants, the local community begins to rent out their vacant properties for residential or commercial use. New buildings are being built to meet the increased demand for office and residential space. In addition, a slew of new service providers have sprung up to meet the migrant population's diverse requirements. Changes in these regions can have a big influence on agricultural production, environmental amenity, and natural habitats, as well as water availability and quality, and energy usage.

Peri urbanisation is often confused with urban sprawl. Urban sprawl is a phenomenon, and peri urbanisation is the manifestation of it. It is the result of sprawl that rural areas get converted into urban areas. The peri-urban pertains to a nature inheriting dynamism and transformation, which is attributed to the progress of a rural area to a developed urban area, meaning that the peri-urban of the present is bound to transform or manifest in the urban of the future. (Tiwari)

"Small farmers, informal settlers, industrial entrepreneurs, and urban middle class commuters may all coexist on the same land, but with diverse and opposing interests, behaviours, and perceptions." There are other examples of peri-urban regions that were formerly located outside of the city centre getting swallowed as a result of statutory city boundary extensions. (Dr. Vishal Narain)

In India, peri-urban growth refers to the growth of census towns within close proximity to statutory towns. Unlike statutory towns, which are controlled by urban local governments, census towns are administered by rural local governments. This peculiarity is due to local politics and engrained interests. In 2011, India had 3,892 census towns with a population of 54 million people (about 14% of the country's total urban population). Between 2001 and 2011, the number of census towns increased by 186%, compared to a 6% growth in the number of statutory towns. According to the findings, approximately 37% of the new census towns announced in India in 2011 is centred on major cities.These parameters are used by the census office to determine the amount of urbanisation in the nation. However, because state/local governments are responsible for urban and rural development as well as governance, state governments define settlements as "urban" or "rural" depending on their own criteria, which are not clearly stated. (Gauba)

As all central government actions and funding for settlement development are dependent on their designation as 'urban' or 'rural,' state governments turn settlements into towns or villages regardless of the local area qualities they possess. When a community is designated as "urban," it is subjected to rules and regulations such as construction by-laws, development restrictions, and taxation, in order to ensure planned expansion and development. As a result, state administrations often avoid transforming villages into cities because they believe that applying urban regulations will offend and make villagers unhappy, as well as make state or local political leadership unpopular with the rural electorate. The absence of urban governments in census towns is leading to a poor quality of life as the panchayats are not equipped properly to deal with the changing characteristics caused by urbanisation.

2. Peri urban development of Pune:
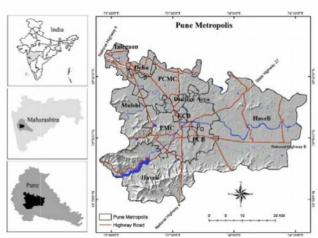
Figure 1: Pune metropolis and it's geographic location with respect to India, Maharashtra and Pune District.

Pune is the second largest metropolis in the state of Maharashtra and one of the fastest growing cities in India. This makes infrastructure planning and investment challenging for the government as there is not a clear framework to pin down where and if needs are unmet. This is why Pune is chosen as a case study since it exhibits peri-urban characteristics.The study area is composed of-

1. Two municipal corporations, Pune (PMC) and Pimpri-Chinchwad (PCMC).
2. One municipality Talegaon-Dabhade (TD).
3. Three cantonment boards namely, Kirkee (KCB), Pune (PCB) and Dehu (DCB).
4. The surrounding outgrowth towns and villages under the administration of semi-urban and village councils in Haveli and Mulshi. (Figure 1)

2.1 Factors contributing to development of peri urban areas:

To have a better understanding of the transitional interface's characteristics, it's necessary to look at the numerous sources of growth in the periphery, or the variables that induce growth.Peri-urban growth is influenced by a number of interrelated and interdependent factors:

1. Physical growth of city boundaries (urban sprawl): the physical expansion of a city to accommodate an expanding population leads to growth in the periphery.
2. Migration of individuals from rural to urban areas is another factor that influences growth. Farmers generally move from rural settlements to metropolitan regions in quest of better career prospects, but many are forced to dwell in the city's less costly peripheral neighbourhoods due to rising living prices.
3. Development of new aspects of the economy: Creating a new industry in the region generates work prospects, luring individuals from rural areas.
4. Services develop along the fringe: The development of activities that are not normally available within the city, such as airports, educational institutions, and information technology centres, are also catalysts for the rise of the periphery. (Tiwari)
5. The impact of IT Parks has sparked significant urbanisation in the areas surrounding them. Prior to IT Parks, the region had tremendous expansion due to the fundamental support of tertiary activities and residential activity. These settlements were abandoned, providing area for urban growth in response to the IT Parks' various demands.
6. Proximity: The area's position is such that it is accessible from the west via the Mumbai-Banglore Highway (NH4) and adjacent PMC boundaries, which have developed a residential and tertiary service sector.(Ujjwala Khare)

2.2 Peri-urban Development Patterns:

In figure 2, Urban core is defined here as a high density built-up areahaving at least 50% of the built-up land in its one square kilometre neighbourhood.Peri-urban development is spatially extensive and

can be divided into 3patterns in Pune district are urban fringe, ribbon development and scattered development.
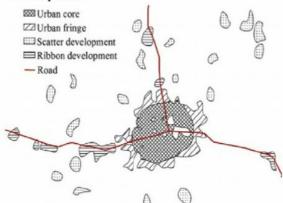
Figure 2: Schematic diagram of Peri-urban development typologies

1. Urban fringe is defined here as built-up area whoseone square kilometre neighbourhood contains 30-50% of built-upland and is between urban and rural system area.

2. Ribbon development is defined as built-up area within100 m proximity to main transportation corridors i.e., national andstate highways with less than 30% of built-up land in its one squarekilometre neighbourhood. Figure 1 shows the highways used in thisstudy to identify ribbon development.

3. Scatter development isdefined as built-up pixels which have less than 30% of built-up landwithin their one square kilometreneighbourhood and which do notbelong to ribbon development.

(Ujjwala Khare)
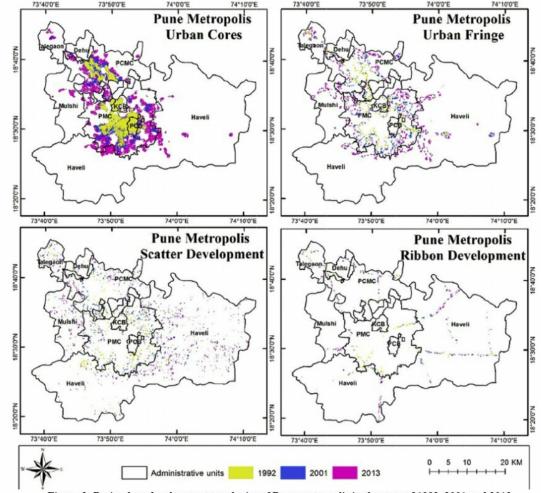
Figure 3: Peri-urban development typologies of Pune metropolis in the year of 1992, 2001 and 2013

From figure 3, we understand that, by 2013, urban cores had developed in all administrative divisions.Pune and Kirkee CantonmentBoards had a reduction in the urban periphery, while all other units saw an increase. When compared to other parts of Pune, Haveli has seen a significant amount of ribbon and scatter development. In comparison to 1992- 2001, the number of scatter and ribbon projects in the suburbs increased dramatically in 2001- 2013. In the Pune metropolitan, an examination of urban typology found three distinct growth trends. First, from 2001 to 2013, the pattern of coalescence urbanisation in key city regions such as Pune and Pimpri-Chichwad Municipal Corporations.Second, between 1992 and 2013, the dispersion pattern of urban expansion in the suburbs such as Haveli, Mulshi, and Talegaon. Third, the sort of marginal or no growth observed in cantonment boards over the research period.
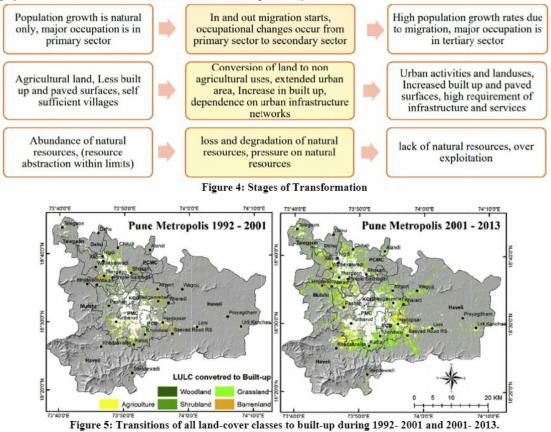
3.   Transformation in peri urban areas

The transforming nature of the peri urban in context can be identified in order to determine the changes that occur and to define the peri urban border.
1.   Changes in demographics.
2.   Differences in socio - economic factors.
3.   Aspects of the physical and infrastructural context.
4.   Changes in the surrounding environment.

Though various attempts have been made in establishing a range for various indicators, through the literature review and case studies, it is found that the indicator range or limit is purely contextual based depending on the urban area to which the peri urban has to be identified. (Tiwari)

Following figure 4 shows transformations in the peri urban areas in the socio-economic sector, physical sector and the environmental sector respectively.

Figure 4: Stages of Transformation

Figure 5: Transitions of all land-cover classes to built-up during 1992- 2001 and 2001- 2013.

4. Impact of transformations

When an eco-carrying system's capacity is pushed to its limits, there is enough data to show that ecosystem will be affected. That's also true in peri-urban areas. Existing peri-urban areas in Pune are experiencing a transformation and are under significant stress as a result of urbanisation pressures. Following are the impacts of transformation and their causes-

1. Uncontrolled growth, unregulated/haphazard development and abysmal services (water, sanitation) due to absence of statutory development plans, laws, land use maps & land monitoring systems.
2. Increase in number of buildings because of absence of land/building/ development controls.
3. Unsafe high-rise built structures and forced land acquisition by mafia. Shrinking open spaces and changing land use caused by lack of clarity in administrative boundary & areal extent.
4. Delays in project implementation due to illegal land occupancy due to administrative unpreparedness, inferior management of the area, fragmented & uncoordinated planning.
5. Forced eviction of unauthorised occupants because of prohibition to apply urban byelaws.
6. Displacement of native population and reduced food grain & vegetable produce; rising food grain prices caused by unplanned dispersal of industries & other economic activities from city.

5. Challenges

The interconnection of peri-urban expansion with the urban on one side and the rural on the other is important. However, if this link is not understood and recognised, proper planning actions in these sectors may fail. Because of their complexity and inherent dualism, these villages face unique essential challenges that are not present in nearby rural or urban settlements. The challenges faces by the Peri- urban areas in Pune can be divided into 4 aspects-

1. Physical-
   1.1 Haphazard Growth.
   1.2 Various stages of development.
   1.3 There is a loss of open space.
   1.4 Development in vulnerable regions such as flood plains and wetlands is prohibited.
   1.5 Conversion of agricultural land to non-agricultural purposes.
   1.6 Accessibility issues, There isn't a well-organized traffic and transit system.
   1.7 Land use pattern that is irrational or non-conforming.
2. Environmental-
   2.1 Environmental concerns in peri-urban areas are not confined by the same boundaries.
   2.2 There is a lack of environmentally conscious planning in the areas.
   2.3 The water table in the earth has dropped.
   2.4 Development of wetlands has resulted in urban floods.
   2.5 Increased pollution as a result of increased industrial growth in certain locations.
   2.6 Lack of waste management has a negative influence on people's health and ecosystems.
3. Governance-
   3.1 Peripheral areas do not have policy formulation tailored to the magnitude and direction of urban sprawl.
   3.2 For these sectors, a proper planning structure and institutional approach are also required.
   3.3 There is a disconnect between plans and their execution.
   3.4 Multiple authority and borders with no clearly defined responsibilities.
4. Infrastructure-
   4.1 Inadequate infrastructure provision.
   4.2 The cost of the resources varies.
   4.3 For the same resource, there is competition with urban areas.
   4.4 There is a shortage of solid waste management.

4.5　Open drains are preferable to no drains at all.

6.　Conclusion:

As Pune is urbanising, concern is growing over the adverse conditions created by uncontrolled growth and unregulated development in peri-urban areas. The paper indicates that both the core city and the urban centre are experiencing rapid expansion. Due to the cheap land costs on the periphery, peri urban areas attract real estate; development becomes profitable in these areas, leading to the peri urban areas' growth. Development of transportation networks, information technology centres, industries, and real estate developments all become growth drivers, boosting the dynamic nature of peri-urban expansion. These changing sectors bring both possibilities and difficulties, which are important to consider while planning for these crucial areas.

Strength-
Emergence of growth drivers, such as large industrial/institutional units and a well-developed road/rail network. Better housing alternatives that are less expensive, more roomy, and more affordable. The cost of living is quite inexpensive. There are no tolls, taxes, levies, or fees. For urban and industrial development, there is a lot of room for expansion. There are a lot of god owned and wholesale markets. Larger parcels of land are more easily available at lower prices.

Weakness-
Agricultural property is being subdivided into tiny lots without permission and haphazardly. Due to comparably lower property values and straightforward land conversion procedures, there is a high level of land speculation. Pollution is at a high level, and the environment has deteriorated. Planning, development, and management lack a well-defined legal framework.Due to simple processes and the lack of a legal framework, agricultural land is being converted on a large scale to non-agricultural purposes.Land use patterns that are non-conforming, development patterns that are fragmented, and a lack of essential infrastructure and services.

Opportunities-
Creating a high number of job possibilities and economic activity.Creating a development pattern that is both inexpensive and cost-effective.Developing a significant supply of cheap homes in close proximity to the main city.Creating a sustainable balance between rural and urban development.Effectively integrating urban and peri-urban development and service networks.Limiting the expansion of slums in the mother city.

Threats-
Pollution is at a high level, and the environment has deteriorated.Continued conversion of agricultural land to non-agricultural uses on a wide scale. Slums and low-quality dwellings exist. Basic infrastructure and services are lacking. Irrational/non-conforming land use trend persists.

　　　As a result, the idea of peri-urbanization becomes contextual, varying according to the direction and drivers of growth in peri-urban regions. The peri-urban regions accept rising population, i.e. spill over population as a result of sprawl: this population poses a number of difficulties to the peri-urban areas, including natural resource depletion, environmental, social, and ecological issues. However, rigorous study and case studies demonstrate that these highly dynamic locations have the potential for a comprehensive planned intervention that would not only decongest the urban centre but also build a more symbiotic rural-urban connectivity. Urban challenges, such as the worldwide issue of deteriorating city environments, can also find a solution in the peri urban interface, where growth has only just begun and management is still possible with the help of authorities.

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Government Program for Rural development through different technology

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Abstract: This study identified two alternative but potentially simultaneous processes for rural development in India. One is the 'bottom-up' approach where individuals and groups of villagers work innovatively in developing new building construction opportunities, prompted by contemporary and indigenous design and construction methods. The alternative 'top-down' approach is associated with changes caused by external influences, such as directions given from funding sources, and encouragement for the use of specific knowledge and technologies. When this two approaches go hand in hand it helps in the rural development. The government works for rural development through different organizations with adequate potential in developing promising technologies and replicable technology models/packages with forward and backward linkages to benefit and empower local people in participatory manner under the Department of Science and Technology.

The aim of this paper is to highlight and explore different technologies evolved in field of sustainable rural development from Indian organisations. The main objective of this paper is to explore the technologies developed by organisations with respect to its linkages to benefit and empower local people in participatory manner. The methodology adopted to investigate will be through case studies of structures designed by organisations.

This paper reflects how this organizations help in rural development for betterment in different manner.

Keywords: Rural Development, Organization, stakeholders, Technology, India

1. Introduction :

Recently, a geater understanding of future needs and a different emphasis on sustainable development in rural areas has been reflected in Indian government policies. From different levels of the government administration system, funding has been allocated to support the development of rural areas. The approaches and impacts, however, have been variable in different regions in India because of the largely diverse social, cultural and natural environment in the country. For this, professional architects and planners tend to work on two main aspects of rural projects; firstly, producing master plans for each village; Secondly, some architects have carried out designs for new housing in ways that try to protect the otherwise fast-disappearing traditional buildings in villages. The research presented in this paper refers to technologies developed by Indian organisations for the betterment of sustainable rural development throughout different part of country. Therefore, the aims of the paper is to highlight and explore different technologies evolved in field of sustainable rural development from Indian organisations.

2. Government Program:

Science for Equity, Empowerment and Development (SEED) Division has been set up under the Department of Science and Technology(DST), established with the broad objectives of providing opportunities to motivated scientists and field level workers to take up action oriented and location specific projects aiming towards socio-economic upliftment of poor and disadvantaged sections of the society through appropriate technological interventions especially in the rural areas.

Technological Advancement for Rural Areas (TARA) is the scheme under SEED programs is essentially to provide long term core support to Science based Voluntary Organizations/field institutions to promote and nurture them as "Science & Technology (S&T) Incubators" / "Active Field Laboratories" in rural and other disadvantaged areas to work and provide technological

solutions and effective delivery of technologies for livelihood generation & societal benefits. Organizations have to follow eligibility conditions like minimum 10 years field level experience in rural technology development and management with proven capability of delivering technology model(s) through adaptive R & D for field level application. This organisations gets the funding for projects.

There are total 25 organisations which works along TARA for sustainable rural development. These groups are S&T based voluntary organizations across the country supported by SEED Division, DST to work on innovative and scalable technological solutions for rural transformation.

3. Top-Down and Bottom-Up Processes : Simultaneous Processes in Rural Development:

The design for redevelopment needs to include financial and technical support for refurbishment for all houses in a village. For villagers who built new houses, many worked with small rural construction teams producing monotonous brick or concrete block dwellings, which neither incorporated any heritage from local tradition, nor had sufficient consideration for impacts of sunlight/daylight, protection from the extremes of heat gain or loss, structural strength, or suitable spatial arrangement. Health and safety issues were also associated with these sometimes rather amateur construction processes, as well as inadequate build quality.

Based on the technologies detailed below, this study argues that in order to understand how to adapt regulations and guidance for the diversity found in rural areas, analysis should be separated into two alternative, but potentially simultaneous, processes for rural development occurring in typical village redevelopments. One is the 'bottom-up' approach where individuals and groups of villagers work innovatively in developing new building construction opportunities, prompted by contemporary and indigenous design and construction methods. The alternative 'top-down' approach is associated with changes caused by external influences, such as the direction and prioritization provided from funding sources, and prompts for use of specific knowledge and technologies filtered down and promoted through village administrative systems.

4. Role of Organisation:

In both Top-Down and Bottom-Up processes, some professional knowledge is needed for good quality and effective decision making. This approach has some implications for sustainable rural development. It calls for the sustainable development process to consider how the decisions can be made at the interface of the administration teams, designers and villagers. It also emphasizes that outcomes have to consider stakeholders, the decision making process, participation, and implementation; and enable each level to give feedback to the other levels in both top-down and bottom-up processes. This process should lead to the development of specialist roles for organisations in India involved in rural development; roles which should develop beyond the conventional professional duties.

5. Organisations working under TARA:

This organisations mainly works for different appropriate technologies for rural application which are -
1. Housing
2. Machinery and Tools
3. Energy Lighting and Fuel
4. Agriculture and Animal Husbandry
5. Food Processing
6. Leather and Animal Product
7. ICT Based Technologies
8. Water and Sanitation
9. Health

Pravara Rural College Of Architecture, Loni

From Architect's perspective Housing, Energy Lighting & Fuel, and Water & Sanitation are three technologies to look in details. For this technologies following organisations are working continuously for betterment of Sustainable Rural development-

5.1. Centre of Science for Villages (CSV):

CSV started functioning in 1976 by its founder Chairman and Director Late Dr. Devendra Kumar from the premises of Maganwadi in Wardha. The idea behind the centre was to establish a place, which could act as a centre for transfer of technology and be a bridge between the portals of National Laboratories and doors of the Rural communities. The Vision and mission of CSV are to work towards a holistic and futuristic development of the small community based decentralized village economy and to demonstrate appropriate rural technologies which are ecologically sound, economically viable and socially justified. The area of coverage mostly in Maharashtra but also similar regions of Central India.

5.2. Development Alternatives (DA) - Technology and Action for Rural Advancement:

DA is a non-profit organization engaged in research and action for sustainable development. It was established in 1983. The DA believes that "development", being a dynamic process, is all about evolving inter-relationships between social and environmental factors, particularly interactions between nature, machines, institutions and people. The Organization works towards creating sustainable livelihoods for the poor, fulfilling basic needs and delivering eco-solutions. Built on DA's innovative low carbon technologies and market principles, these enterprises help build local economies and communities, while maintaining a minimum ecological footprint.DA's activities under Core Support mainly work in the 13 districts of Bundelkhand.

5.3. Himalayan Environmental Studies And Conservation Organisation (HESCO):

HESCO helps rural villages to focus on their economic and development needs and encourages them to tap local resources that open up new avenues to self- reliance. HESCO have been applying knowledge of the environmental sciences and simple technologies to bring consistent development to the rural villages of the Himalayas. They live and do field research in the rural villages of the Himalayas. HESCO as the group is popularly known which its acronym, was formed in 1979 by a group of people who felt strongly over the rapid deterioration of the Himalayas. Mainly works for the areas like Uttarakhand,Himachal Pradesh,Madhya Pradesh, Jammu & Kashmir, North East States.

5.4. NB Institute for Rural Technology(NBIRT):

It has been working on low-carbon technology development in rural India. The vision of the organisation is to provide affordable low-carbon technologies related to shelter, energy and sanitation to the tribal and other weaker sections of the North East region of India.

5.5. Society for Rural Industrialization (SRI):

SRI's mission is 'Technology for the people' – SRI shall work so that every citizen will have access to knowledge and to learn the skill for using the knowledge in one's own socio-economic situation.SRI aims to go beyond livelihood security to a system that ensures sustained growth and improvement in the quality of life of the rural poor in general and tribal community in and around Jharkhand in particular.

5.6. Shri AMM Murugappa Chettiar Research Centre (MCRC):

MCRC is a non-profit research organisation. MCRC's ideologies are centred around S&T applications for rural development thereby improving the quality of life of the rural people, particularly the underprivileged and the marginalized.The vision is to develop sustainable technologies with low environmental impact and mission is to develop technologies for improved livelihood, harness and disseminate. MCRC focuses on the research in the areas of Food, Energy and Environment for Livelihood (FEEL).

5.7. Vigyan Ashram (VA):

'Development through Education and Education through development' is a mission of VA. VA believes it is necessary to use technology to increase pace of our rural development. VA is founded by Dr.S.S.Kalbag in 1983 as laboratory of his philosophy of 'Rural Development through Education (RDES)'. VA is directly implementing its program in Maharashtra (92 villages), Chattisgarh (7 villages). It is providing support to NGOs in Karnataka, Goa, Assam, and Jharkhand.

6.   Technology Category:

6.1. Housing :

6.1.1.   Tile-faced Mud Blocks developed by CSV:

Ordinary mud (80% murum & 20% BC soil or clayey soil) is used to make 230 mm thick walls using tile faced mud blocks and filling the masonry joints with cement pointing. The mud block wall is rain proof and rodent proof. This is to be noted that there is no need to press or ram or concrete or add any other binding material in these bocks. The mud blocks are made using 230 mm X 230 mm wood or steel mould in which facing tile is kept on one side and then it is filled with mud mix by hands. If required inner surface of the wall can also be tiled. All these materials are locally available and the villagers can make the blocks themselves. For a villager house of 250-sqft only three days labour is required for block making. Each block costs very less money. The face tile is made of burnt clay measuring 230 X 100 X 12mm with 25mm key. One man can make 250 tiles per day, which can be baked locally by a village potter. Door Window frames are fabricated in mild steel, with horizontal guard bars and fixed in position by hold-fasts to the brick columns.

Figure 1: Tile-faced Mud Blocks

6.1.2. Guna Vault Roof developed by CSV:

"Guna", is a tapering, burnt clay pipe. The Roof is permanently insulated since it consists of a series of arches made up of burnt clay conical tile inserted into one another. A series of such arches make a barrel vault capable of withstanding considerable loads – upto 1 ton/m2. The arches are held together by plaster from outside. Fixing of broken china tiles pieces over the roof renders it waterproof and reflects the sunlight making the interior to remain cooler. The roof needs neither wood nor steel and is most suitable for disaster prone areas like flood & earthquake. It is fabricated and ready for use within 3 days. Requires no maintenance and has life span of more than 50 years.

Figure 2: Guna Vault Roof

6.1.3. Product development for low input soil/sand: Utilization of foundry waste slag and sand in building materials(2016-17)Phase II - developed by DA:

DA Group, under Core Support Programme has developed a novel technology to use foundry slag in paver block manufacturing by replacing 100 percent of the natural aggregates by crushed slag. This meets the twin demands of resource efficiency and waste utilization. This crushed foundry slag is an ideal candidate for the replacement of natural aggregates due to its intrinsic properties close to natural aggregate. Foundry slag (FS) is waste materials generated by metal casting processes at metal foundries. Currently Business models for foundry slag based paver block technology was developed for the entrepreneurs. Total 15 commercial enterprises were setup which are operating in a profitable manner.

Figure 3: Foundry Waste Based Paver

6.1.4. Hollow Brick Production Technology using Soft Extrusion(2014-15)Phase II developed by DA:

Based on the low cost extruder, DA has developed a process for producing hollow bricks. Various experiments have shown that with the soft extrusion technology, a maximum of 14% hollowness can be achieved. Combined with a waste use of 5-10%, this type of bricks has a capacity to save 25% of soil. Compressive strength tests of hollow bricks have shown an increase of 3 times compared to normal hand molded bricks using the same soil quality. Currently this machine is being commercially marketed by TARA Machines and Tech Services Pvt. Ltd., New Delhi under a licensed agreement to manufacture, sell and service the same.

Figure 4:Hollow Brick

6.1.5. Low Cost RCC Frame(2010-11)Phase I developed by DA:

Along with saving of natural forest and reducing climate change effects use of RCC door frames has a highly potential in both urban and rural areas. The door frame produced initially was a good quality product but out-of reach of rural users. This was due to the fact that usually they prepare a door frame by illegally cutting wood from the forest and other areas. A low cost option of RCC door frame was developed without compromising the quality at a price on Rs. 400 – 450 to cater the rural market compared to the Rs. 800 – 1,000 for normal door frames. Currentlythis technology has been transferred

to the mason communities and they have been well trained to produce the same. It can also be produced through village based enterprises.

Figure 5:Low Cost RCC Frame

6.1.6. The TARA EcoKiln Package(2010-11)Phase I developed by DA:

With the production of approximately 200 billion bricks every year the Indian brick industry is an informal rural industry using traditional production methods which are resource inefficient and highly polluting, along with serious social implications such as unsanitary and hazardous working conditions and exploitation. The TARA Fly Ash Technology package provides a turnkey solution to profitable clay brick making.Currently the technology has been fully developed and is available for commercial dissemination. The EcoKiln technology has been transferred to technology provider in North India for commercial dissemination.

Figure 6:TARA EcoKiln

6.1.7. The TARA Fly Ash Technology Package(2010-11)Phase I developed by DA:

With production of approximately 200 million tons of fly ash every year in India; disposal of fly ash is a serious source of soil and water pollution. The TARA Fly Ash Technology package provides a comprehensive range of services. The most demanded hydraulically operated machine is equipped with mechanized feeding of machine from pan mixer through hopper cum conveyer system. The full package produces 1000 bricks per hour. Currently the technology has been fully developed and commercially available for dissemination. The technology package has been transferred to a commercial entity TARA Machines and Tech. Services Pvt. Ltd., New Delhi under a licensed agreement to sell and service the same.

Figure 7: Fly Ash Bricks

6.1.8. Storage Structure(2007)Phase I developed by HESCO:

The mechanical properties of Lantana have been utilized for making utility items. In rural areas, in the wake of poor purchasing power, the rural community makes domestic items out of the wood available around. Bamboo has been the major wood used in the past. Since Lantana has woody properties it can also be used to make such domestic articles. Grain storage, water storage baskets can be made from Lantana.

Figure 8:Storage Structure

6.1.9. FERRO CEMENT PANELS (2014-2015)PhaseI developed by NBIRT:

NBIRT has developed this earthquake resistant Ferro Cement Panel by providing wire mesh which are now being used in Tripura. Low cost Ferro cement panel is a viable alternative in cheaper rate than the conventional brick made houses. Ferro cement wall panels are made of OPC, PPC or blast furnace slag cement, aggregates and reinforcements like Wire Mesh and skeletal reinforcement as steel wire or small diameter steel bar. NBIRT has already developed these panels but the present process is manual resulting into low productivity. A few houses have also been constructed with these FC panels. The application of this is mostly noticed in roofs, water tanks and even in boat hulls. Under the Core support scheme the process of manufacturing these FC panel will be mechanized (semi-automatic) for high productivity with an excellent quality and this technology can be helpful for more people. The longevity of these houses is expected to be good in the years to come.

Figure 9:Ferro Cement Panels

6.1.10. Pabal Domes(2009-2010) phase I developed by VA:

VA has its special way to create this dome and VA also has developed this manual which gives you step by step instruction to construct a dome. It is made mostly of bamboo. The Pabal Dome provides an attractive living space at an extremely economical price. The Pabal Dome requires simple nut bolting of color coded components, making it ideally suited to do-it-yourself construction. As the construction requires cement or brick masonry, it can easily be carried out by local masons. Because of its uniform loading, the Pabal dome does not require deep foundations. A team of 8 people can complete the construction in less than a fortnight. The kit can be assembled in one day.Currently VA

conducts training on geodesic dome construction for mesons, architect etc. VA also provides kits for dome assembly through it alumni entrepreneurs.

Figure 10:Pabal Domes

6.2. Energy Lighting and Fuel:

6.2.1. Micro Solar Dome (Capturing Daylight)(2015-2018) Phase Ideveloped by NBIRT:

In the rural edges of the country, there are mud walled houses either with thatched roofs of hay or with the GCI sheets. The solar dome will overcome the shortage of sunlight by capturing it. This innovation comes in two versions, Photo-Voltaic (PV) and Non-PV.

Non-PV dome type daylighting device has a transparent semi spherical upper dome shaped acrylic material which captures the sunlight as much as possible. The captured light is then passing through tubular shaped pipe having a thin layer of highly reflective coating on the inner wall of the passage. A lower dome inside the room is made of acrylic. At the end of this passage there is a suitable retrofit to illuminate every corner of the room with good luminosity. There is also a provision to control the amount of light in the room. The dome provides 3W- 15W of light inside the room during daytime, that is, for about 10-12 hours.

The PV version is the latest version of the Micro Solar Dome. The integrated PV module fitted in the dome charges a battery during the day which in turn powers a light during the night for about 5 hrs through an LED bulb fitted in the lower dome. A PV integrated version can thus provide light inside a room for about 18 hours. Currently Technology ready for commercialization.

Figure 11:Micro Solar Dome- Photo-Voltaic Version

Figure 12:Micro Solar Dome- Inside view

6.2.2. Aditya Home Light developed by SRI:

Many areas in Jharkhand, due to the terrain and the physical structure of villages are not very favourable for a centralised grid based power system. Aditya Home light system is a Solar power based distributed system which is operated and maintained by women entrepreneurs. The system consists of a solar power central charging station. The lamps use 6V battery for powering 2 watt LED lamp and give 30 lux at a distance 1.5 meter. The system operates on a rental basis. These lamps have been specially designed for focussed area lighting suitable for study not for special illumination. Currently this system, in association with TERI under their LABL program has been installed in 21 remote villages of Jharkhand through women vendors promoted by grass root level women headed NGOs. It is benefited more than 300 households. Most of them are operating satisfactorily.

Figure 13:Aditya Home Light

6.3. Water and Sanitation:

6.3.1. Slow sand Water purifier (Phase I: 2009-14) developed by MCRC:

MCRC has developed a simple, cost-effective, biological water purification system using river sand, pebbles, packed in PVC pipe. And carbon in a separate cartridge attached to the main PVC column. This system effectively reduces 98.9% of coli form of bacteria found in the dirty water and enable people in rural areas to have access to clean drinking water.

Figure 14:Slow sand Water purifier

6.3.2. Pre Cast Toilet Technology Package(2014-15)Phase II developed by DA:

The production system is designed for manufacture of precast toilet panels using reinforced cement concrete. The modifications have been made in reducing wall thickness of panels, increasing the inner dimensions to 1.10m x 1.10m and incorporating a groove in the roof panel for interlocking with wall panel. The reduction in wall thickness was done to reduce the dead load of the panels and to

bring down the cost of toilet.Currently this package is now being produced under commercial scale to understand the production price and prepare a technology package, which is ready for use.

7. Conclusions:

The two processes are: the 'bottom-up' approach where individuals and groups of villagers work diligently and innovatively in developing new building construction opportunities, and the alternative 'top-down' approach that is associated with changes caused by external influences. As a result, it is argued that design for development needs to treat these two processes separately, and include financial and technical support not only for new constructions but also for restoration for exsting houses in the villages. For villagers who built new houses, not only was professional guidance for design and construction needed, but also a better understanding of the design quality aspects of living environments, sustainable resources, and suitable methods of construction. Since the government policies for rural development have now been in place for some time, organisations should be encouraged to get involved in rural development by adopting a long term interest, rather than simply transferring their urban design methods to rural projects. In this paper, the main focus is to provide a realistic understanding regarding how the different forms of knowledge are at play in village development and to suggest how organisations have a potentially significant role in the process.

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Importance of Services in Villages

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Abstract

It is said that india is a country of villages. Rural areas usually refer to villages. Total no of villages in india in 2001 was 638,365 out of which maharashtra had 43,722 no of villages in 2001 & 63,663 in 2020. Overall statistics says that, ¾ of the population lives in villages only. So, the first priority of development has to be in rural areas. Developing the country should start with the villages or rural areas.

A focus of this research is on coastal areas, maharashtra has about 720 km long coastline. Though each of the village situated near coastline is famous for offbeat weekend gateways, but the structures, services & facilities in these area for a common man is very much poor. The village named kondivali, small area situated on the coastal road between diveagar & shrivardhan is a same kind of a village. Total population of this area is maximum 1000 people out of which ½ of the populations has shifted to mumbai due to lack of infrastructure, employment, worst services regarding education, water, hygiene & houses.

Aim is to understand the difficulty level of people living in this village, their struggle & problems they are facing regarding the facilities.

The main objectives of this research paper are to solve the basic problems in economical way, development of the streets, services, water problems, drainage issues & use of the various innovative techniques to reduce the financial problems & increase the stability of the structure.

Methodology towards solving these issues will create a significant difference in current situation. To start with, the research & in depth literature survey was carried out to understand the theory & reasons behind the issue and framed the critical analysis of the same. Case studies & experiments played the major role in finding out to identify the major problems in current scenario & the solution to the said problem.

Keywords: *coastline villages, structures, services, economics, architectural practice*

Introduction:

Living in coastal region itself is a challenge for people. Problems are integral part of the individuals as well as the communities. In rural areas, individuals and communities are experiencing number of problems and challenges, which are proving to be major impediments within the course of meeting livelihoods opportunities.

The major problems are, poverty, illiteracy, unemployment, homelessness and crime and violence & most important infrastructure. The individuals get effected by either one or more of these problems, which are having unfavourable consequences within their overall quality of lives. Poverty is characterized by lack of resources. Prevalence of illiteracy is common among rural individuals, apart from poverty. Lack of literacy skills, education and awareness leads to an increase in unemployment. Homelessness among rural individuals takes place due to unaffordable housing, when they lose property, wealth and housing due to the occurrence of natural calamities and disasters and so forth. Prevalence of crime and violence is common in households as well as in other places, such as, schools, market places and so forth. The impact of all these situations leads to deterioration of infrastructure, services & construction. The study of this villages focuses on how the important services also have not been given preference while living in such rural areas.

NEED OF THE STUDY
CURRENT SCENARIO –
Why cyclones are picking up on India's west coast
A report about, 'a return of cyclone-related devastation after four decades on the west coast' by Kiran Tare, Mumbai on May 19, 2021 in times of India states that, there are many transport systems as well as trees are uprootes after heavy rainfall due to cyclone Taukte.

The 1976 Arabian Sea cyclone made landfall in Saurashtra on June 3. The coast was lashed by wind of up to 175 kmph, damaging 51 villages killing 70 persons and causing damage worth Rs 3 crore. That was the last major cyclone in over four decades. Since then, cyclones have returned to India's west coast with a vengeance. Since 2019, India has recorded eight cyclones, five in the Arabian sea alone.

Cyclone Tauktae, which made landfall in Goa on May 13, in Maharashtra on May 15 and in Gujarat on May 17, has devastated these three coastal states. It is the third consecutive cyclone after Vayu in 2019 and Nisarga in 2020, and the most severe one the Arabian sea has recorded since 1902. At least 59 people lost their lives so far and around 50 are missing. Five lakh people have suffered financial losses in terms of damages to their houses and farm lands. An estimate of the losses is still being done, but it could run into hundreds of crores.

LOSS IN MAHARASHTRA
Close to 2.20 lakh people in Maharashtra have been affected. While 16 people died in cyclone-related incidents, 30 have been injured. The crops and horticulture on 8,830 hectares of farm land in 3,571 locations have been destroyed. Sindhudurg, Ratnagiri and Raigad have been the worst-affected districts. All the affected area comes in rural regions, These districts were yet to fully recover from the cyclone Nisarga, which had flattened countless palms of coconut and betel nut and damaged three lakh houses on June 5, 2020. Not only In Maharashtra, but Gujarat also battered in the same cyclone

IMPACT ON THE LIFESTYLE AND PROPERTY
There are too many disastrous affects of the cyclone not only on lifestyle but also on lifestyle from all the three sides, the water rising with the storm surge along with the heavy rainfall and the rising sea level, these factors create a "compound impact", as said by the climate scientist Roxy Mathew Koll of Indian Institute of Tropical Meteorology (IITM), Pune. It aggravated due to high Sea Surface Temperature over the Arabian Sea.
With the continuous pandemic situations, Taukte made it worst to live in such condition. It aggravated the prevalent conditions of pandemics and created chaos.

REPERCUSSIONS ON THE FARM ECONOMY IN INDIA
Approximately 70% of the unripe mangoes that were about to get harvested were destroyed by the cyclone and only 10% remained available for harvesting. This resulted in a 50% loss for the farmers in their annual average income. The changing weather conditions have always been dreadful for the farmers and have brought bad news for them.

LITERATURE REVIEW
    A. **Coastal costs: the serious downsides of living**
It is always grass is green on the other side. Everyone has a simple & straight opinion that living on the sea sides is always delighted & peaceful. But no one can dare to live by the sea side regions.
Living by the sea brings many joys but, for those living on west coast, Cyclone Taukte provided a few scary moments about the perils of coastal living.
Here are the downsides of coastal living, ranging from annoying to downright devastating.

1. Visitors

Seaside dwellers often find that their home is in high demand for the holidays of others. This can be great, but tricky when visitors don't necessarily get that your life isn't always paradise and that you aren't permanently on holiday.

2. Sand

Sand, sand and more sand. Lovely when it is fringing an azure blue ocean. Not so great when you have an entire beach worth of it to clean out of your house.

Prevention is definitely better than a cure when it comes to sand. Train everybody – including visitors – in the art of de-sanding before they come inside. A well-placed outdoor shower (or the more budget version; an outdoor hose with trigger nozzle) is key in the fight against gritty floors.

3. Salt and sea breezes

The sea breeze is one of the joys of living near the beach, but avoiding salt damage to interiors and appliances by keeping all windows tightly closed at all times.

This would also be a recipe for mould growth, something that is a common problem in coastal climates.

"All houses deteriorate, but coastal ones have moisture build-up on surfaces, sand-blasting from the wind and higher salinity in the air – that's harsh stuff," it is a advice to wash down all external surfaces every six-to-12 months (every three months if you have absolute beach frontage). "Use

a soft brush, sugar soap and a low-pressure wash,". Recommendations are to use premium quality paints in satin or semi-gloss finishes. "Salt sticks to low-sheen surfaces," he says.

For metal finishes, recommends high-grade stainless steel, a point echoed by Caroline Crooks, who lives 500 metres from the beach.

4. Repairs and insurance

Coastal dwellers should pay close attention to insurance, remembering that it does not cover the wear and tear from the effects of salt, sand and sea breezes.

5. Extreme weather, coastal erosion and rising sea levels

Coastal areas are not alone in experiencing extreme weather, but living by the sea gives you a front row seat for cyclones, east-coast lows and storm surges. Climate change is heralding more intense rainfall and rising sea levels.

CASE EXAMPLE

The study done here is about the small village on the coastal road, between shrivardhan & diveagar. The name of this village is Kondivali, is around 10 km away from the Shrivardhan on the way to Diveagar, which is exactly in mid area of this road journey. Since this is a unexploded beach, it is very much clean & uncluttered. This beach is away from tourist rush. Roads are bumpy, but worth visiting if in search of unexplored beaches and places. Without crowd but peaceful, as very few visitors visit this place. Good for photography. No activity or water sports. Though such good reviews from tourists' point of view, the inner story of this village is very scary.

Location

Geography
The village called Kondivali is a tiny small village on the western coast.

Special Layout

A typical city has a layout, when we talk about villages like kondivali, we hardly find defined roads, defined spaces for schools. Here people live as per their convenience, some in houses, some in huts, some in concrete homes, some in thatch houses, as per their financial condition.

Lower portion towards sea is Khalchi Kondivali & the globe shaped portion upside is

varachi Kondivali (denoted in yellow color). Other sides of the road are fields (denoted in green color).

Current issues

People living in this area are extremely poor. Due to climatic conditions around they are not able to work in their fields so the economic ratio resulting the surrounding condition is decreasing significantly. All the basic services laid in this village are in repairing conditions but they are not able to do it. Some of them are explained here,

1. **Water:**
   The basic need of living being is water. The source of the water in this region is taken care by a well. But how? There is a well in khalchi kondivali which has continuous water in it, excluding cleanliness & hygiene. There is animal drinking, motor room, cloths washing area and a drain.

There is a well in khalchi kondivali which has continuous water in it, excluding cleanliness & hygiene. There is animal drinking, motor room, cloths washing area and a drain.

Cloths washing area   *Well & animal drinking provision*   *Motor room*

The water from this well is taken to the water tank at upper level in varachi kondivali, through GI pipeline. This pipeline is running along the road, covered by planters & hey on the road.

Water GI pipelines running along the road

Water Tank (taki) in varachi kondivali

2. **Electrification:**
   The electricity poles are standing at the road way.
   Which carries electricity cables. But due to cyclone the pole bent & village was in dark for at least for 3 to 4 months.

Bent Electricity poles   *New poles erected but the condition is the same*

3. Internet:

No electricity no internet provision so no schools in pandemic. Since the villages & villagers are under poverty line, they hardly get electricity same as with internet. There is a connectivity problem even at the upper level.

4. Waste Disposal, Sanitation & drainage:

There is a lack of literacy, so they don't understand the importance of wastage separation system. Wherever they find space they dump the waste, or bun it, it may be dry or wet.

There is an open type of drainage system. All the gutters & drainages are open. These open drains are filled with dry wastes, so they are of no use. In rainy season all these gutters & drains are over filled & over flows on the road.

Open gutters filled with dry wastes

5. Utilisation of space:

Though the area is big, it is not utilised properly. Unnecessarily spaces left around the house, which is neither used for farming nor for gardening not for any proper utilisation. No systematic planning of the village.

Narrow roads, can be called as lanes. Now a days some people have started building houses with techniques & proper materials, but others are still living in huts.

Houses

CONCLUSION

There are many villages or rural areas in Maharashtra, in India which may be are in the same conditions. And need to repair its situation. There are government policies too which are trying to upgrade the condition. But it is now a role of an Architect to look into this matter & try to improve the situation with the help of our skill of space utilisation & technology.

The issues in the villages can be solved only with the help of strategic planning & government policies. The issues raised in this paper can be solved in the later stage with proper implications & planning.

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EVALUATION OF USABILITY OF PUBLIC PARKS IN SATARA CITY (W.R.T. INCLUSIVE DESIGN),

DIST – SATARA, MAHARASHTRA.

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Abstract: Historically the main purpose of public urban parks is to provide large open spaces within a city that can help mitigate the negative effects of industrialization. Recently, most developed countries of the world have recognized the importance of inclusive design of public parks for both environmental and social sustainability. These include increasing community resilience by shaping people's perceptions of positive health outcomes, social welfare and social relationships, trust, welcome and safety. Therefore, it is imperative to ensure that public parks are inclusive. "Inclusive" means "space for all" which suggests that everyone should be greeted in space regardless of gender, age, sexuality, race, ethnicity, religion, cultural background, socio-economic status or personal values. However, there are many public parks that already exist in developing cities but suffer from abandonment or underuse due to their un-inclusive planning with respect to physical, mental and social needs and preferences of citizens. The purpose of the study is to evaluate the elements required to improve the park usability through inclusive design and to analyze the factors affecting park usability and its inclusiveness with case examples of four public parks of Satara city, Maharashtra. Primary data is collected through field observations and behavioral mappings and interview survey. 120 samples of different age group, gender, and social background and income groups have been collected.

Finally, the research identifies the opportunities and challenges for inclusive design of public parks in Satara city. Finally, the paper reflects on the generality of the overall design that must be taken into account and considered when designing successful public parks.

Keywords: Public Parks, Usability, Inclusive, Visitors.

1. Introduction

1.1 Study Area:

Satara city from Maharashtra, India is a historical city currently at acceleration stage of the process of urbanization. The city was founded in the 16th century and was the seat of the Chhatrapati of Maratha Empire; Shahu I. Satara city is located in the Satara District of Maharashtra state of India, near the confluence of the river Krishna and its tributary, the Venna. The city gets its name from the seven forts (Sat-Tara) which are around the city. The town is situated near Pune-Bangalore, Diversion National Highway No.4 and lies between latitudes $17^0 54'$ to $18^0 11'$ N and longitudes of $75^0 3'$ to $74^0 54'$ E with an altitude of 697 m above mean sea level. Satara city is located in the bowl like enclosure formed by Ajinkya Tara fort on south joined by Yawteshwar hills in South-west. Important historical places like Pratapgad and Sajjangad are also near to Satara city. World famous hill stations like Mahabaleshwar and Pachgani are within reach of two hours from Satara city. Satara city is also well connected with important towns and cities of Maharashtra by Road and Rail. Satara city also serves as political, economic, social and industrial and educational hub of the entire district (Ankush Barkade, 2011). Hence, it is mushrooming as one of the developing cities.

Though Satara has blessed with many natural green spaces, heritage sites and historical places in and around city, they are out of reach of citizens considering time, expenditure and transport medium in day-to-day life. Therefore, the public parks in city play an important role in fulfilling physical, psychological and social needs of citizens

and within reach of people considering time, expenditure and transport in day-to-day life.

Figure 1: Location of Satara [10]

Figure 2: Arial view of Satara City [10]

1.2 Background of Public parks and Inclusive planning:

Green spaces have existed in cities since ancient times, mainly as private gardens in palaces. The concept of 'Public Park' evolved after industrial revolution as areas set aside to preserve sense of nature in cities and towns. The, modern public parks were created in United Kingdom in mid-ninetieth century to improve physical and mental health of people [1]. The idea of modern urban park to bring enormous green spaces in the urban communities was first introduced in Britain with improvement of Victoria Park 1840. Which turned into initiator of public parks was called as "People's Park". It was then trailed by development of Birkenhead Park 1847 in Liverpool, England designed by Joseph Paxton [2]. The Birkenhead Park was greatly appreciated due to fulfilment of people needs by providing recreational areas with different activities [3]. In a contemporary urbanized society, public parks play a very important role from environmental benefits to enhance physical, social and mental health of citizens [4].

Understanding the need and importance of public parks in citizen's well-being: like other developing cities, local authorities particularly Satara Municipal Corporation has made a great effort since 1992 to develop several green spaces for serving recreational and cultural activities for making the city healthy and livable.

So, it becomes more significant and relevant for a city like Satara to prioritize public space inclusivity, as it has culturally and socially diverse population and definitely inclusive planning to parks will add value to its usability and success.

Inclusiveness is fundamental to the successful design of public parks (planning magazine-well-designed public spaces are inclusive ones). Inclusive public spaces are places where people feel comfortable and have a sense of belonging regardless of their gender, age, ability, sexuality, race, ethnicity, culture, socioeconomic status, religion, profession, etc. When grandparents with kids, people who pick up bottles and young couples can feel comfortable being together in the same space is an Inclusive public space. Initially, all public spaces should be inclusive. They create opportunities for social interaction and promote urban diversity. It's not always possible to create a 100% inclusive public space, but there are always ways to improve and engage as many people as possible.

The feeling of inclusiveness is a subjective feeling rather than an objective measure. There are many overlapping dimensions of various physical, social and mental attributes that can affect the sense of inclusiveness in a public space. When people use public space, it becomes a process of transforming a built-in space into a meaningful space with a mixture of combined memories and identities. Inclusive public space can make people feel both physically and mentally; So being in a public place is a physical and emotional experience. This makes it challenging to evaluate public space inclusion, as it is affected by both tangible physical environment and intangible mental experience. [5]

1.3 Need of study:

Presently most developing countries have recognized significance of multi-utilitarian utilization and inclusiveness of public parks in sustainable development of cities and peaceful and health life of citizens. Inclusion means overcoming obstacles that may deprive some people of the opportunity to enjoy the benefits of the park and recreation. Therefore, in order to know the perceptions and feelings of citizens about existing parks, it is necessary to evaluate the role, benefits and potential of existing public parks in developing cities. Understanding the importance of "inclusion" of parks in developing cities; As an architect to improve the usefulness of the park through

inclusive planning in the future; The four examples are taken as an opportunity to evaluate the usefulness of the most visited public parks in the city of Satara.

1.4 Aim and objectives:

The aim of this research is to evaluate the usability of selected parks by examining the concept of 'inclusion' of public parks and to identify the properties that describe this concept. The aim of this paper is to reflect on the generality of the overall design that should be considered at the beginning of the park design. First, with the help of case studies to identify the most used and popular parks in different places with their current usage patterns and then to understand the feasibility of measures to evaluate the utility of parks in the context of inclusive planning. In addition, the objective of study is to explore the level of inclusiveness and their interrelationships through aspects of physical, social and psychological properties that affect park inclusion, which should better equip park managers and designers to develop and manage inclusive public parks at developing cities like Satara. These findings can help improve the overall design approach and management of public parks. This research focuses primarily on the physical, mental and social needs of citizens towards inclusive parks.

1.5 Scope and Limitations:

The scope is focused on different scales but the most visited public parks in Satara city have been selected. The study includes field observations and on-site interviews to understand the preferences of different users for inclusive design of parks.
Limitation –The ecological and economical aspects of public parks are excluded from research as it focuses only on the physical, social and psychological aspects.

2. Literature Review:

According to Drivers, Brown and Peterson [5]. Park visitors will react in the urban space, if they found their desires or needs. If park fails to respond to visitors needs and preferences, it might be represented through decreasing usability of parks [6]. As per Maslow [7], basic human needs are divided into six categories: physiological needs, safety-security, feel of belonging, need or recognition, fulfilment of potential, aesthetics. But these are very general and need a thought while

applying to park design [6]. It was proposed by Carr et al. [8] That successful urban public spaces should respond to five basic human needs; comfort, relaxing, discovering, passive and active engagement with park environment.

Carr suggests that comfort is most important and essential need [6]. The relaxation could be achieved through combination of psychological need of sense of exploration. Watching and observing natural features, people activities can attend passive engagement of visitors [6]. Active engagement involves socializing through talking or playing with other individuals [6] Parks serve their visitors through fulfilments of different needs and preferences. Therefore, evaluating usability through inclusiveness is an important tool for finding information on the characteristics of park visitors' needs for improvement of existing parks or development of new parks. Proper design and maintenance of public parks in accordance with the needs of the users and in a good natural environment will provide an inclusive green space with a positive impact on the citizens and nature. Accessibility, convenience, and responsiveness to a variety of uses are key principles for achieving an inclusive design (Waller and Clarkson, 2009; EIDD, 2004). In the context of public parks, inclusive design takes into account the needs of general users and special needs groups, such as the elderly and disabled users. It also takes into account the different preferences and needs of people of different ages, genders, social status or ethnicity in recreational activities. Different requirements for park visitors of different ages have been highlighted by different scholars (e.g., Liu et al., 2017; Jim and Xizhang,2013). While seniors enjoy open spaces with social connections and some prefer to live in nature-connected spaces, teenagers are in dire need of a hangout area with maximum views of passers-by. Significant differences in park activities among users with different ethnics are found in the requirement for social and nature-based activities (Whiting et al., 2017). Given the diversified use of public spaces, a variety of spaces should be provided to be inclusive public parks for different groups of users (Towards an engaging, inclusive and meaningful planning development of an urban park. In phitsanulok, Thailand Suthat yiemwattana1, sasima charoenkit1Doi: 10.21163/gt_2019. 141.21)

3. Methods and Methodology:

Figure 1.1: Flow Chart of Methods and Methodology

3.1 Data Collection:

3.1.1 Literature review:

Research begins with a review of the literature to find a correlation between the needs of parks and people and the usability and inclusiveness of public parks. It is important to ensure that our public spaces are inclusive, as everyone should have equal access to the free valuable resources provided by public spaces. Therefore, data is collected through literature studies to understand the many interrelated components of inclusive planning of public parks.

3.1.2 Selection of public parks of Satara:

In Satara city, there are 15 existing parks (fig.4) with different amenities, scale and type, different locations. In present study, four parks based on most visited, popularity and expert's opinions are selected as case study. Among the four parks Ayurvedic Garden, Godoli is nearly developed in last four years. Chh. Sumitraraje Udhyan and Guruwar Baug are established around 1996 and were renovated in last four years. Rajwada Baug was oldest of all. Chh Shahu Udhyan and Chh. Pratapsinh Maharaja Udhyan (Rajwada Baug) are situated at core (congested – Gavthan) area of Satara City. While Ayurvedic Garden and Chh. Sumitraraje Udhyan are situated in non–congested zones of city.

Figure 4: Parks in Satara, Maharashtra [10]

The Figure 4 shows the 15 existing parks in Satara, Maharashtra. Out of the fifteen parks following four parks have been selected for study:

1. Shri. Chh. Sumitraraje Bhosale Udyan
2. Chh. Shahu Udyan (Guruwar Baug)
3. Ayurvedic Garden
4. Shri. Chh. Pratapsinh Maharaj Udhyan (Raj Wada Baug)

Quantitative and qualitative analysis of the existing uses on the basis of field observations and interview survey to evaluate usability of parks through lens of inclusivity was conducted.
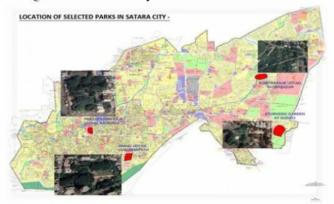
Figure 5: Location of selected Parks in Satara City [10]

3.1.3 Site survey /Field observation study:

Primary data collected through field observations and behavioural mappings at different timings on weekdays and weekends. The observations are recorded in form of photographs and markings on layouts. The comparative analysis graphs of four parks are prepared. Possible opportunities and challenges of parks w.r.t inclusive planning approach are explored.

3.1.4 Interview survey:

The survey was done by a structured questionnaire with questions based on different attributes of inclusive planning affecting usability of parks. 120 samples with different age groups, genders, income and social backgrounds and with different abilities are selected. Almost 30 samples are selected for each park.

4. Discussions:

4.1 Field observations and comparative analysis:

4.1.1 Site context:

The site context of each garden is different in many ways. Chh. Sumitra Raje Garden is built on a triangular plot at the junction of two roads. Many hospitals, institutional areas are close to it. The Ayurvedic Garden also has several multi-speciality hospitals, school and college buildings and residential and commercial areas at closed proximities. Guruvar Bagh is situated on the edge of Gaothan and is surrounded by residential and commercial areas. Chh. Pratap Singh Maharaj (Rajwada) Park has a Chowpatty area which is close to the main market of the city, next to it is a historic palace. It is located in the heart of Satara city. There are many important places like main Rajwada bus stand, rickshaw stop, peddler zone, Golbagh etc. Due to its central location, it is the most convenient park for the citizens of Satara.Considering the places and parking facilities, only parking area is defined in Ayurvedic Garden, Chh. The parking lot of Sumitra Raje Udyan is on the side of the road and Rajwada Udyan has no defined parking area and parking conditions are extremely critical during rush hour. Guruwar Baug also has no defined parking zone, visitors park their vehicles along roads which sometimes become reason for traffic congestion. Due to its proximity to the central city bus stop, only Rajwada Udyan is easily accessible to city buses and people in the long-haul area. Other parks, the Ayurvedic Gardens, are accessible by city bus, as Visawa Naka is 500 meters from the bus stop. But Sumitra Raje and Guruvar Bagh cannot be reached by city bus. The Ayurvedic Garden has more water features than the other three gardens and they are in working condition. These features are the highlight of the park for children. Only Chh. Sumitra Raje Park has two entrances while other parks have only one entrance. Ayurvedic Garden and Guruwar baug has maximum lawn areas (40%) which are not allowed to access to visitors. On other hand Chh.

Sumitraraje Udhyan also has one lawn patch not accessible to visitors (20%). Rajwada baug has no lawn patches (fig.11) Ayurvedic Garden(fig.13) has in its N-E corner very dense vegetation which is not accessible (18%) Chh. Sumitraraje Udhyan has almost 40% of its area under dense closely placed vegetation not accessible to visitors (fig.10) Rajwada baug and Guruwar Baug(fig.12) has no dense vegetation areas but it has old trees with big umbrellas creating natural shading areas to visitors.

Figure 6: Chha. Shahu Udyan (Guruwar Baug) [10]

Figure 7: Shri. Chh. Pratapsinh Maharaj Udhyan (Raj Wada Baug) [10]
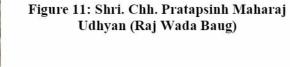
Figure 8: Shri. Chh. Sumitraraje Bhosale Udhyan [10]

Figure 9: Ayurvedic Garden [10]

4.1.2 Amenities, activities, landscape composition and special patterns and design

Figure 10: Existing layout of Shri. Chh. Sumitraraje Bhosale Udhyan

Figure 11: Shri. Chh. Pratapsinh Maharaj Udhyan (Raj Wada Baug)

Figure 12: Chha. Shahu Udyan (Guruwar Baug)

Figure 13: Ayurvedic Garden

Table 1: DESIGN, PATTERN, ACTIVITIES AND AMENITIES IN THE PARK WERE DISTINCT FROM EACH OTHER WHICH ARE SHOWN IN FOLLOWING TABLE

	CHH. SMT.SUMITRARAJE UDHYAN,	CHH. SHAHU UDHYAN (GURUWAR BAUG)	CHH.PRATAPSINGH RAJE UDHYAN (RAJWADA BAUG)	AURVEDIC GARDEN
	Case study - 1	Case study - 2	Case study - 3	Case study - 4
Location	SADAR BAZAR	GURUWARPETH	RAJWADA	AT GODOLI
Size	9,460 sq. m.	10,560 sq. m.	3,127 sq. m.	12,732 sq. m.
Accessibility	Foot, private vehicle etc.	Foot, private vehicle etc.	Foot, private vehicle, bus etc.	Foot, private vehicle, bus etc.
Physical Attributes				
Presence of parking	No separate parking zone, Parking along road	No separate parking zones Parking along road	No separate parking zones Parking along road	separate parking zone
Entrances	Two	One	One	One
Presence of water Element	Not present	Two fountains but not in working condition	Not present	Two Water fountain in working condition
Present functions	Jogging tracks, open gym, Children play area	Jogging tracks, open gym, Children play area	Children play area, Toy train area, No separate jogging tracks.	Jogging tracks, Acupressure path, Children play zone, Fountain show, Stepped seatout in front of fountain, Yoga pyramids
Lighting condition	Good at children play zone, entrance and stepped seatout. Poor at jogging tracks.	Good at children play zone, entrance. Poor at jogging tracks.	Poor	Poor
Clean drinking water facility	Not available	Not available	Not available	Only one filter is available
Toilets	Good clean	Very bad very bad condition	Not provided in the park but outside park public toilet	Good
Food facility in and around park	Only one or two hawkers are there in the evening	Small snack centres are available around	Rajwada chaupati is next to baug	Many snack centres are available around
Water features		Old fountain present but not in working condition	One small fountain	Waterfall at entrance. Fountain with fountain show.
No. of benches	9	8	4	0
Maintenance	Good	Poor	Poor	Very good
Psychological Attributes				
Shade	Jogging tracks lined with trees have good shade but children play area has no sufficient shading area	Due to presence of many old trees with large umbrellas, very good shade areas all over park	Due to presence of many old trees with large umbrellas, very good shade areas all over park	Very good
Comfort	No comfortable seating areas for care givers of children, old age	No comfortable seating areas for care givers of children, old age	No comfortable seating areas for care givers of children, old age	No comfortable seating areas for care givers of children, old age
Aesthetics	Good	Fair	Fair	Very good
Safety	Good	Good	Good	Very good
Explorational activities	Not present	Not present	Not present	Not present
Barrier free vision Of all zones of park	Due to many dense vegetation zones, no visual connection of zones achieved.	Besides scale of park, and many old trees, due to central large pathway, vision of almost 65% park at a glance is achieved.	Due to small scale and equal division of park zones and central pathway clear vision of All zones possible.	After entering the park, vision of whole park at a glance is achieved.
Social Attributes				
Group seating areas	Not specially designed Benches are also randomly arranged.	One small concrete raised platform provided with only 3 to 4 benches. And one small stepped amphitheater like seating arrangement. Riser of seats is not comfortable to old people.	No special benches or seating arrangement. Boundary walls of children play area acts as seating.	Stepped amphitheater like central area gives lot of scope to group seating with small riser. But some old people find this small riser very uncomfortable for seating.
Community gathering areas	Not present, but opportunity of converting lot of dense vegeted areas to such places is present.	Not specially provided, but lot of scope is available with proper planning and design.	Due to small scale, less scope.	Not present, but lot of scope available through alteration in design of unaccessible lawn patches, which are almost

				40% of park

4.2 Behavioural and usage pattern mapping and comparative analysis:

Behavioral and usage pattern mapping of visitors for four parks are done at different week days and on weekends at morning and evening.
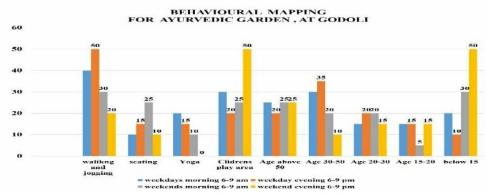
Figure 14: Ayurvedic Garden at Godoli

At Ayurvedic Garden:

Use max. on weekday evening and weekend evenings by age group below 15 for children play area, for fountain show at evening and to experience ambience and aesthetic of lush green environment. Even the children below 12 yrs. like to play on stepped seating and teens and adults like to chitchat, relax while seating at central stepped portion. As there are no other recreational, explorational activities and Maximum use for jogging and walking and children play area. For yoga, visitors find this park's green atmosphere very peaceful and relaxing.
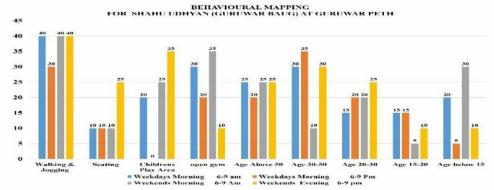
Figure 15: Chh. Shahu Udyan (Guruwar Baug) At Guruwar Peth

At Chh. Shahu Udhyan:

Due to poor lighting conditions, maintenance problem, visitors feel this park unsafe for evening use. This resulted in use of park max. on weekday morning and weekend mornings. besides poor maintenance of children plays equipment's, it is found that Response from below 15 age group is max. on weekend morning and weekday mornings for children play area. Walking and jogging activity has maximum preference by visitors due to long and broader track running around periphery and through different park zones. Seating is mostly favoured by age group 30-50 and above 50 yrs. But they find seating capacity insufficient and uncomfortable.

Figure 16: Chh. Sumitraraje Udyan

At Chh. Sumitraraje Udhyan:
As no other recreational facility other than jogging track and children play area available, Max. Use for jogging and walking on weekdays morning and weekend mornings. Only 40% of jogging track used at evening due to dense vegetation and poor lighting. widths of jogging track not suitable for vigorous activities like running etc. age group 15-20 have very low response.
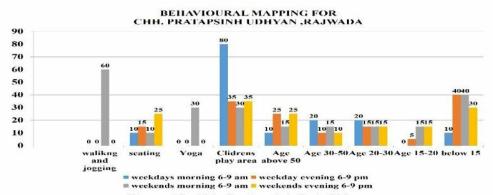
Figure 17: Chh. Pratapsinh Raje Udyan

At Chh. Pratapsinh Maharaj Udhyan:
use max. children play area on weekdays morning and weekend evenings. Response from 15-50 age group is low as there is no other activity other than children play area.
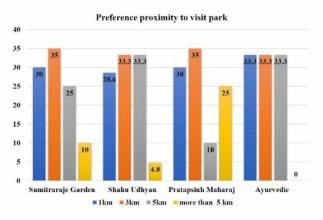
4.3 Interview Survey and Analysis:
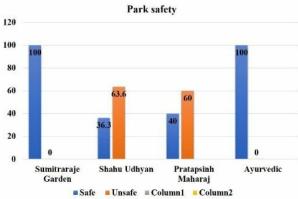
Proximity preference:
Almost equal percentage of participant visiting the Ayurvedic Garden from minimum to maximum shows that visitors from long distance also prefer to visit this park: the reason is that they feel it is the best park with respect to activities, green atmosphere, safety and maintenance comparing other parks. The fountain show at evening is main attraction point for all age groups. Comparatively only 10% of participants prefer to visit Sumitraraje Udhyan from long distances due to limited activities and insufficient seating and not appealing to spend extra time. Only close proximity preferred to visit this park. 5% Participants from long distances more prefer to visit Shahu Udhyan

maximum percentage is of up to 5 km for jogging and walking. Participants prefer to visit Pratapsinh maharaja park from close proximity up to 3km and only 25% prefer to visit from long distances more than 5 km.as this park has easy accessibility by city bus and share autos. And chaupati (food facility) in close proximity.

Preference proximity to visit park

Park safety
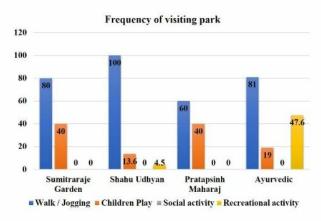
Frequency of visiting:

The frequency of visitors for walking and jogging for Shahu Udhyan is maximum due to its comfortable jogging track due to its width, length and ambience created due to old trees around jogging track. Frequency of visiting all parks for social activities is zero as park's planning and design is lacking to create scope for such activities.

Social Interactive place:

61.9% participants are satisfied with Parks social interactive places of Ayurvedic Garden as its central stepped seat out created gives opportunity for at least small-scale gatherings, 65% are not satisfied with Sumitraraje Garden as there is no scope for even small group seating.77.3% not satisfied with Shahu Udhyan ,50% participants are not satisfied with Pratapsinh Maharaj Udhyan. This shows that only Ayurvedic Garden has potential of having social interactions.

Frequency of visiting park

Social interactive place

Park Safety:

100% participants are satisfied with safety of Ayurvedic Garden and Sumitraraje Udhyan due to comparatively good light condition, no barriers for vision of different zones of park.36% are satisfied with Guruwar Baug safety as visitors feel compound wall height and type is not safer and 60% are satisfied with Pratapsinh Maharaja Udhyan safety as it is closed from all sides with proper compound wall.

Favourite Park:

Ayurvedic Garden has maximum ratio 95% of citizens as favourite park due to its better ambience, activities, maintenance, light conditions, safety, recreational activities like fountain show, acupressure path which visitors find appealing than other parks. This shows that citizens like to explore new places for recreation, physical activity and atmosphere.

Favourite Park

How longer stay at park:

Maximum preference was to time of 30 to 60 minutes was shown by participants of all parks and very low response to more than 60 min was observed. This shows that citizens of Satara prefer to spend 60 minutes only at park which is average time. Parks should be developed to attract and urge people to stay longer.

How longer stay at park

Seating Capacity
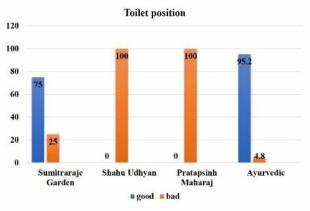
Seating Capacity:

Though Ayurvedic Garden has max. seating provided from other parks. Still 71% participants
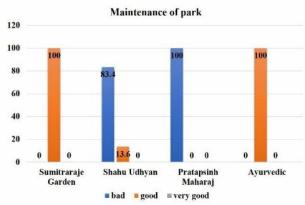
find it not sufficient. 95% participants of Sumitraraje Udhyan not satisfied with Seating facility.100% participants of Pratapsinh maharaja Udhyan and Shahu Udhyan are unsatisfied with seating facility. This shows that place for sedentary activity and comfort of participants should be taken into consideration while designing parks.

Toilet position

Toilet position and facility:

90% participants are satisfied with Toilet facility but 100% are not satisfied with its position at Ayurvedic Garden Satara as it is placed very close to children play area and visitors find it unhygienic and uncomfortable and entry of toilet is very open,75% participants are satisfied with toilet facility and 60% with toilet position at Sumitraraje Udhyan. No one is satisfied with toilet position. Only 36% satisfied with toilet position of Shahu Udhyan. This shows that toilet facility and positions need to be given thought as it is very basic need of visitors.

Maintenance of park

Maintenance of Park:

100% participant are unsatisfied with maintenance of Pratapsinh Udhyan, 86% of participants are not satisfied with Guruwar bag maintenance, 100% participants are satisfied with Ayurvedic Garden

and Sumitraraje Udhyan maintenance. This shows that only 50% of Satara parks have good maintenance and others need to improve.

5.   Key Findings:

The decline in open public space has also been caused by 'publicity' and 'inclusion' in provision and management policies, which exclude people from the process of designing, developing and managing physical space and public space instead of creating inclusive space for all. (Rogers, 2010; Low et al., 2005; Akkar, 2005a; 2005b; Neal, 2010a; Public Research Group n.d.) Akkar (2005), The type of access also defines the ideal all-inclusive public space, which is: physical access, social access, access to activities and discussions, or interaction and visual access.

Considering all the analysis of the area and interviews, it is clear that the design of Satara Public Parks leaves opportunities and challenges to ensure inclusiveness for the needs of the community and for relaxation, relaxation, contact with nature, diverse activities and social communication opportunities.

Following key findings based on study of case examples are noted:

1. Proximity is important determining whether people will use park or not? Creative ideas are needed to develop additional facilities and basic amenities to urge inclusiveness to access visitors from distant proximities.

2. Park should offer inclusive activities appealing to adolescents, females and seniors: Park space in Satara city are currently devoted to moderate activities. But both moderate and vigorous and sedentary activities area needed for females, seniors and teenagers that currently underutilize park services.

3. To increase attractiveness and safety inclusivity of parks; appropriate signage's to make route attractive and to help people become aware of walked distances etc. should be added.

4. Maximize current park capacity: Parks are underutilized particularly in morning and weekdays. This provides an opportunity for an inclusive design and program for residents who are not at work like senior citizens.

5. One dimension of the inclusive design is that it will connect different zones of parks through visual access for all and enhance the feeling of safety and security for all. In Chh. Sumitra Raje Park, the level of inclusiveness is low, as the dense vegetation creates obstruction of contact and visibility. Which is having a detrimental effect on garden use in the evenings.

6. The dimension of inclusiveness is that it is necessary to take care of social access at Ayurvedic Gardens and Chh. Shahu Udyan (Guruwar Baug) has many wide areas of green inaccessible lawn patches are acting as dead space. Therefore, they need to be made alive and usable and transformed into vibrant places

7. Visual and functional connectivity enhances the inclusion of parks. Balance with a wide range of landscape features, such as naturalness, diversity, vitality, maintenance and safety, balance of colours, variety of colours and number of accessory elements play a vital role in the overall inclusion of gardens that must be considered in Satara Gardens.

8. Satara Gardens create challenges and opportunities for inclusiveness for young people as they need to use open public spaces for their personal development and engage with the public sector. Young people need free and unrestricted space for their physical, social and mental development, for the development of their self-reliance and creativity, for experimenting with their identity while developing their own concepts of morality and empathy. (Aitken, 2001; cited in Perkovic, 2007). However, the design of most public parks in Satara excludes youth. From the above key findings; Satara Parks have opened up space and opportunities for inclusive planning and thereby improving the usability and sustainable urban life for all citizens.

6.   Conclusions and recommendations:

Following are some basic guidelines and recommendations for an inclusive planning approach to public parks from an overview of all literature reviews, observations, analyses and key findings:

The layout of the garden should be legible.

Everyone values options, such as passive or active recreation, sun or shadow, single or multiple seats. Hence the vibrant activities that are provided for different days and times for different visitors.

Parks should enable visual and functional connections. Design should have social interaction. Parks should also have mile markers for encouragement. The gardens should underline the natural beauty that creates peace and comfort.

Multifunctional and diversity

No space has only one single characteristic. Each public space should have pockets with different features and the community can decide what they want to highlight.

- Public spaces are not uniformly designed and should not be. They are all unique and site specific. They should also reflect the local community and the environment in which they are located.

- Public space should allow for different levels of participation. People should not have to interact with public places in the same way.

- Public space needs to have a 'scale' of engagement so that people can interact and engage with public space in the way and level they want.

- Public spaces should be multipurpose day and night. They are dynamic not static.

Organic, flexible and community oriented

- Public space must be organic. If there are pieces of basic design, they should allow users to interact and interpret space in their own way and customize the space.

- Public space reflects income level. If a place is too manicured it automatically excludes lower-income communities and becomes a space for more affluent groups.

- Although public space programming and activations help increase space usability, they should not be a solution to improve inclusion. A public space should be inclusive in itself without much intentional programming or activism.

- There should be no need to rely heavily on design changes for public space inclusion, but instead use small things that make them unique and people-friendly. (as shown in fig. 18)

- Highly planned and highly manicured public spaces are less inclusive. People should be allowed to interact and interpret public space in different ways. [5]

Some of the solutions to implement the above guidelines are given as examples (Fig. 18).

A low and very wide bench and totally flat which would allow a mother to lay a baby on its back And it provides a back to lean against which makes a huge difference in comfort for longer stays for senior citizens also.
source – cfn guide

source – cfn guide

Slight change in boundary wall design Can create scope for group seatings and interactionplaces

https://in.pinterest.com/ebuildin/innovative-urban-park-benches-outdoor-seating/

Some wooden logs can make dead lawn patches to liveable

https://nextluxury.com/home-design/outdoor-fire-pit-seating-ideas/

Lawn patches can be converted into active areas When combined with other interesting activities

https://icma.org/blog-posts/increasing-s equity-through-parks-and-recreation

Parks should have no more than a 2 percent grade for those in wheelchairs.

www.smartcitiesdive.com

https://www.smartcitiesdive.com/ex/sust ecitiescollective/what-do-seniors-need-parks/1070996/

In combination with other key elements like a sense of quiet, trees and shrubs, and benches in the right number and with plenty of variation, seating systems can become rich spaces of wonder and learning
source – cfn guide

source – cfn guide

Figure 18: Challenges and Opportunities

Parks are important settings in cities to provide opportunities for physical activity, relaxation, exposure to nature, and social interaction. There is a need to balance the park zone, green environment and various facilities.

Inclusive design can be used as a guide for developing open public spaces to develop solutions that enhance cultural exchanges, increasing the likelihood of participation of all types of users. As well it can help to ensure the needs of all members of a community and allow for better quality of life between the people and their city. Also, an inclusive design approach will help to improve social relationships and in a best-case scenario, help to increase a wellness environment that reduces potential sources of conflict as well as ensure the right to equality, including people of different abilities, without border gender (elderly, pregnant women, children, etc.).

7. Acknowledgments:

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ANALYSIS OF URBAN HEAT ISLAND EFFECT OF STREETS IN PUNE CITY, MAHARASHTRA, INDIA

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Abstract: Rapid urbanization has been observed over the past few years in Pune city, Maharashtra. The research paper aims to analyze the impact of local vegetation, built form material, land use pattern and traffic circulation at different locations in Pune city. The objective of this paper is to understand urban heat island effect and their causes, and further investigates the effect of vegetation on selected case examples of local streets. The paper concludes with the guidelines for selected cases and application of vegetation and heat absorbing materials to reduce the urban heat island effect on selected cases.

Keywords: Urban Heat Island, streets, Vegetation, Temperature

1. Introduction:

1.1 Urbanization:

Over the past 15 years, the highest rise is in land surface temperature has been observed all over the world.Urbanization has a dynamic relationship with the environment; urbanization has direct impacts on the structure of the city, which are direct impacts on the environment.Rapid urbanization often neglects the design issues related to urban climate, the material of the building, and streets which increase the level of discomfort of the city. Approximately half of the world's population lives in cities, and value is expected to increase to 61% by 2030. India is a fast-growing country, according to census 27.8% in 1990. The urban population is expected to rise to around 29% by 2025.[9]

1.2 The urban heat island:

Urban heat island (UHI) means a metropolitan area that is significantly warmer than its surrounding rural areas, which means air and surface temperature that is higher side than rural areas.

The main cause at UHI island surface use of materials that effectively retain heat. A UHI is created when naturally vegetated surfaces e.g., grass and trees replace with nonreflective, impervious surfaces. Decrease of surface moisture available for transpiration, complicated geometry, and excess use at asphalt and concrete for roads.

1.2.1 Urban Albedos:

The capacity of urban surfaces to reflect solar radiation- is one of the most important contributors to changes in outdoor temperature, intensifying the urban heat island phenomenon, where temperatures in urban centres are higher than the surrounding rural environs.[9]

Figure 1: Urban Albedos
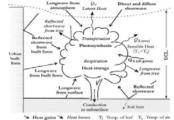
Figure 2 :Daytime energy exchanges between a tree and urban built form

1.3 Causes of Urban Heat Island:

1. According to the relevant literature, the urban heat island effect has the following causes (Oke, 1987; kleerekoper 2012).

2. Absorption of short-wave radiation from the sun in low Albedos (reflection) materials and trapping by multiple reflections between buildings and street surface.

3. Air pollution in the urban atmosphere absorbs and re-emits longwave radiation to the urban environment.

4. Obstruction of the sky by buildings results in a decreased long-wave irradiative heat loss from street canyons. The heat is intercepted by the obstructing surfaces and absorbed or radiated back to the urban tissue.

5. Anthropogenic heat is released by combustion processes, such as traffic, space heating, and industries.

6. Increased heat storage by building materials with large thermal admittance. Furthermore, cities have a larger surface area compared to rural areas and therefore more heat can be stored.

7. The evaporation from urban areas is decreased because of 'waterproofed surfaces' – less permeable materials, and less vegetation compared to rural areas. As a consequence, more energy is put into sensible heat and less into latent heat.

8. The turbulent heat transport from within streets is decreased by a reduction of wind speed. [9]
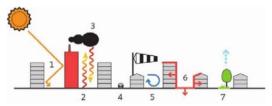
Figure 3: Causes of urban heat islands

1.4 Parameters of Urban heat island effect:

Following are the parameters of UHI selected for studyin terms of literature and their characteristics.

1. Vegetation on roads.

2. Use of urban materials

3. Urban geometry (Land use Pattern)

4. Air Quality

5. Additional factors

1.5 Aim and objectives:

The research aims to analyse the urban heat island effect of the streets in Pune city, Maharashtra, considering the focus on parameters of urban heat island.

Based on this aim, following are the objectives of the research:

a. To understand the urban heat island effects and their causes,

b. To identifydifferent heat pockets of various streets in Pune city.

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To investigate the effect of vegetation on UHI mitigation of the selective cases. This will be based on field measurements through IRGun, mapping, and photo collection with the analysis of the data collected

1.6 Scope & limitation

The scope of the study is focused on four case examples of urban heat island areas of different urban streets of Pune city. The scope is limited to mapping of vegetation and material patterns

The study pertains to analysing the UHI effect of streets of Pune. The paper seeks to study the different parameters of the road that are the Width of the road, vegetation pattern on the road, Material of the road, and Land-use pattern.

Based on the parameters the study area was focused on different roads from Pune city:

1. Jangali Maharaj Road, Deccan Gymkhana, Pune.
2. Pashan NDA road, Aundh ,Pune.
3. Singhad Road, Pune.
4. Magarpatta Road, Pune.

There are various causes of the UHI effect but the study is limited to the Vegetation, Material, Traffic, and land use pattern and is restricted towards pollution, social and cultural context, and the wind factor of the roads within the Pune city.

1.7 Literature Review:

According to the relevant literature,the growing urbanization creates a temperature difference from rural areas that are called as urban heat island effect. Due to the growing urbanization and reduction of vegetation, there is a reflection of solar radiation which leads to heat gain and absorption.

Using the remote sensing applications and Landsat images it is analyzed that the built-up area was increased by 32.68% from 1999-2006 with the reduction of 10% agricultural land and 21.91% of barren land which is added to intense urban areas. With the faster urbanization process, there is a 10% reduction in vegetation and a rise in temperature from 10°C to 40°C from 1999 to 2006. also, there is more impact on the suburbs due to the rise in construction. (Pradnya Nesarikar-Patki, Pratima Raykar-Alange, Nov. - Dec. 2015) [10]
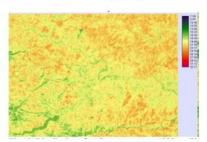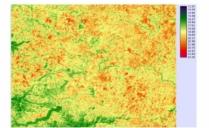
Figure 4: Distribution of surface temperature 1999

Figure 5: Distribution of surface temperature 2006

The growth of rapid urbanization with the reduction of the landscape of cities by the construction of densely built forms and the roads with impermeable surfaces results in the formation of an urban heat island which results in temperature rise in the urban areas.

The articles discuss the causes of the urban heat island effect which includes the growing urban sprawl due to loss of green cover, the heat emitted by the building materials, and urban morphology. Further, the article discusses the increased use of energy in turn more air pollution and degradation of water, and thermal discomfort with ill health effects dueto UHI. Various strategies like trees and landscape, green roofs reduction of heat due to building appliances are studied. (Gunjan Jain & Shuvojit Sarkar, 2017) [8]

The paper studies the Urban heat island effect in Bathinda city and the surrounding. Five different rural areas (Kotshamir, Mehma Swai, Nehian Wala, Bhucho Khurd, Multania), and 3 urban areas (Nacchatar Nagar, Matidas Nagar, and Kamla Nehru Colony) of Bathinda city were selected and their temperature were measured using a thermometer from February to April 2015. This is due to the vicinity of the desert which allows rapid cooling at night. (Nidhi Sharma, Puneeta Pandey, 2015) [7]

2. Methodology

The causes of UHI and the different parameters is identified, observed and experience during a commute. Relevant literature is reviewed to understand the mapping techniques, selection of tools for mapping, to understand the conclusion studies that were undertaken from different locations.

Table 1: Tools and techniques used for study area

Figure 6:Methodology

Tool name	Tool used
IR Gun	
Thermal Camera App	
Physical Mapping	

The issue of UHI on the streets of Pune has been identified. Four different locations from Pune have been chosen for the mapping and analysis. The two locations seek to investigate the role of trees and material on the thermal performance of the streets and the two locations seek to investigate the thermal performance without trees and the material impact.

Each street selected is included with a 1 km stretch including the main chowk. The selected roads are divided into different sectors like greenery and non-greenery areas, to fix all the variables that affect urban heat islands such as asphalt road, concrete road, stone pavement, normal pavement, etc.

Temperature measures through infrared thermometer (IR meter) were carried at different times to investigate the effects of vegetation and material during daytime. Measurements were carried out at four different times of the day that is 10 Am, 12 Noon, 4 Pm, 6 Pm. Also, the thermal camera app is used for the supporting photogenic format.

3. Data Collection:

There are four roads selected for the analysis of the UHI effect.

Jangali Maharaj Road (JM Road)Pashan NDA roadSinghad RoadMagarpatta Road.

Out of these four roads, two are the roads with greenery that are.JM road and Pashan Road and two are the non-greenery roads that are Singhad Road and Magarpatta Road

Figure 7: Location Roads on PMC map.

1. JM Road   2. Pashan NDA Road, Aundh

3. Sinhgad Road   4. Magarpatta Road, Hadapsar

3.1 Street 01: Jangali Maharaj Road, Pune

The first location selected is from Pune. Mapping and the temperature measurements are done through an IR gun and the photos are taken from the Thermal map on 10/11/2021 (Wednesday). Measurements were carried at four different times of the day to investigate the effects of vegetation and material. The Jangali Maharaj road is selected with a 1Km stretch with Jangali maharaj chowk at the center and includes the greenery area sector.

Table 2:Characteristics of the JM road:

Figure 8: Location Plan of JM Road

Width of the street	35 M
Typology of buildings	Commercial and Residential
Green Cover (%)	24%
Road cover (%)	28%
Built Up Density (%)	48%
Vehicular Density	High
Types of vertical Materials	Concrete with glass Facade
Types of Horizontal Materials	Asphalt road and paving
Type of Vegetation	Moderate and broad canopy trees
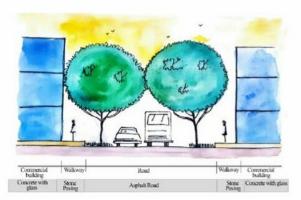
Figure 9: Schematic Section of JM Road

The above sections depict the amount of dense   vegetation on the road which does not allow the sunlight on the road resulting to maintain a shaded main road. Also shows the material mapped on the road.

Commercial area

Residential Area

Open space
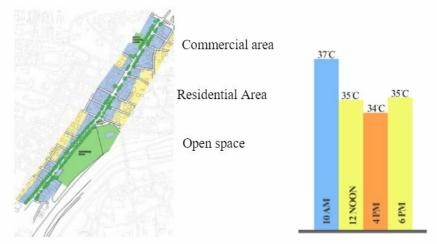
Figure 10: Vegetation mapping and land use pattern of JM road.

Figure 12 :Temperature of material on the street

Figure 13 : Site Photo of JM road

Figure 14 : Site Photo of JM road

Dense vegetation

Asphalt road

Curb Stone
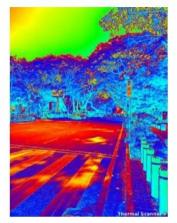
Figure 15: Temperature mapping by thermal Camera App for JM road.

Densevegetation

Asphalt road

Stone Paving

Figure 16 : Temperature mapping by thermal Camera App for JM road.

Heated (> 40 °C)

Moderate Heated(37 °C - 40 °C)

Shaded (35°C-37 °C)

Dense Shaded (> 35°C)

Analysis of Jangali Maharaj Road, Pune

The temperature in well planted area is lower with different material temperature during the daytime. The peak temperature is 40 C and is reduced to 35 C due to dense vegetation. There is less urban heat island effect which leads to thermal comfort on the road.

3.2 Street 02. Pashan NDA Road, Aundh

The second location selected is from Pune. Mapping and the temperature measurements is done through IR gun and the photos are taken from Thermal map on 11/11/2021 (Thursday). Measurements were carried at four different times of the day to investigate the effects of vegetation and material.

The Pashan NDA road is selected with 1Km stretch with Pashan Chowk(Garware chowk) at the center and includes the greenary area sector. The trees are loacted on both sides of the road with dense canopy

Figure 17: Location Plan of Pashan NDA Road, Aundh

Table 3: Characteristics of the Pashan NDA Road, Aundh

Width of the street	35 M
Typology of buildings	Commercial, Residential and Educational
Green Cover (%)	30%
Road cover (%)	38%
Built Up Density(%)	18%
Vehicular Density	High
Types of vertical Materials	Concrete structure with apex paint
Types of Horizontal Materials	Asphalt road and paving
Type of Vegetation	Moderate and dense canopy trees

Figure 18: Schematic Section of Pashan NDA Road, Aundh.

The above sections depict the amount of dense vegetation on the road which does not allow the sunlight on the road resulting to maintain a shaded main road. Also shows the material mapped on the road.

Figure 19: Vegetation mapping and land use pattern of Pashan NDA Road.

Figure 20: Temperature of street at different times of the

Figure 21:Temperature of material on the street
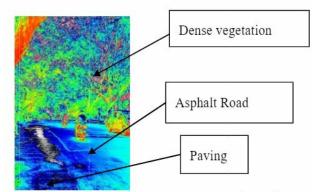
Figure 22 : Site Photo of Pashan NDA Road, Aundh

Figure 23: Site Photo of Pashan NDA Road, Aundh

Figure 24: Temperature mapping by thermal Camera App for NDARoad, Aundh.

Analysis of Pashan NDA road, Aundh:

The temperature on the road of Pashan NDA is lower with different material temperatures during the daytime. The peak temperature is 34°C and is reduced to 29°C due to dense vegetation and less vehicular movement. There is less urban heat island effect which leads to thermal comfort on the road.

3.3 Street 03. Sinhgad Road:

The third location selected is from Pune. Mapping and the temperature measurements are done through an IR gun and the photos are taken from the Thermal map on the date 13/11/2021 (Saturday). Measurements were carried at four different times of the day to investigate the effects of vegetation and material.

The Singhad road is selected with a 1Km stretch with Rajaram Square at the center with and includes the non-greenry area sector. The road is the main road and has a huge traffic movement.

Figure 25: Location Plan of Sinhgad road

Width of the street	45 M
Typology of buildings	Commercial and Residential
Green Cover (%)	15%
Road cover (%)	58%
Built Up Density(%)	27%
Vehicular Density	High
Types of vertical Materials	Concrete with glass facades And apex paint
Types of Horizontal Materials	Concrete road and paving
Type of Vegetation	Low heighted small canopy trees

Figure 26: Schematic Section of Sinhgad road, pune

The sections depict the lesser vegetation on the road which allows excess of sunlight on the road which results to heat the road. It also shows the use of material on the road.

Figure 27:Vegetation mapping and land use pattern of Sinhgad road

Commercial area

Residential Area

Open space
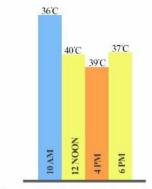
Figure 28: Temperature of street at different times of the
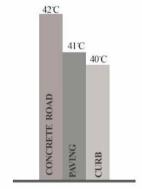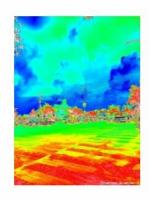
Figure 29:Temperature of material on the street

Low   canopy
Trees

Concrete road

Analysis of Sinhgad Road:

The temperature on the Singhad road is higher with different material temperatures during the daytime. The peak temperature is 40°C and is reduced to 36°C due to lower vegetation and high vehicular movement. The road is highly heated at the pick time of the day which causes a high level of UHI effect.

3.4 Street 04. Magarpatta Road, Hadapsar:

The fourth location selected is from Hadapsar, Pune. Mapping and the temperature measurements are done through an IR gun and the photos are taken from the Thermal map on the date 12/11/2021 (Friday). Measurements were carried at four different times of the day to investigate the effects of vegetation and material.

Width of the street	30 M
Typology of buildings	Commercial and Residential
Green Cover (%)	18%
Road cover (%)	43%
Built Up Density(%)	27%
Vehicular Density	High
Types of vertical Materials	Concrete with glass facades And apex paint
Types of Horizontal Materials	Concrete road and paving
Type of Vegetation	Broad and moderate canopy trees

Figure 33: Location Plan of Magarpatta Road

Figure 34: Schematic Section of Magarpatta Road

The sections depict the Moderate vegetation on the road which allows sunlight on the road which results to heat the road. It also shows the use of material on the road

commercial area

sidential Area

pen space
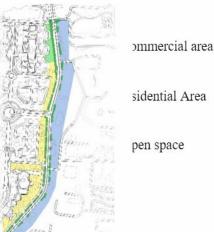
Figure 35: Vegetation mapping and land use pattern of Magarpatta
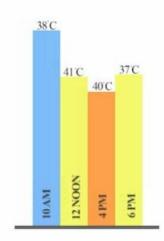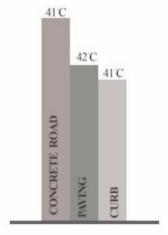
Figure 36: Temperature of street at different times of the
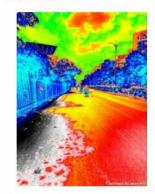
Figure 37:Temperature of material on the street

Paving

Concrete road

Analysis of Magarpatta Road:

The temperature on the Magarpatta Road is higher with different material temperatures during the daytime. The peak temperature is 41°C and is reduced to 38°C due to lower vegetation and high vehicular movement. The road is highly heated at the pick time of the day which causes a high level of UHI effect.

4: Analysis& Key Findings:

The tables include the remarks analyzed from the data collection of four selected streets in Pune.

Name of the Street	Existing Condition of the streets (Key Findings)	Remark
Jangali Maharaj Road	It has dense vegetation with broad canopy trees which provide shaded road and does not heat the Asphalt road.	Vegetation reduces the UHI effect. Shaded Roads create thermal comfort on the walkways.
Pashan NDA Road	The road is shaded due to dense vegetation. Asphalt road with paving and stone curb.	Broad Canopy trees provide shaded roads also less traffic movement leading to less UHI effect.
Singhad Road	High traffic movement on the concrete road. No trees were found at the core signal.	A high UHI effect was observed at the noon due to low vegetation and impervious materials.
Magarpatta Road	Concrete road with paving and moderate canopy trees with high traffic movement.	Though there were trees they did not shade the road hence UHI was observed.

5: Conclusion & Recommendations

Urban heat island is now one of the important problem in the rapidly growing cities as a part of global warming.In urba cities need to take some precautions at the time formation and the implementation of development plans. Following are some recommendation form research done on different streets in pune

1. A composed team from different disciplines (urban planners, architects, climate scientist, geographer, geomorphology, sociologists, landscape architects, etc.) should be involved during the preparation of urban development plans.

2. A proper native plant palette should be selected with the involvement of horticulturist or landscape architect.

3. Large canopy trees should be planted to create a shaded road.

4. Exisiting trees around the roads should be protected and trees should be planted in case needed.

5. Use of heat aporbant materials should be preferred and imprevious surface should be avoided.

6. Roadside planting should be done in the streets to prevent street canyon effect.

7. Climate maps should be created in cities,

8. Information systems following the city climate's current development should be established. (with remote sensing and GIs)

The influences that these type of green infrastructures have in reducing the urban heat island effect by alleviating the solar exposure was determined

In summary, adding vegetation suggests potential impact. Using trees and vegetation is significant in urban heat island mitigation due to its evaporation and shading.

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Assessment of Spatial Development in Peri-urban Villages of Baramati

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Abstract : Villages surrounding the city undergo the process of peri-urbanization which transforms their original village character. These villages undergo fast and unplanned physical growth and development. Due to the expansion of urban activities, peri-urban villages are experiencing extensive changes. Focusing on the peri-urban villages of Baramati city in Maharashtra, India, this paper assesses the nature and extent of spatial development and identifies the factors contributing to the rapid development of peri-urban villages. After reviewing similar studies, four indicators are selected to assess the spatial development of peri-urban villages-1) Population 2) Road network 3) land use landcover change & 4) Built-up distribution. This paper uses QGIS application as an instrument to examine the development patterns of selected villages for the past 20 years. The spatial development of peri-urban villages of Baramati is uneven as few villages are still expanding or growing while few villages have started intensifying. From eleven selected villages, Malegoan Bk has highest rate of development whereas the Sawal has the lowest rate. The main factor for this development is the presence of industries and educational institutions. In the future, most of these peri-urban villages will be in the intensification phase, so if this happens in an unplanned manner, it will create stress on services and facilities. This study provides a theoretical basis for the development of peri-urban villages. Analysis reveals significant variation in development patterns and trends across selected villages, which can provide informative support for policy making associated with (re)development of peri-urban villages.

Keywords: Peri-urban villages, peri-urbanization, spatial development, factors and indicators of spatial development

1. Introduction :

Developing countries are facing rapid growth in urban population which causes major socioeconomic and ecological changes. India is urbanizing rapidly and about 377 million people live in 7935 towns/cities across the country which constitutes about 31.2 % of the total population (Census, 2011). Human settlement is like a living organism which keep changing with time. Changes in land use and cropping pattern, livelihood activities, land management and settlement types can be seen. These changes subjected to physical growth of villages. So, the focus of the research paper is on spatial development. Due to highly dynamic character of peri urban villages, it is necessary to conduct study to understand these villages.

Peri-urban areas as the interface between urban and rural regions are currently experiencing enormous changes due to the extension of urban activities(Wisnu Pradoto, 2012). Peri-urban areas have received attention in research and development due to its distinct characteristics that needs to be addressed on their own terms. The areas facing the most significant changes regarding land use, farming systems, livelihoods, infrastructure, and pollution (Carol Rakodi, 1999). Hence assessing the spatial

development of peri-urban villages will be useful for understanding their characteristics and help planners in policy formulation.

1.1 Research Questions

How the peri-urban villages undergo growth in last two decades?

What are the factors affecting on spatial development of peri-urban villages?

1.2 Aims and Objectives

To understand the dynamic character of peri-urban villages.

To define the growth pattern of peri-urban villages.

To identify the factors influencing spatial development of peri-urban villages.

1.3 Scope and limitation

The focus of the research is on assessing the spatial development, so the indicators and factors related to spatial development were considered. however, other factors such as economic, cultural and social should be considered for assessment of overall development.

This paper is limited to study and understanding the peri urban areas. So, it can be taken further to find the effective planning strategies which will help in the sustainable development of peri urban villages.

1.4 Hypothesis

Development varies over time and by location. There are many factors and indicators which can characterize spatial development. Due to industries and educational facilities in Baramati, peri-urban villages have been started growing. So, it is necessary to overview this development. The results of this study provide a theoretical basis for the development in peri-urban villages in Baramati region.

2.Methodology

The research study is mainly based on secondary data. The indicators for village development have been derived in two stages. In the first stage, after reviewing similar studies, indicators related to village development and which can be measured in village terms have been listed. In the second stage, the indicators will be decreased by selecting those that would most relatable to spatial development of sample villages.

Indicators for spatial development selected for the study are

1.Population

2. Road network

3. Land use landcover change

4. Built up Distribution

Demographic data is collected from census handbook of Pune for 2001 & 2011. Land use and landcover map of selected villages were extracted from Bhuvan website. For identification growth pattern, google earth imagery data of 2007, 2015 & 2020 is collected and analysed. This paper uses QGIS application as an instrument to examine the development patterns of selected villages for the past 20 years.
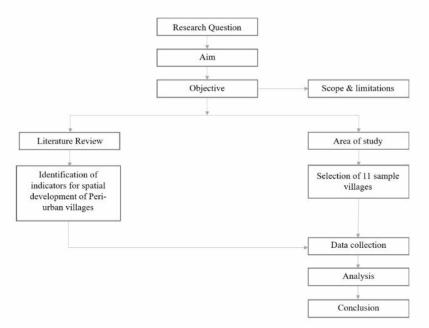
Figure 1: Methodology Flowchart

3. Study Area

Baramati is a city and a municipal council in Pune district. There are 111 villages in Baramati Taluka. With population of 429,600, Baramati is the fast-growing city in Pune district, Maharashtra, India. For the study, peri-urban village sharing boundary with the Baramati city are selected. Jolochi is excluded from villages as it is census town and the focus of study is on villages. Total 11 villages are selected for the study- Baramati Rural, Tandulwadi, Medad, Malegoan Kh, Malegoan Bk, Malad, Gunwadi, Pimpli, Kanheri, Sawal and Rui All selected villages have the Gram panchayat as administrative body. They are under 15Kms of distance from Baramati city.
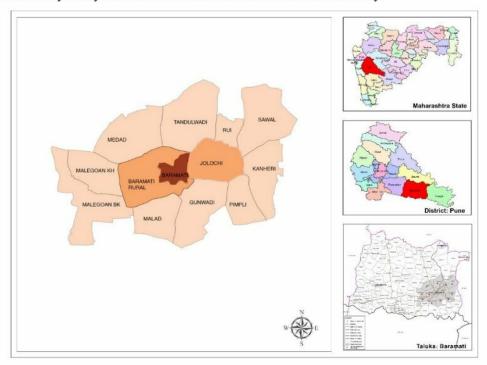
Figure 2: Map showing selected villages for study from Baramati Taluka.

3. Data collection Discussion and Findings

The data is collected for all the selected villages with respect to the indicators of spatial development.

3.1 Population

Population growth is a crucial factor in the process of spatial development. The effect of population growth can be positive or negative depending on the circumstances.

The population is studied for year 2001, 2011 and 2020 from district census handbook and population trend is prepared (Figure 3).

It is observed that Malegoan Bk has highest population in the initial year but rate of increase in population of Baramati Rural is faster than the Malegoan Bk. Baramati Rural shows rapid population growth. Malegoan Kh, Sawal & Kanheri shows stable trend in population.

Baramati Rural, Tandulwadi & Rui has experienced significant population growth in the first phase i.e. 2001-11. But in 2011-20, the rate of population growth has decreased compared to previous phase of study year. MIDC area is in Tandulwadi. As peri urban area has low land values compared to nearer city so people migrated for job opportunity tend to live in peri-urban areas. This is one of the reasons for increase in rate of population in few peri-urban villages.

The main reason behind Rui's population growth rate is presence of Vidhya Pratishthan educational institute. Baramati Rural is the nearest village to Baramati city. So, city proximity is one of the reasons for increase in rate of population growth of Baramati rural village.
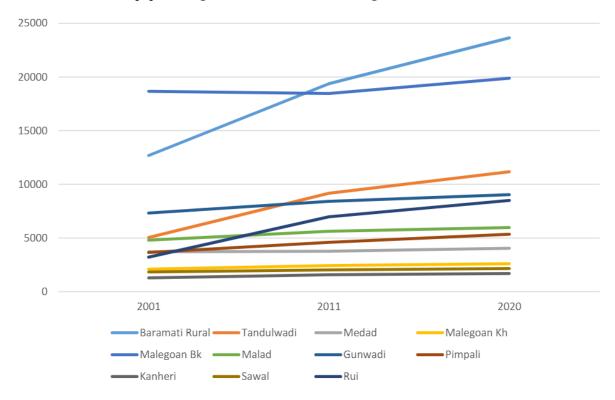
Figure 3: Population trend of selected peri-urban villages of Baramati

Malegoan Bk has showed interesting population growth rate. In the initial period Malegoan Bk had the highest population compared to other selected villages. But population get decreased during 2001-11 and increased in 2011-20. The change is negligible so we can say that Malegoan Bk has stable population growth rate. Though the population growth rate is low but Malegoan Bk has highest increase in built mass rate. This is due to the increased built mass is of mining category.

Medad is the only village whose rate of population growth has increased in second phase of study i.e. during 2011-20.

Overall during the study period of 2001-11, almost all villages has high rate of population growth while during the second period of 2011-20, rate get reduced.

3.2 Road network

Ease of transportation is closely related to change in the spatial form. All the peri-urban villages of Baramati city have good road connectivity to the other places.
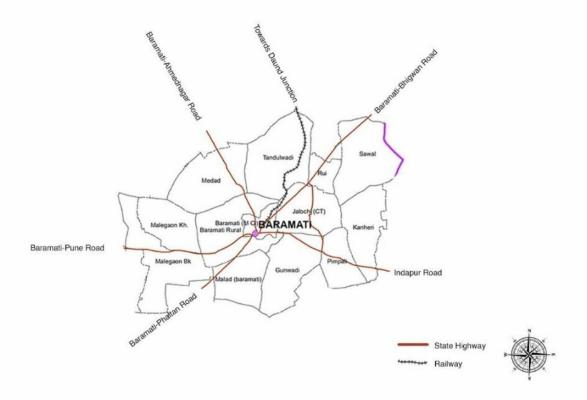
Figure 4: Map showing the major modes of transportation available in selected study area.

State highway passes through all the villages except Tandulwadi, but it has a railway station (Figure 4). The road network connects these villages to Pune, Daund, Indapur, Phaltan & Bhigwan. No major change is observed in road network during the study period of 2007 to 2020.

3.3 Land use Land cover Change

There is no doubt that land development control plays a pivotal role in driving peri-urban growth. Hence it is necessary to study the land use land cover changes in peri-urban area. Malegoan Bk shows noticeable change in land use. It has highest percentage of built-up increased and agriculture decreased. Which means newly emerging built-up land was mainly converted from agricultural land. The important factors for this change are sugar factory, industries and educational institutes. Due to these factors increase in population can be seen which results in demand for land. In few villages barren land is converted into built up and agricultural use.

In peri urban villages of Baramati development is dominated in the N-NE & S-SW part, while the E-S &W-NW part contained a large portion of agricultural land.

2005-06

2015-16

■ Built Up,Urban	■ Grass/Grazing
■ Built Up,Rural	■ Barren/unculturable/Wastelands, Salt Affected Land
■ Built Up,Mining	■ Barren/unculturable/Wastelands, Gullied/Ravenous Land
■ Agriculture,Crop land	■ Barren/unculturable/Wastelands, Scrub Land
■ Agriculture,Plantation	■ Barren/unculturable/Wastelands,Sandy Area
■ Agriculture, Current Shifting Cultivation	■ Barren/unculturable/Wastelands,Barren rocky
■ Forest	■ Rann
■ Forest,Forest Plantation	■ Wetlands/Water Bodies, Inland Wetland
■ Forest,Swamp/Mangroves	■ Wetlands/Water Bodies, River/Stream/Canals
	■ Wetlands/Water Bodies,Reservoirs/Lakes/Ponds

Figure 5: Land use Land cover Maps

It can be concluded that the peri urban area of Baramati town have experienced changes in land use and conversion of productive agricultural land into built up. The land-use pattern of the wetland was relatively stable throughout the study period. The one of the reasons for this land use change is to meet the housing need of increasing population. The increase was observed in built-up area from 2005 to 2015. On the other hand, agriculture land and barren area followed a declining trend. The driving force behind this change was urbanisation, economic development and population growth.
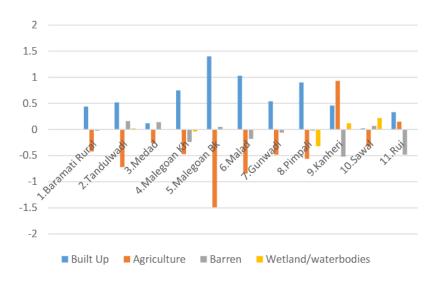
Figure 6: Land use change in percentage

3.4 Built mass Distribution

Built up is an important part of land use and key indicator of spatial development. The development path of urban villages involves three phases, namely expansion (more land), densification (higher built-up density through infilling) and intensification (increasing floor space per plot). (Pu Hao, Stan Geertman, Richard Siliuzas, 2011) So, the growth observed in the sample villages is defined in terms of expansion, densification and intensification. Google earth is used as a tool for the built mass distribustion study.

Villages	2007-2015	2015-2020
1. Baramati Rural	Expansion	Densification
2. Tandulwadi	Expansion	Densification
3. Medad	Expansion	Densification
4. Malegoan Kh	Densification	Densification
5. Malegoan Bk	Expansion	Densification
6. Malad	Densification	Expansion
7. Gunwadi	Expansion	Densification
8. Pimpali	Densification	Densification
9. Kanheri	Expansion	Densification
10 Sawal	Expansion	Expansion

11 Rui	Densification	Intensification

Table 1. Observed growth phases for seleted villages

From the table no. 1, four patterns of development phases during the selected period 2007-15 & 2015-20 are observed-

3.4.1.Expansion-Densification

In this type of pattern for the first phase built up expands on vacant land. The expansion is majorly seen along road. In the second phase built up get densified by filling up the in between empty plots. Total six villages are under this development phase are- Baramati Rural, Tandulwadi, Medad, Malegoan Bk, Gunwadi, & Kanheri.

3.4.2. Expansion- Expansion

Villages under this phase states that they are still growing. They show slow growth rate. From the land use study, it is found that the major land used for expansion is agricultural. Sawal is the only village in this development phase. The expansion is linear away from core village & along the road. It is farthest village from Baramati city and 83.57% of male population is engaged in agriculture. This shows it is less affected by urbanisation. This might be the reason it is behind all other villages in development.

3.4.3. Densification-Densification

This phase shows that villages are still densifying because of slow rate of growth. Malegoan Kh & Pimpli is under this type of development phase. Major male population of these two villages is engaged in agriculture. In future there are chances that these villages will expand along major roads.

3.4.4.Densification-Intensification

Facing the situation of land inadequacy for urban village development, intensification has become the most important measure for the villages to further grow. Rui is the only village which is under this development phase. Rui has lowest land area compared to other hence to fulfil increasing population need intensification is seen.
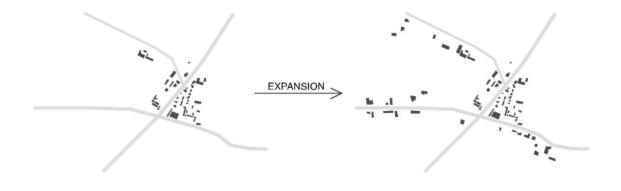
Figure 7: Process of Expansion
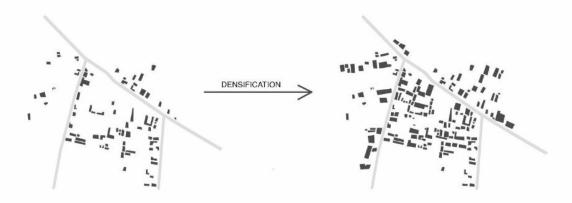
Figure 8: Process of Densification
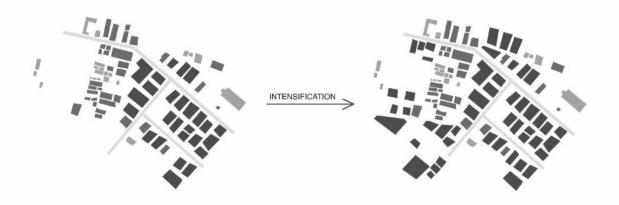
Figure 9: Process of Intensification

4. Conclusion

Focusing on a peri-urban village of Baramati city, this paper assesses the nature and extent of physical development in peri-urban areas, and identifies the factors contributing to the rapid development of peri-urban areas. Spatial development of peri urban villages of Baramati is uneven as few villages are still expanding or growing while few villages have started intensifying. The main factor for this development is presence of industries and educational institutions. Distance from city centre does not have prominent effect on spatial development selected peri urban villages, because all these villages are well connected with the city through good road network. To avoid future problems to people and environment there is need to prepare development plans for peri urban villages.

Population is important factor which directly drives the development of peri-urban villages. The nature of spatial development of peri-urban villages is complex and lacks in its own village character. In future most of the peri-urban villages of Baramati will be in intensification phase, so if this happens in unplanned manner, it will create stress on services and facilities.

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Strategies to Overcome the Challenges in Inclusive Planning of Housing for the Urban Poor in Pune Region.

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Abstract:

Inclusive urban planning is needed worldwide today catering integrated sustainable and affordable approach including everyone in the development, creating an awareness of rights and developing sense of citizenship making everyone able to participate in overall social growth. Planning and design play an important role in the same. Provisions made for the developments of infrastructure for urban poor people are insufficient even with Central, State Government, Local Municipal bodies working together. Inclusive planning of housing for urban poor should include public needs regarding housing to enhance quality of life and healthy environment avoiding insecurity, inaccessibility to infrastructure considering planning for livelihood and basic civic amenities catering to values and needs of community.

Solution to all problems above can be achieved through participatory approach which includes active involvement of all stake holders, local plans along with master plans and quality control. Instead of focusing only on ownership, provision of shelter homes for poor and facility of rental houses can be made. Collaboration of non-profit organisations and private organisations might be a solution for current funding challenges along with other sources such as green building approach, social enterprises and self-help housing model.

This paper focuses on finding solutions to challenges in inclusive planning of housing for urban poor in Pune region urban sprawl due to migration. Provision for a healthy environment for people is difficult task, financially. The whole research paper is based on secondary data collection. The outcome of this research will help in inclusive planning of Pune region.

Keywords: Inclusive urban planning, housing for urban poor, community development.

Methodology :

This research paper is about formulating Strategies to Overcome the Challenges in Inclusive Planning of Housing for the Urban Poor in Pune Region. For the collection of data for research various research papers are studied and summarized. The whole research paper is based on the secondary data collected. The data is collected through research papers available on the internet, journals, magazine articles, etc.

1. Introduction :

Urban population and migration from rural to urban areas in search for better opportunities is a worldwide scenario now. India is no exception and so the metropolitan cities in India like Pune. Pune is one of the urban destinations in India as it has favourable climate to stay and people look at Pune as a hub for Education, Automobile, Industry, Business, Manufacturing, IT, etc. Pune district is the second highest populous district in the state of Maharashtra. The urban population of Pune region has increased substantially in the past three decades, primarily due to the presence of manufacturing industry. With that comes the increase in the migration of people to find jobs, a place to settle in, a place to find opportunities to grow financially. The opportunities in the said

industry and the "IT hub" of Pune have been inviting a large manpower to the city, which has resulted in the rapid growth of population in the city. Figure 1 gives a fair idea on how the population in Pune has grown in the past 3 decades.

The Pune City is divided into two parts, Pune Municipal Corporation (PMC) and PimpriChinchwad Municipal Corporation (PCMC). *In the last three decades, the population of Pune city within the limits of PMC grew from 8.56 lakhs to over 30 lakhs.* (Nallathiga, Ramakrishna & Shetty, Ashwini&Thangarayan, Sumati& Yadav, Sonali, 2021)
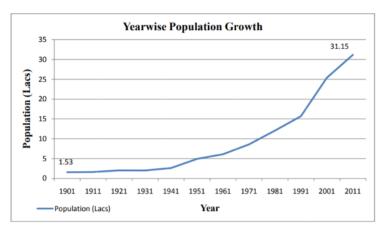
Fig. 1 Year wise population growth in Pune City.
(source: PMC ESR report_2012-13)

1.1 Urban Poverty:

The general definition of poverty is that there isn't enough to eat for the person. But poverty cannot be said to have one dimension only, there are multiple factors that need to be considered while speaking about poverty such as quality of life, access to basic amenities, clean water, etc. If we consider the original definition of poverty, there may not be any poor in the Pune city and when we consider all the other factors, the whole slums are included in the Urban Poor population.

The situation in Pune is such that the density of population in slum areas is six times that of the overall city. Which indicates that the overall pressure on the infrastructure of the particular area is more that it can handle. For the basic amenities most of the slum dwellers have direct access to services or they access it through community or common facilities. (Pune City Development Plan, 2006)

The rapid growth in the population has risen another challenge to provide with the accommodations for all groups of population, especially for the people at the bottom of financial pyramid. The rapid growth of the city results in the growth of slum areas within the city. Table 1 gives information on regions of Pune city, the number of Slums and the number of people living in slum areas, according to the PMC ESR report_2012-13

Table 1. Region wise distribution of Slums

REGION	NUMBER OF DECLARED SLUM AREAS	NUMBER OF NON DECLARED SLUM AREAS	TOTAL NUMBER OF HUTS	TOTAL NUMBER OF SLUM RESIDENTS
Aundh	28	16	44	72,540

Gholeroad	27	18	45	98,851
Kothrud	42	29	71	1,41,742
Warje Karvenagar	2	4	6	37,730
Dholepatil Road	44	33	77	84,073
Nagar Road	12	9	21	76,408
Sangamwadi	23	12	35	99,581
Bhavanipeth	51	30	81	1,06,851
Kasaba-Vishram	22	3	25	12,050
Sahakarnagar	32	12	44	78,529
Tilakroad	14	12	26	2,01,010
Bibewadi	18	16	34	68,235
Dhanakwadi	4	2	6	11,330
Hadapsar	34	15	49	1,00,794
Total	**353**	**211**	**564**	**11,89,724**

(source: PMC ESR report_2012-13)

The people residing in these slum areas are majorly termed as Urban Poor. Poverty is defined as amount of income needed to sustain a healthy and minimally comfortable life. But urban Poverty is not just a financial condition. Financial poverty is a kind of urban poverty. Urban poverty has various parts such as financial poverty, social poverty, health poverty, educational poverty, etc. The EWS and LIG forms largest section of urban poor population. Economically Weaker Section (EWS) is a group of people having income up to 3,00,000. Low Income Group (LIG) is a group of people having income of INR 3,00,000 to 6,00,000. In case of Pune City, as per the contents of Table 1 in 2012-13 better part of 12,00,000 people are staying in the slum areas. It also creates burden on urban poor and not poor groups being in main areas in city limits regarding services, infrastructure, roads etc. which needs to cater and improve the existing scenario. The Urban Poor Population also includes the people who are sleeping on the footpaths, not having any kind of shelter over their heads and with no income to sustain in the city. While planning the cities the needs of these sectors should be taken into consideration.

1.2 Classification of Urban Poor:

Figure 2. Classification of Urban Poor

The Urban poor can be classified into two categories recognised and unrecognised. (Susan Loughhead, Onkar Mittal, Geof Wood, 2001) The recognised urban poor live mostly but not limited to the slum areas and the unrecognised live on encroached areas, footpaths, polluted canal banks, railway lines, etc. they are not documented formally, they are not capable of having any income source. They do not have any option except living in these health hazardous conditions

without basic needs such as toilets and sanitation. If we consider 'Right to Shelter' for everyone, there should be some arrangement for these people.
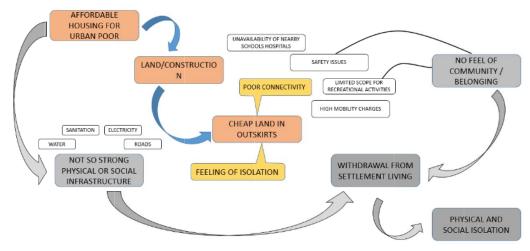
2. Government Schemes urban poor :

To support the needs and raise the quality of life for slum dwellers, central/state government, PMC have launched and implemented various programs. Such as Government redevelopment scheme to enable free construction of house of about 270 sq. ft. built up area. PMC has built about 12,000 toilets under the Paid Toilet Scheme. Central Government and PMC have implemented the Valmiki-AmbedkarAwasYojana giving Subsidy for a house of 225 sq. ft. PMC is also implementing the LokAwasYojana for the LIG. (Pune City Development Plan, 2006).

2.1 Govt. Scheme for Affordable Housing for Urban Poor :

According to State Govt. rule based on housing allotment criteria, the regulation for earmarking of EWS and LIG housing (part of the JnNURM) by certain percentage of reservation in every housing project is in place. Though mandatory, it has many flaws and needs reformation and additional ways for earmarking needs to be worked out other than this. The scheme being worked out is for buyers only, leaving out the other population of urban poor unable to afford buying of any property. The scheme lacks in the process of ambiguity about the selection of beneficiaries, authority for selection and whether the beneficiary will get the house for market rate or for a subsidised rate. There is no control on the entire procedure to be followed.

2.2 Challenges to Overcome in Current Affordable Housing for Urban Poor:

Figure 3. Challenges in Affordable Housing Projects.

3. Inclusive Planning:

Inclusive planning can be defined as a planning process which includes all the stakeholders that are affected by the planning. Inclusive planning also means that the stakeholders are actively participating in the given process, activities. Inclusive planning takes into consideration the needs of all of the stakeholders, keeping everyone equal, on the same side regardless of any differences. Inclusive urban planning tries to include various dimensions of urban poverty in the process of planning formation and its implementation.

To implement inclusive planning in provision of housing for Urban Poor in Pune, a number of approaches can be used such as rental housing approach, shelter homes approach, self-help

housing model approach, affordable housing approach, etc. The approaches can be explained and discussed with the urban to get them to participate in the planning of housing, along with the other stakeholders directly affected by the approaches.

3.1 Rental Housing Approach :

If we study the process of urban development it can be clearly seen that though urban areas provide a lot of opportunities, also creates and helps to spread the poverty. The major challenge of the urban poverty is to overcome the shortage of housing. Not all people have capacity of buying the home.

When we talk about 'urban poor' there are many points to be considered such as due to poverty they are completely excluded from social environment and not involved physically with other population. The major part is lack of access to education and unemployment.

If we see the last 15 years' journey of India towards affordable housing it can be observed that major focus is on providing housing to buyers. The Affordable Renting Housing Complex Scheme introduced by the government of India (June 2020) is a first step towards provision of rental housing to the urban poor.

3.2 Self-Help Housing Approach:

The concept of self-help is defined as an *act of relying on your own efforts and abilities in order to solve your problems, rather than depending on other people for help.* (Oxford Advanced Learner's Dictionary 7th edition, 2010) This concept is being utilised in large cities for the housing for urban poor globally.

Given the number of people in LIG and EWS, who are not able to afford a house, and the load on the governing bodies to provide these people with appropriate accommodations the 'self-help housing' model based on a community development approach can be utilised. The self-help housing groups can utilise abandoned old structures, land which is not currently in use, and make the place habitable by making necessary alterations, additions, etc. The governing bodies can make available such properties for setting up the self-help housing models. The implementation of Self-Help housing model would require participation of Public and Private sector.

A community with a number of people with skills supporting the setting up and maintenance of the housing model can be developed. This community can then take care of the issues arising in the housing model. A number of people with no prior income source can be trained in this housing model to be skilled people making them financially independent. A term of residence and a few terms can be given to the model so that the people residing in the community can be pushed to be financially independent at the end.

A self- help housing community has many advantages such as it would make use of abandoned parts of the city, a community of people being developed, the neighbourhoods would be improved as the abandoned parts are utilised, the model would be engaging and empowering urban poor to stand on their own with learning new skills to sustain in the urban sprawl.

The cluster redevelopment approach stated in the draft of Maharashtra State Housing Policy can be worked out with the concept of self-help housing. (Maharashtra State Housing Policy, 2007) The successfull models for the same in Hong Kong, Singapore and Shanghai can be studied and reformed as per needs, requirements and available resources in Pune.

3.3 Shelter Homes Approach :

When we consider the 'right to shelter', there is a need to provide the unrecognised urban poor with shelters to stop them from living in the health hazardous surroundings. Shelter homes providing either rooms, dormitories or large halls with single beds along with the basic amenities can be considered to give the unrecognised urban poor a roof over their heads. This would also help in documenting the unrecognised urban poor people.

These shelter homes can be provided in key areas of the city either reusing old structures or building new structures on abandoned plots. As this group of people has no way of making a living on their own, a way of making money through a cottage industry owned and supervised by the governing body can also be provided in these facilities, as the facilities would be located in key areas of the society. The shelter homes can also be equipped with tools to give basic education to the unrecognised urban poor, so as to taking a step towards independence for them.

Abandoned factory buildings, hospitals, residential buildings, commercial buildings, etc. can be utilised in implementing the shelter homes approach.

4. Strategies to Inclusive Planning for Housing for Urban Poor:

1. Proper documentation of urban poor which will reduce the gap of information while formulating any policy for urban poor and its actual implementation on the field.
2. Need of improved policy framework which is practical and easy to implement to reduce urban poverty considering aspects such as physical infrastructure, environmental and tenure security, etc.
3. Formulation of governing body to control the rent and other defining factors for rental housing according to model tenancy act, which is still in draft stage.
4. Development of model for self-help group house based on actively participating community in terms of monitory form or actual physical work which includes training of skills for financial independence of urban poor along with public and private participation.
5. Formulation of policies and planning for shelter homes (rooms, dormitories or beds) and its maintenance with basic amenities and sanitation for people with no income residing in health hazardous state, encroach key areas of the city.
6. Encourage awareness of urban poverty on socio-cultural, economic and environmental aspects of the society and to reduce unwillingness of stakeholders with more and proper incentives to developers or investors for things such as innovative use of sustainable materials and construction technologies.

5. Conclusion :

The research paper has focused on the study of challenges incurred in process of inclusive planning for urban poor in the urban sprawl of Pune City. The paper underlines the need of formulating strategies to overcome the issues in the inclusive planning of housing for urban poor. Central, state government, PMC and PCMC are taking a step forward by launching various schemes for the housing of urban poor. These schemes are available for the slum dwellers or the people in low income group. The study is useful in inclusion of the people sleeping on footpath, or who do not have any kind of shelter in the inclusive planning for urban poor. Provision of rental housing, practicing self-help housing model are useful to tackle the issue at hand. The study is useful for further research in planning for affordable housing for urban poor in Pune in future and provides useful suggestions for the planners and the policy makers to find the solution on the issues in the process of inclusive planning for urban poor in the urban sprawl of Pune City.

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Exploring the Cultural Geography of the Built Environment of a Traditional Settlement: Walawal in Konkan

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Abstract : It is a known fact that the built environment in primitive cultures is primarily a direct expression of socio-cultural aspects; and in the process other aspects like climate, available resources, methods of construction and technology act as form modifiers. It is also recognized that the built form is the collective response of the local communities to their immediate environment also representing their world worldview. The primitive settlement pattern and houses in the Konkan region of Maharashtra is one such typical example. But then, a settlement in Walawal, a village in South Konkan revealed a different picture. This paper shall explore the variations in the built form and settlement pattern within the Walawal settlement itself and will compare the differences in the larger context of the region. The study intends to investigate the variations in the built form by co-relating it with the geographical factors of the Konkan region in conjunction with the socio-cultural factors of the local communities, and their mutual dependencies. The investigation was done by collecting historic data from secondary sources and through on-field studies like physical documentation of the houses and the settlement. Also by documenting the geographical features of the settlement at the micro and macro level. Further surveys were carried out by interviewing the locals about their culture, beliefs and profession. This paper will demonstrate the need to document the local and fragile identities of regions at micro scale by throwing light on the deviation in the architecture and settlement pattern from the norm of the region and be a small contribution to the study of traditional house forms. The paper will also demonstrate that cultural geography is an important tool in analysing and documenting settlements.

Keywords: Walawal, Konkan, built environment, settlement pattern, cultural geography

1. Introduction:

Cultural geography was pioneered by Freirich Ratzel in the late 19th century and by Carl Sauer in the early 20th century to study the evolutionary nature of relationship of humans with the natural environment based on the theory established by Charles Darwin. Cultural Geographers explore the way humans adapt to their environment and subsequently affect the very same environment resulting in the formation of cultures unique to each geography..

 This brings us to an understanding that as many geographies, those many cultures, In order to understand this interaction, cultural geographers address the issues of distribution (where things are and why); ways of life; systems of meaning; questions of practice; and notions of power. They are concerned with social processes like the formation of identity, the construction of cultural differences, the sense of belongingness and the issues of citizenship. (Atkinson et al, 2005.)

The dwelling of man in primitive societies is an expression of their culture. It is attuned to it's physical setting i.e. the place and responds to the way of life i.e. culture. Climate, resources available, and the technology known are the form modifiers. Over time an identity of the entire community gets created. Cultural geography of vernacular architecture looks at how communities, because of their

unique world view have a differential response to the same environment (geography), creating varied built environments. (Rapoport, 1969). This paper analyses the variation and transformation of the built form of Walawal village in South Konkan. It demonstrates the cultural geography of the built environment in refernce to the typical of the region. Out of the several aspects of cultural geography as   given   in

Cultural Area	• Demarcating parts of earth that have similar cultural elements
Cultural Regions	• Comparing and contrasting areas that are culturally different
Cultural Diffusion	• The spread of the cultural component in different parts of earth
Cultural Landscape	• Contribution of culture to visual distinctiveness of the region
Cultural Ecology	• Adaptation to landscape and how people impacted the landscape
Cultural Interaction	• The impact of cultural traits of one culture on another

Figure 1 (Balasubramanian, 2018), the aspect of cultural region, cultural diffusion and cultural ecology was found to be the most relevant for following reasons.

Cultural Region: Walawal lies in the coastal belt of Maharashtra which has a different geographic characteristics as compared to the rest of Maharshtra owing to the Sahyadri Mountain range separating the two. Moreover, due to the rugged terrain, there are several unique chracteristics distributed across the belt. In order to study the factors contributing to the nature of built form, studying the uniqueness of the region under consideration becomes important.

Cultural Diffusion: Owing to the proximity of the region with another culturally rich region, Gomantak (Traditional name for Goa) and the attacks that Gomantak received during the medieval times, there was mass migration of the local Hindus to the Konkan region. Walawal is the effect of one such migration; which justifies the study of Cultural Diffusion and what place they occupied in the given region.

Cultural Ecology: Migration takes us to studying Cultural Ecology which is to understand why man occupied the particular place and what were the driving forces for the settlement to take the form that it has. It will help trace the probable evolution of the settlement and also help decipher why the built environment is different as compared to the typical of the region.

Cultural Area	• Demarcating parts of earth that have similar cultural elements
Cultural Regions	• Comparing and contrasting areas that are culturally different
Cultural Diffusion	• The spread of the cultural component in different parts of earth
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Cultural Ecology	• Adaptation to landscape and how people impacted the landscape
Cultural Interaction	• The impact of cultural traits of one culture on another

Figure 1: The aspects of Cultural Geography
Credit: Prof. A. Balasubramanian

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The study was carried out as a part of the settlement study for First Year students (2016-17 batch) of Aayojan School of Architecture and Design, Pune comprising of 2 faculty, and a team of 33 students. Primary data was collected onsite using qualitative methods; onsite observation, interaction with villagers, sketches, photographic documentation and Measured drawings. The site stories were crosss verified with the secondary data sourced from the gazette of Konkan and Goa. The data for the typical houses of the region and the Indian way of life was sourced from secondary data and also the earlier settlement studies.

In the following description, the data collected, its analysis and discussion is presented with the help of drawings, sketches and analytical diagrams. The conclusion is drawin from this discussion.

2. Cultural Region

Konkan Region and built form

Walawal is located in the Southern region of Konkan in Sindhudurga district, very close to Goa and Karnataka. Konkan is the coastal belt of Maharashtra separated by the *Sahyadri* range which imparts it the distinct climate, Warm and humid with heavy rainfall in the monsoons. It has a rugged terrain and many rivulets that flow from the valleys of Sahyadri westwards into the Arabian sea. 'Refer Figure 2'. With very little space for large farmlands, most families own small hillocks with large orchards growing a variety of fruit trees with the house at the centre which demands a house of an extrovert nature.Refer Figure 4. (Dengle, 1998)
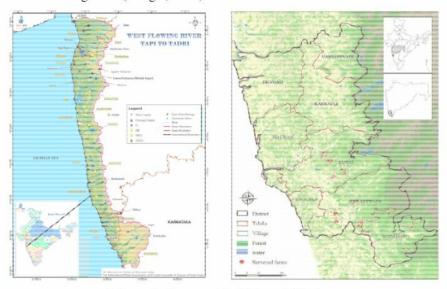
Figure 2: Geographical Map of Konkan
Credit: Gazette of Sindhudurga district

Unlike its cousin in the Deccan plateau, the centre of the house is the most private space. The house grows in a concentric manner around it. At each layer the sense of enclosure reduces and the outer layers are visually more connected to the outside. The outer layer is a mix of semi-open for various farm-related activities and covered spaces reserved for cooking and retiring. An additional layer of a temporary nature is reserved for all the peripheral acivities and also to connect one to the surroundings and protect the house from the vagaries of nature, specially heavy rains. It is interesting to note the modularity that is a response to the available material resources and also for the ease of covering the house a sloing roof. A centrally cascading hipped roof is the most suitable for this configuration making way for an attic at the apex (mala). The entire Konkan region is dotted with this archetype. (Dengle, 1998). 'Refer- Figure 2 and Figure 3'

The study region- Walawal

On one of the rivulets flowing towards the Arabian sea is the river *Karli* that divides the Malwan and Kudal Taluka. On the southern banks of the river is the quaint little village of Walawal of Kudal Taluka. On the Northern banks are the villages Kalse and Dhamapur of Malwan Taluka. Malwan is flourishing with nature's bounty and with large orchards and plantations is a major supplier to Kudal. River Karli works as a connector between the 2 for trade purposes. Kalse is believed to be the representation of *Kashi* in the North by the locals. Walawal also has another water body, a lake. As per the stories, the place on account of its 2 water bodies would always remain wet (*ola-ola* in Marathi); the name Walawal is a derivation of that. Refer- Figure 5b and Figure 6a&b.

3. Cultural Diffusion

Spread of Cultural Component

The distinct geography of the region was the reason for migration from Gomantak (Goa) to the Konkan belt in 14th century when the prevailing religion and all its cultural symbols faced a threat of

Figure 3: Typical Konkani House
Credit: The author, based on earlier settlement studies
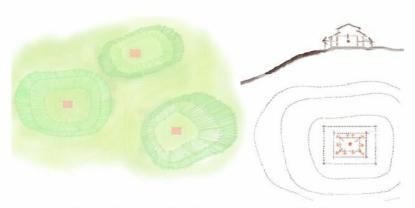
Figure 4: Typical settlement pattern in Konkan
Credit: The author, , based on earlier settlement studies

extinction from the attack of Bahamanis. Protecting the deity was important and what better location than the undulating valleys of the *Sahyadri*, where the deity remained inconspicuous. Refer- Figure 5a & b. It was much later, only during the rule of the Peshwas, when the region expereinced peace that the deity was housed in a temple. The present form of the temple was a much later transformation. It is important to note here that this population had migrated from the fertile belt of Saraswati to Gomantak, via the sea route when the river dried up during the Vedic times. (GCCI, 2019)

4. Cultural Ecology

Various components occupying space in the landscape; The Temple and the Market

This site, near the 2 water bodies was ideal, there was proximity of the river and also a low-lying area near the lake. For Cultural reasons, a deity is not placed on the Southern bank of the river, thus the Northern bank of the lake is where the idol is placed. Laxmi-Narayan deity faces the east, the direction of the Gods. Another deity, Rawalnath, a protector from evil forces was needed at the mouth of the village in the southern direction. Since South is believed to be a direction of all negative forces (Demons), Rawalnath deity faces the south. (Refer - Figure 6).
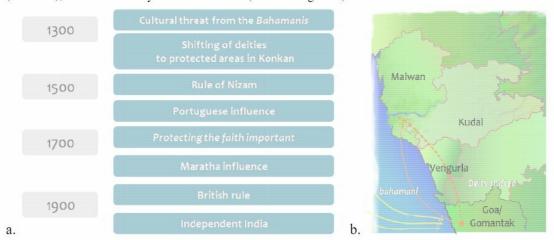
Figure 5: Timeline of events in Konkan region
Credit: the author

Another important force developed; A trade route, via the Karli river, between the Malwan and Kudal regions. Malwan had rich and abundant produce which was supplied to the south and Kudal supplied artefacts and craft items made of Bamboo to the North. The establishment of the deity lead to the development of a pilgrimage path between the temple and the regions of the North of the river, which would have established the trade route between Malwan and Kudal through the river, making Walawal a significant port and trading centre. (as per stories from village elders and leaders). Refer - Figure 6

People occupying adapting to the landscape

As the temple and the Bazaar was established, people of various related professions began occupying their place in the landscape. The temple is an institution and brought along with it a whole set of people; The Brahmans- the keeper of the faith, the Kshatriyas- protectors and rulers of the community, the Vaishya- traders and the sellers lastly the Shudras- the clearners. Each have a distinct role to play in the community and there always was a unwritten rule regarding the place one occupies in the given environment.

As it is clear from the diagram, those associated with the temple and in service to the temple (*Brahman*) occupied the inner circle, close to the temple and other professions were in the outer periphery. (Refer- Figure 7). Another focus that was established, the bazaar, the trading community

(*Vaishya*) occupied the place near the river. The leaders (Kshatriya) occupied a slightly higher location near the river. Those with an higher economic ability and more power occupied the hills.

Table 1: Professions and their place in the landscape

Vaishya - Shop-keepers	the path of the trade route	Bazaar Peth
Kshatriya -Chaudhary	A higher location behind the bazaar	Chaudhary wadi
Brahmans- Priests	higher ground near the temple	Deul wadi
Businessmen -Bhandari	Hillock - away from the temple	Darwar wadi
Shudra- Harijan Cleaners	At the edge of the settlement	Harijan Wasti
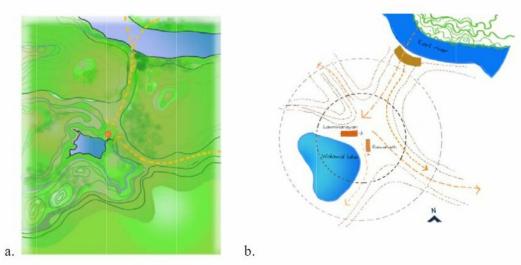
Figure 6: Cultural Ecology
a-Temple and Market occupying the space in the landscape.
b-The impact on the landscape
Credit: The author

People impacting the landscape

As people settled in this environment, they immediately start impacting it. A pathway emerged from the bazaar peth to Deul wadi. Another from Bazaar Peth to Kudal and from Deul wadi to all the orchards with the Deul as the nucleu os the settlement. For their dwellings, the locals adopted the typical of the region with a deviation and transformation as per the local context and the need of the community. We shall be discussing this in the context of Bazaar Peth, Chaudhary wadi and Deul wadi. and in refernce to the drawings and diagrams presnted in Figure 8.

Discussion - House Form - Variation from the typical

The study revealed that the house forms of each of these clusters are similar but the way they are oriented, transformed and the manner in which they come together varies with each profession.

Figure 7: Cultural Ecology -People occupying a place in the landscape
Credit: The author

Orientation: The longer face and the entrance house faces the East in most Konkan settlements. Here in Walawal, the houses in Deul Wadi and Chaudhary wadi, those of Bhandaris are oriented to the North and the longer axis of the house is parallel to E-W axis the longer side facing the North. This orientation is a direct response to the value that the river has on the local culture. River is the one that feeds them and she may at times be ferocious and thus needs to be reverred to, the first thing in the morning. In accordance to this, Tulsi Vrindavan is at the front of the house, in the North- East direction. It is an act of gratefulness that is expressed through these religious symbols and worship. Refer Figure 8-A-b & c

The world view of the Vaishya (Wani) community in Bazaar peth is however different. For them the customer is the provider. Their houses are on either side of the street and face the street. N-S street compels that the house be oriented to East or West. The front being reserved for the shops and daily trade, Tulsi goes to the backyard. For practical reasons, they have adopted a different part of the story revolving arounds Goddess Tulsi. She is considered to have succumbed to lord *Vishnu* who took to the form of *Shaligram,* her husband. She occupies a place at the backyard. In doing so, the residents also get enouhg privacy for reverence. Refer Figure 8-A- a.

Form Transformation, Cluster Pattern and its relation to Profession: (Please note that here we are not concerend with the way the tranformation happened when families grew and the house got divided. We shall only see the impact of proession and way of life on the transformation).

Bazaar Peth: House in Bazaar Peth have undergone a tranformation. The need of selling goods and storing it meant more space. The concentric growth that the house allows made enough space for the activity. This outer ring has activities like a shop, storage ora flour-mill along some semi-shaded open space. This space, apart from marking an entry to the house, gives some respite to the traveller/ buyer/ guests. The climate demands that the houses are away from each other. But agian, economical concerns and the nature of activity take a precedence and the houses are arranged in a row, almost touching each other making a linear pattern. al social activity happens only at the backyard. Refer Figure 8-B-a

Chaudhary wadi: The houses of Chaudhary's are clustered. They are placed perpendicular to the slope It defies the standard recommendation of placing the units parallel to the contours. When the houses come together, the entrance of the neighbour's house do not come face to face either. The front of one house faces the back of the other and are roughly aligned, with an equal size of open space in between. This conveys that, paying reverence to the river goddess is a priority over the lay of the land

and social communication. The positives or learning here is the formation of terraces, enclosed by the houses, retaining walls and a few fruit trees. As there is series of pairs of houses, each terrace is connected to the other visually as well as physically with 8 to 9 steps. In contrast to the bazaar-peth, this cluster has a cosy environment that encourages social activity. Refer Figure 8-B-b

Deul wadi: Deul wadi has isolated houses with large parcels of land around for the purpose of plantation. They may be atop the hillocks or on plain land. Some of the house belongs to the landlords and some to the brahmans. This strategic location of the house enables them to keep a watch on all the plantation around and also suggests power. The hillock has been terraced to accommodate the various plantations. The house is approached by a series of steps that more or less align to the central entrance of the house.

Each cluster in the settlement has a separate identity and yet acts as one whole unit.

With this knowledge, it is imperatiive to gain some insight into the old texts (purana) of India. Texts like matsyapurana and vastushastra are like a conceptual framework for building the dwellings. The texts guide one on selecting the right place in the landscape, right direction for various activities of the house in accordance to the sun, wind and light. Since these are guidelines, they leave a lot of room for one to interpret and adapt to one's specific conditions, be it the lay of land, the way of life, the occupation one pursues and also the world view or the belief system one holds. Please note the word one here means the representatives of the entire community.. (Dengle, 1998)
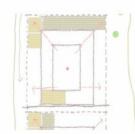
A. Orientation and Placement of Tulsi Vrindavan
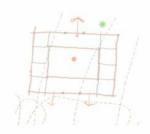
Typical to the region   a. Bazaar Peth   b. Chaudhary wadi   c. Deul Wadi
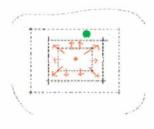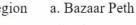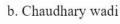
B. House Form

Typical to the region   a. Bazaar Peth   b. Chaudhary wadi   c. Deul Wadi
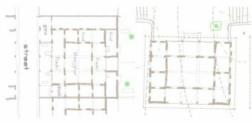
C. Cluster pattern

Typical to the region   a. Bazaar Peth   b. Chaudhary wadi   c. Deul Wadi

| Segregated | Linear | Linear Clustered | Segregated |
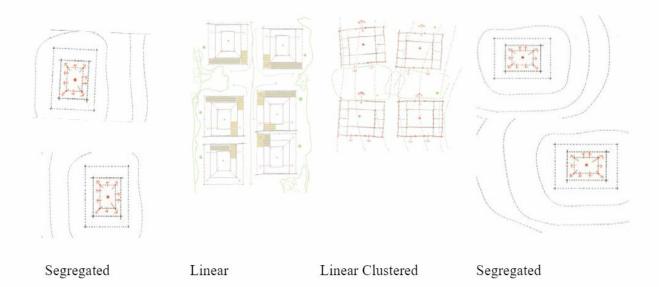
Figure 8: House Form Transformation
Credit: The author

5. Conclusion

We see here that culture is a derivative of the geography, it emerges from the reverence of nature either to offer gratitude or to praise the elements of nature or even to protect from and tame the forces of nature. all of the environment that man creates is built to cater to this belief. While in most of Konkan the front of the house faces the east in recerence of the rising sun, here in Walawal it is in reverence to the river (element water). If we recollect from figure 2 that the people might be river worshippers having come from a land where the river had dried up, the polulation might have a high reverence to the river, thus the orientation of the houses of most of the communiies is towrads the North, facing the river. A pragmatic mind convinces that it for the purpose of catching the land breeze and water breeze (an important strategy for the Warm and Humid Climate) that the house is oriented with long face towards the North and South.

The variation of the house form in Bazaar Peth only conveys and confirms that the loose framework of the ancient Indian texts for building dwellings gives a lot of freedom to one to modify the dwelling as per one's needs and profession. It also confirms to this belief "Culture in Indian sense was meant to be forever evolving, never static. While it is attuned to its immediate environment and connected to its past, its inherent quality is to forever adapt and assimilate from the various influences." (Vatsyayan)

The strength of the oral traditions is also worth noting here. It is doubtful that one may have read the religious texts, but the learnings have been passed on from generations. As long a the sense of community is intact, the identity is intact.

6. Recommendations

This study has opened up many avenues for further studies. Primary among those is to study the built form of other villages in Konkan belt that are along the west flowing rivulets. After having studied those many more generic conclusions can be drawn. Second is that there would be many such unexplored micro-regions, a study and mapping of which will reveal the other deviation from the norm and probably bring out the Cultural Geography of the evolutionary nature of the Traditional house forms. Third will be to have a critical understanding of the term Cultural Geography in refernce to the puranas and texts for the building of houses of the common people.

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STUDY OF VALUES ASSOCIATED WITH RURAL OPEN SPACES
(VILLAGES OF WESTERN MAHARASHTRA)

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Abstract: The definition of open space varies according to the context in which it is situated. Open space in rural areas like agricultural land, coastal land, river bank, hills and hill slopes, temple and its surrounding etc. are most closely connected with the natural environment, tradition and culture of the land. These open spaces have values and significance in themselves and in their wider context. Open spaces are significant for public enjoyment, recreation and education. Values associated with Rural Open Spaces viz. Functional, Educational, Aesthetical, Ecological, Socio- cultural, Economic are important and interconnected. Use of these open spaces and their importance varies among people. Due to the urbanisation, human intervention and impact of calamities, characteristics and identity of the rural open spaces are changing. This issue evokes the sensitivity towards rural open spaces. Case study of villages in Western Maharashtra gives experience and insight into the issue which helps in summarising the importance of values associated with rural open spaces.

Keywords: Rural open space, values

1. Introduction:

Rural open spaces are of different variety and have special and different characteristics where people live, work and take part in social and recreational activity. Rural open spaces can be enrich with natural beauty and help to maintain the ecosystem. Some of these spaces have features which are valuable for archaeology. They may have history and have association with the local communities. Relation of people with rural open spaces changes over time period and their values varies among people.

This paper provides insight into the use of Open Spaces in the Villages of Western Maharashtra and summarises the significance of various values associated with Open Spaces.

1.1 Aim:

To study the values associated with open spaces in the Villages of Western Maharashtra.

1.2 Objectives:

1. To understand the rural open spaces in Indian Context.

2. To understand the rural open spaces in the context of Maharashtra.

3. To identify and categorised the rural open spaces.

4. To study and analyse the activity associated with open spaces in the Villages of Western Maharashtra.
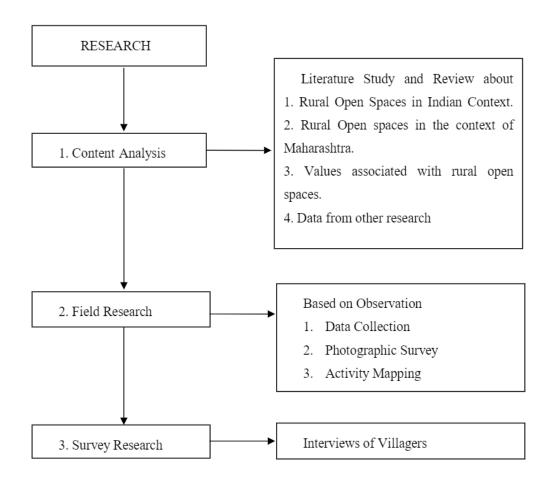
1.3 Research queston:

▪ Which are the landscape values associated with rural open spaces?
▪ What is the significance of these values?

1.4 Scope and limitations:

▪ Scope of the study includes the study of Rural Open Spaces and its importance to the village communities.
▪ Study is limited up to the study of values associated with Rural Public Open Spaces in the villages of Western Maharashtra.

1.5 Research methodology:

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┌─────────────────┐
│    RESEARCH     │
└────────┬────────┘
         │                      ┌──────────────────────────────────┐
         │                      │  Literature Study and Review about│
         ▼                      │ 1. Rural Open Spaces in Indian    │
┌─────────────────┐             │    Context.                       │
│ 1. Content      │────────────▶│ 2. Rural Open spaces in the       │
│    Analysis     │             │    context of Maharashtra.        │
└────────┬────────┘             │ 3. Values associated with rural   │
         │                      │    open spaces.                   │
         │                      │ 4. Data from other research       │
         │                      └──────────────────────────────────┘
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┌─────────────────┐             │  Based on Observation             │
│ 2. Field        │────────────▶│   1. Data Collection              │
│    Research     │             │   2. Photographic Survey          │
└────────┬────────┘             │   3. Activity Mapping             │
         │                      └──────────────────────────────────┘
         ▼                      ┌──────────────────────────────────┐
┌─────────────────┐             │  Interviews of Villagers          │
│ 3. Survey       │────────────▶│                                   │
│    Research     │             │                                   │
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2. Literature review

2.1. Indian villages – settlement and structure

Village is the basic unit of Rural society in India. The Vedic period in India prevailed approximately from 1500BC to 500BC. In this period Aryans emerged in the ancient land of India. Vedic civilisation was took place in the north and north western part of India, near the river Saraswati. Aryans cleared the forest near the Gangetic plains and settled down to form the Vedic civilisation. In the Vedic civilisation agriculture gained the importance, land and cattle became very important. By the end of the letter Vedic age, agriculture had become the main occupation of the Vedic Civilisation. Their involvement in agriculture led to the formation of village. Many villages together form the kingdom. These kingdoms later merged with each other to form large kingdom. The Vedic civilisation was highly organised at social as well as political level. From the Vedic period village is the basic unit of rural society in India. The caste system had emerged during the Vedic age which is still in practice in the villages. Group of families and collection of dwellings and cultivated land are the principal physical features of the villages.

2.2. Gandhian concept of rural development

Mahatma Gandhi as a visionary of India had a very clear perception of its villages and made an emphatic assertion that "India lives in her seven and half lakh of villages. He further believed that India will have to live in villages, not in towns, in huts not in palaces. He held this conviction by saying that, "If Villages perish, India will perish too". Rural development as outlined by Gandhiji contained self sufficiency, Inter-dependence for other wants and development of village industries. Gandhiji's ideal villages belong to the Pre-British period, when Indian villages were the small republics undisturbed by the periodical visitations of barbarious hordes. This republican character of the villages was destroyed by the British rule.

Gandhiji aimed at the attainment of village Swaraj which is a complete republic, independent of its neighbours for its own vital wants and get interdependent for many others in which dependence is a necessity. Thus every village's first concern will be to grow its own food crop and cotton for its cloth. It could have a reserve for its cattle, recreation and playground for adults and children. Then if there is more land available, it will grow useful money crops, thus excluding ganga, tobacco, opium and the like. The village will maintain a village theatre, school and public hall. It will have its own water works ensuring clean water supply. The village envisaged by Gandhiji could be constructed on the basis of the principles of public hygiene and sanitation. The houses which are to be built with locally available material will have sufficient light and ventilation. Each house or cottage shall have a courtyard to grow vegetables for domestic consumption and to house cattle. The village street and lanes will be kept clean.

Gandhiji was very keen to bring about maximum regional self-sufficiency in regard to food, clothing and shelter in rural areas. To solve poverty he emphasised not only agriculture but also cottage and small scale industries. He focused his attention on non agricultural aspects of the rural economy also. He wanted diversified economic activities in the villages and thus stood for all around development of rural India.

2.3. Villages in Maharashtra – Open Space Structure

Maharashtra the land of the Marathi speaking people located in the north centre of Peninsular India. Maharashtra is the third largest and most advanced state in India. Maharashtra falls into three broad geographic divisions. The Konkan is the coastal lowland running from just north of Bombay (Mumbai) to Goa. Inland from this area the Western Ghats, a line of hills that parallels the west coast of India.

Villages in Maharashtra are enriching by natural resources. A typical village in Maharashtra is a collection of mud-stone-and straw dwellings surrounded by agricultural fields.Agriculture is the basic source for livelihood. Few families are settled in the agricultural fields for convenience. Few villages are surrounded by mountain ranges. A local well or nearby pond or river provides water for most villages. Some larger villages have running water. A council of elected elders, called a panchayat, governs most villages. The panchayat has the power to hear complaints and administer punishments. Few villages in Maharashtra do not have proper approach road and public transport facilities and are dependent on other villages or nearby city for school and medical facilities. Temple premises are the space for celebrating various cultural and religious activities which facilitates social awareness through entertainment and help to develop the social bonding.

2.4. Categories and types of rural public open spaces

Rural open spaces can be categorised as follows

a) Open Space in Vicinity of Water Resources

- River bank / Ghats

- Stream , Lake

- Canal

- Dam / Back Water

- Well and its surrounding

- Public Water Supply
  http://en.wikipedia.org/wiki/Category:Villages in Maharashtra

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- b) Open Spaces for Social Interaction

- Main Road, Internal Lanes, Pathways

- Temple and its Surroundings

- Chawdi / Par

- School Ground

- Play ground, Health Club / Akhada

- Market Place

- Space for Fair, Religious Week

c) Virgin Open Spaces

- Hills and Hill slopes

- Scrub Land

- Grazing Yard

- Sacred Grooves

- Forest

2.5. Values associated with rural open spaces and its significance

- Functional Value: It is the service provided by open space and therefore prevention of open space is necessary eg. Protection of water quality, minimisation of soil erosion.

- Aesthetical: Aesthetic value can be easily understood by us when we experience the beauty of the open space. People admire natural open spaces and it relieves the work stress and hence protecting open space is important.

- Ecological: Open spaces supports the various local unique species of plant and animal and their association which are valuable and hence ought to be protected.

- Socio cultural: Open space eg. Temple and surrounding premises, river banks etc. provide space to relax, interact, play, engage in physical activities.

Economic: Many people visit forests, beaches, mountains, rivers, lakes, and streams for extended vacations or for shorter period for relaxation. These open spaces serve income generating activity.   Agriculture   fields   forms   the   backbone   of   economic   activity. *Natural Resource Management, PGDESD syllabus, IGNOU.*

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All these values are interconnected and its importance varies among people.

3. Case studies

Criteria for selection

Both cases village Dholwad and village Mandede are in Pune, Maharashtra so able to give visits to the villages and convenient for communication and understanding villagers feelings and their association with the open spaces.

Both spaces are different in location context, geographical features and natural surroundings. Both spaces have different open space structure and typology of open spaces which helps to gives insight and understanding of the subject.

Format for case study

- Regional Context
- Local Context
- Socio-cultural Context
- Ecological Context
- Present Open Space Structure of the Village
- Present Activity Pattern in the Village
- Visual Analysis of Open Spaces
- Analysis of Open Spaces

3.1 Case 1 – Village Dholwad

Location: - 100 Km. from Pune on Pune- Nashik Highway. Dholwad is a midsized (population is 3500 people) village located in Junnar taluka in the district of Pune in the state of Maharashtra.

3.1.1 Regional context

Village Dholwad is located in Pune region. Pune District is in the western region in Maharashtra in India. Pune district lies in the Western Ghats or Sahyadri mountain range and it extends on to the Deccan Plateau on the east. Pune stands on the leeward side of the Western Ghats.

Fig. 1 Dholwad located in Pune region in Western Maharashtra, India.

3.1.2 Local context

The surrounding villages to Dholwad are Ozar, Hivare, Umbaraj, Pansarwadi and Otur. The way to Dholwad is from Ozar off the Pune Nashik highway. Ozar is known for a Vighnahar Ganapati Temple which is one of the Ashtavinayak temples.

2011Google- Map Data @ 2011 Europa Technologies

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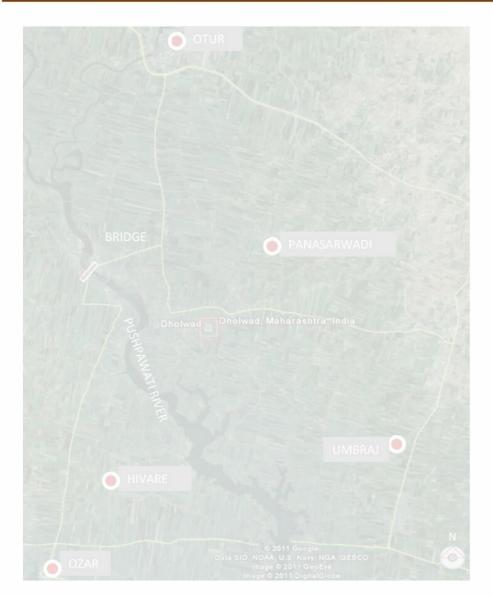
Fig.2 Local Context of Village Dholwad.

3.1.3 Socio cultural context

Village Dholwad is located on a East bank of River Pushpawati. Small Ghat is builted on the river which is used for washing, drying. Previously ghat was also used for bathing but now every house has a gram panchayat water connection. Temples are built on the bank of river. Agriculture is the basic source for livelihood. Youngsters from the village do job/working in the Pune, as village is near from the Pune city and have many opportunities.

3.1.4 Ecological context

LAND: Village is enrich by river Pushpawati, a natural source of water which facilitate the agriculture. Most of the agricultural land is under cultivation of sugercane crop.

WATER: Village is setteled on the bank of the river. Previously river water was directly used for drinking purpose but now every house has a water connection in the house.

VEGETATION: Most of the land is under cultivation of crops. Various plants and bird species are found along the bank of the river.

3.1.5 Present open space structure

River Pushpawati flows north-south. Village Dholwad is settled along the east bank of the river. Village field surrounds the settlement and are within walking distance. Dwellings in the village are built very close to one another with small lanes for passage of people and small vehicles. Village has nucleated settlement near the river. Along the river bank open space is assigned to temples and fair. Small ghat built on the river is used for washing clothes, cattle. Basic business is agriculture for the village; therefore dispersed settlements are seen in the farms. Dholwad is connected through horizontal linkages with other villages which are Ozar, Otur, Umbraj, Hivare, Pansarwadi.

Fig.3 Open Space Structure of Village Dholwad

3.1.6 Present activity pattern

Major activity in the village is farming. Farm fields surround the nucleated settlement. For convenience and because of lack of space few families are settled in the fields along the road. An open space along the river is assigned for temples and religious activity and also for fair. Children use the open space in temple premises for playing. A ghat on the river is used by the village women for washing, drying and also relaxes for a while. Various religious activities are carried out in the temples   and   premises   throughout   the   year.
Image source: Google earth

Fig.4-a Activity Pattern in Village Dholwad.

One of the temples built on the bank of river is the Goddess Malganga Temple. In Navratri a person from each house of the village is devoted for the worship of Goddess for nine days. The person is not allowed to go home and in the village and he have to live in the temple and temple premises in the service of god till Dashera. The person can go outside the village Dholwad from the periphery of the village but not from within the village. It is a rule in the village from long time and it is still carried out for nine days. On Dashera a tenth day of Navratra festival, a grand ritual takes place in the temple.

Fig.4-b Activity Pattern in Village Dholwad.

3.1.7 Visual analysis of open spaces

Fig.5 Way to the Village Dholwad

Fig.6 Entrance to the Village Dholwad

Fig.7 Central open space in front of the Panchayat Office

Fig.8 Way to the temples premises and to the Ghat on the River

Fig.9 Temple premise on the Bank of the River Pushpawati

Fig.10 Temples along the River Pushpawati

Photograph source: Visit to the village Dholwad, Junnar, Pune.

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Fig.11 River Pushpawati

Fig.12 Internal Lanes connecting dwellings and other open spaces

Fig.13 Chawadi and Panchayat Office

Fig.14 Primary and Secondary School Ground

Photograph source: Visit to the village Dholwad, Junnar, Pune

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Fig.15 Agricultural Fields

Fig.16 Linkages to the Agricultural Fields and to the other villages

Inferences from the visuals
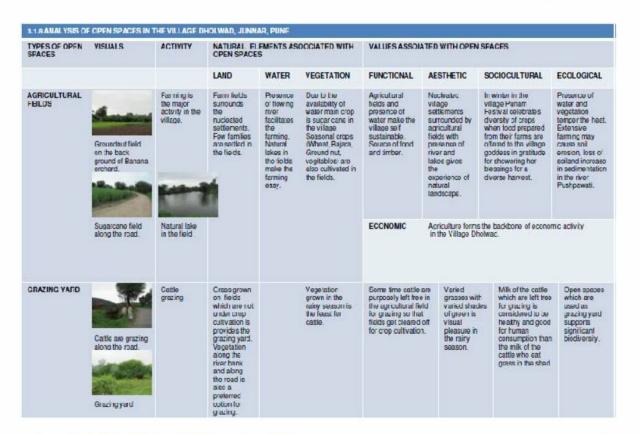
- Variations in use of open spaces and user group .
- Landscape treatment is attempted for temple premise and locally available material is used (eg. Stone for steps).
- Two parts in the village, one is nucleated settlement and other is farm land.

3.1.8 Case Study – 1- Analysis

CASE STUDY - 01

3.1.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE DHOLWAD, JUNNAR, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASSOCIATED WITH OPEN SPACES			VALUES ASSOCIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
RIVER PUSHPA WATI AND RIVER BANK	Sculptural land form along the river bank / Ghat or the river	•Small ghat built on the river is used for washing clothes and cattle's. •In summer children and also men enjoy swimming in the river.	•Slightly sloping land towards river covered with vegetation creates sculptural quality along the bank. •Top soil washed from the uplands to become the silt of the river.	•Free flowing river enrich the natural landscape of the village Dholwad. •River water is the major supporting element for agriculture. •River is the natural drainage way.	Dense natural vegetation along the river bank increase the scenic quality of the space and helps in soil stabilization and water retainsion.	•Microclimate moderation. •Natural food source and habitat for birds and animals.	Gives experience of natural landscape. Sight and sounds of water evoke a sense of pleasure.	•Provide outdoor recreational activities like swimming, community gathering, relaxing. •The behavior of species (flora & fauna) gives villagers an important indications of events that are of social, environmental or agricultural significance.	Soil and adequate water supply are essential to all living organism hence contributes in maintaining the ecosystem.
TEMPLE AND ITS SURROUNDINGS ALONG THE RIVER BANK	Way to the Temple Premises. / God idolls at the river bank / Open space for fair	Various religious activities are carried out in the temples and premises throughout the year. Part of the open space is assigned for fair which held in month of March/April otherwise it is cricket/football ground for children.	Various temples are placed on a flat terrain along the river. This open space is connected with the upland core village with stone paved pathway and steps.	Temples on the background of free flowing River Pushpawati gives picturesque quality to the space.	Coconut trees planted along the pathway and steps leading to the temples creates avenue. Natural vegetation along the bank of the river temper the heat.	It is a buffer zone between the river and village which facilitate various religious activity.	Temples on the background of flowing river and riverside lush green vegetation gives the picturesque quality to the space.	•Facilitates the community gathering through religious and cultural activities and help to enhance the social bonding. •Through these activity traditional local rituals and social customs are forwarded to the next generation	Religious beliefs associated with natural elements helps in their conservation.

3.1.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE DHOLWAD, JUNNAR, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASSOCIATED WITH OPEN SPACES			VALUES ASSOCIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
CHAWADI	Chawadi / between the Panchayat Office and / Panchayat office	•It is a place for every day gathering of male community for reading news paper, chatting and discussions. •A council of elected elders called Panchayat hear the complains, social issues and gives the decision.	Open space in the core of village surrounded by houses.		Quality of the space is govern by a Pipal tree	Space for community gathering.	Central access leads to the village at one side and at another side leads to the agricultural fields is adorn by trees with tree pits (Chawadi) at the entrance.	It is a place for social gathering especially for men community. In case of any complaint, social issue whole village is gathered in the central open space to hear the decision taken by the Panchayat.	Two canopy trees at the entrance temper the heat . Villagers and visitors relaxes for a while under the tree.
SCHOOL GROUND	Primary School and School Ground / Secondary School	Ground is used for P.T. to the school children. Children play on the ground before school and after school also in the recess. Children play on the ground on Sunday and also in the vacations.	Primary school is very near from the entrance to the village. School ground which is a rammed earth is enclosed by the tree. Newly developed secondary school is surrounded by agricultural field.	Gram Panchayat water supply to the school.	Ashoka trees provide the enclosure to the Primary School ground. It acts as a visual, sound barrier and temper the heat. Secondary school ground is also enclosed by tree which is in front of the school building and surrounded by agricultural fields.	School ground provides free play area to children to explore various games and it contributes to their physical developments.	School grounds are enrich with the natural surroundings which relieves the stress and set the mood.	Earthen ground with natural surroundings provides a space to children for playing , learning sharing which helps children to socialize	Earthen ground surrounded by natural landscape with minimum human intervention does not creates any bad impacts on ecosystem.

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3.1.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE DHOLWAD, JUNNAR, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASOOCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
AGRICULTURAL FEILDS — Groundnut field on the back ground of Banana orchard. Sugarcane field along the road.		Farming is the major activity in the village. Natural lake in the field	Farm fields surrounds the nucleated settlements. Few families are settled in the fields.	Presence of flowing river facilitates the farming. Natural lakes in the fields make the farming easy.	Due to the availability of water main crop is sugar cane in the village Seasonal crops (Wheat, Bajara, Ground nut, vegitables) are also cultivated in the fields.	Agricultural fields and presence of water make the village self sustainable. Source of food and timber.	Nucleated village settlements surrounded by agricultural fields with presence of river and lakes give the experience of natural landscape.	In winter in the village Punam Festival celebrates diversity of crops when food prepared from their farms are offered to the village goddess in gratitude for showering her blessings for a diverse harvest.	Presence of water and vegetation temper the heat. Extensive farming may cause soil erosion, loss of soiland increase in sedimentation in the river Pushpawati.
						ECONOMIC	Agriculture forms the backbone of economic activity in the Village Dholwad.		
GRAZING YARD — Cattle are grazing along the road. Grazing yard		Cattle grazing	Grass grown on fields which are not under crop cultivation is provides the grazing yard. Vegetation along the river bank and along the road is also a preferred option for grazing.		Vegetation grown in the rainy season is the feast for cattle.	Some time cattle are purposely left free in the agricultural field for grazing so that fields get cleared off for crop cultivation.	Varied grasses with varied shades of green is visual pleasure in the rainy season.	Milk of the cattle which are left free for grazing is considered to be healthy and good for human consumption than the milk of the cattle who eat grass in the shed	Open spaces which are used as grazing yard supports significant biodiversity.

3.1.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE DHOLWAD, JUNNAR, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASOOCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
CREMATO-RIUM — Surrounding of crematorium. Way to the crematorium		Farming is the major activity in the village.	Cremation ground is located near river. It is a barren land with some seasonal vegetation around it.	After cremation rituals related with water are carried out along the river bank.	In the premises of cremation ground trees of Babool are seen.	Agricultural fields and presence of water make the village self sustainable. Source of food and timber.		After cremation people take bath in the river which is ritual. Till thirteen days various rituals take place in which flowing river have the importance.	Due to the cremation there is no vegetative growth in and around the cremation ground.
MAIN ROAD, INTERNAL LANES, PATHWAYS — Way to the Dholwad. Road in front of the primary school towards agricultural fields. Internal lanes connecting the dwellings and other open spaces		Connectivity and movement.	Dholwad is connected through roads with other villages which are Ozar, Otur, Umbraj, Hivare, Pansarwadi. Dwellings in the village are connected with small lanes for passage of people and small vehicles.	Nalas/ stream along road with dense vegetation	Roads are adorn by the roadside agricultural fields.	Road facilitate the pedestrian and vehicular movement in the village and to the surrounding villages and Pune city.	Free fowing roads with natural surrounding creates interest in the movement.	Connectivity within the village and with other villages and to the city provides scope of intbraction and Information.	External roads are of tar which exerts heat. Vehicular movements may affect the wild species (flora and Fauna)

3.1.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE DHOLWAD, JUNNAR, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASOCCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECCLOGICAL
RIVER PUSHPAWATI AND RIVER BANK	Sculptura land form along the... / Ghat on the river	•Small ghat built on the river is used for washing clothes and cattle's. •In summer children and also men enjoy swimming in the river	•Slightly sloping land towards river covered with vegetation creates sculptural quality along the bank. •Top soil washed from the uplands to become the silt of the river	•Free flowing river enrich the natural landscape of the village Dholwad. •River water is the major supporting element for agriculture. •River is the natural drainage way	Dense natural vegetator along the river bank increase the scenic quality of the space and helps in soil stabilization and water retainsion.	•Microclimate moderation •Natural food source and habitat for birds and animals.	Gives experience of natural landscape Sight and sounds of water evoke a sense of pleasure.	•Provide outdoor recreational activties like swimming, community gathering, relaxing. •The behavior of species (flaura & fauna) gives villagers an important indications of events that are of social, environmental or agricultural significance	Soil and adequate water supply are essential to all living organism hence contributes in maintaining the eccsystem.
TEMPLE AND ITS SURROUNDINGS ALONG THE RIVER BANK	Way to the Temple Premises / God Idolls at the river bank / Open space for fair	Various religious activities are carried out in the temples and premises throughout the year. Part of the open space is assigned for fair which held in month of March/ April otherwise it is cricket/football ground for children.	Various temples are placed on a flat terrain along the river. This open space is connected with the upland core village with stone paved pathway and steps	Temples on the background of free flowing River Pushpawati gives picturescue quality to the space.	Coconut trees planted along the pathway and steps leading to the temples creates avenue. Natural vegetation along the bank of the river temper the heat	It is a buffer zone between the river and village which facilitate various religious activity.	Temples on the background of flowing river and riverside lush green vegetation gives the picturesque quality to the space	•Facilitates the community gathering through religious and cultural activities and help to enhance the social bonding. •Through these activity traditional local rituals and social customs are forwarded to the next generation	Religious beliefs associated with natural elements helps in their conservation.

3. Case studies

3.2 Case 2 – Village Mandede

Location: - 45 Km. from Pune on ahead from Paud village. Mandede is a small village(population is 1200 people) located in Mulshi taluka in the district of Pune in the state of Maharashtra.

3.2.1 Regional Context

Village Mandede is located in Pune region.

3.2.2 Local Context

Village is surrounded by hills from South West and North West. Adjacent village to the Mandede is Andeshe. The way to Mandede is from village Paud in Mulshi taluka.

2011Google- Map Data @ 2011 Europa Technologies

Fig. 17 Mandede located in Pune region in Western Maharashtra, India.
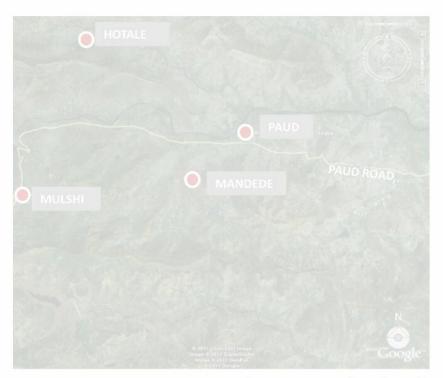
Fig. 18 Local context of village Mandede *Image source: Google earth*

3.2.3 Socio Cultural Context

Settlement within the village Mandede is divided in six divisions depending on the cast and location in the village and according to that name is given and also from the features in the settlement. The divisions are Malwadi, Dhumal Wadi (settlement of people having surname Dhumal), Jeeva Veer Wadi (settlement of people having surname Veer), Parakhe Wadi, Ram Wadi (settlement of Matang people with temple of Lord Rama, Datta Wadi (settlement with temple of Lord Datta), and settlement of Harijan. Various religious and cultural activities are carried out in the village. Agriculture is the basic source for livelihood. Youngsters from the village works in the Pune city. Within the village there are three schools, two of which are primary schools and one is up to standard seventh. For further study the children have to go to Khechre Dairy (which is out of the village and have school up to standard tenth) or to Paud village (school up to standard twelfth).

Village do not have public transport facility. Market place is at village Paud. Village has small provision stores but for buying fruits, vegetables and medicines they have to go to the village Paud.

3.2.4 Eological Context

LAND: It is a sloping terrain surrounded by hills. Slope is from South West and North West. Hill slopes are covered with natural vegetation and other land is under cultivation of rice. Few land from the village is bought by the outsiders for farmhouses.

WATER: A natural stream coming flowing from the hills is the main source of water for the village. Slowly the stream got dry in the summer. Wells constructed along the stream are the source of water for agriculture and from the wells water is uplifted to the overhead water tank which is constructed in Ramwadi and from the water tank water is distributed to the whole village for domestic purpose. In the summer from month of March to May villagers suffer from the shortage of water.

VEGETATION: Hill slopes are enriching by natural vegetation. Mango plantation is the main money giving crop for the villagers. Rice crop is cultivated on the farmland. Cultivation of crop is depends on the rain.

3.2.5 Present Open Space Structure

Village Mandede is surrounded by hills from South-West and North-West. Village has dispersed settlements surrounded by the agricultural fields. Settlements and agricultural fields are connected by pathways. Dwellings in the villages made up of mud, brick are built very close each other with small lanes for passage of people. Stream flows from the hills is the main source of water for village.

Fig. 19 Open Space Structure of village Mandede

3.2.6 Present Activity Pattern

Village settlements are divided in six divisions. Settlements are surrounded by agricultural fields. Farming is the major activity in the village which is dependent on rain water. Mango is the money giving crop in village which has sell out of the village and other crop is rice which also has demand in the city. Rice crops are cultivated in the month of June and after four months crop is ready for cutting. Raw rice is then taken to the mill for final product. Various cultural and religious activities are taken place in the temple premises. In the temple of Lord Rama Ramnavamee is celebrated with a five days reading of religious scriptures. Village has school up to standard seventh; children have to go to Paud village or Pune for further study.

3.2.7 Visuals of Open Spaces in the village Mandede

Fig. 19 Way to the Village Mandede

Fig. 20 Mango Plantation and Rice Farms Adorn Road

Fig. 21 Village is Surrounded by Hills

Fig. 22 Stream Flowing Through the Village

Fig. 23 Use of Stone for Construction

Fig.24   Sanitation   within   Settlement

Fig. 25 Internal Lanes within Settlements

Fig. 26 Use of Natural Resources in the Village

Photograph source: Visit to the village Mandede, Mulshi, Pune

Inferences from the visuals

- Village is enriched by natural surroundings which is picturesque and refreshing.
- Dispersed settlements surrounded by farm land.
- Use of locally available materials (eg. Wood, stone, rice staw) for buildig houses.
- Use of wood as a fuel.
- Human interventions are limited in natural landscape.

3.2.8 Case Study -2- Analysis

CASE STUDY - 02

3.2.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE MANDEDE, MULSHI, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASSOCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
HILLS AND HILL SLOPES	Hills and hill slopes gives the spatial character to the village.	•Cattle are taken to the hill slopes for grazing. •Wood as a fuel is collected from hill slopes and surrounding.	•Hills surrounding the village gives enclosure to the village.	•Hills maintain the water flow in the stream which is the main source of water for village.	Vegetation on the hills and hill slopes captures and slowly releases huge amount of water during non rainy period.	•Provide water and soil. •nursing crop fields both in hills and plains by providing soil and nutrients. •Contributes to pollution control and climate moderation. •Support biodiversity.	•Gives experience of beauty of nature. •Natural surroundings relieves work stress.	•Provide outdoor recreational activities like trekking, hunting. •The behavior of species (flora & fauna) gives villagers an important indications of events that are of social, environmental or agricultural significance.	•Provide habitat for birds, pollinators, soil organisms. Maintain biodiversity. •Moderate weather extremes and impacts.
STREAM	Crematorium along the stream Source of water for village	Major natural source of water for village.	Flowing from the hilly terrain.	Flowing stream provide the water for domestic and agricultural purposes.	Vegetation along the stream support biodiversity.	•Source of water for village. •Protecting watershed for downstream irrigation and water supply installations.	•Gives visual pleasure. •Rhythmic sound set the moot and gives listening pleasure.	•After cremation rituals are carried out along the stream.	Support variety flora and fauna.

ANALYSIS OF OPEN SPACES IN THE VILLAGE MANDEDE, MULSHI, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASSOCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
AGRICULTURAL FEILDS	Rice Farms and Mango Plantation	•Farming is the basic source of livelihood. •Agricultural fields are taken by outsiders for developing the farmhouses.	•Village settlements are surrounded by agricultural fields. •Few farmhouses are maintained and in use and others are not maintain and lands are barren.	•Wells constructed along the stream supports the farming.	•Mango is the money giving crop in the village which is the source to fulfilled the need of other food grains by mode of exchange. •Other crop cultivated in the village is rice which is dependent on rain water.	•Source of food and timber.	•Varied shades of green gives visual pleasure. •Natural surroundings relieves work stress.	• when food grains (any product from the farm) are prepared from the farms, it is offered to the village goddess in gratitude and then it is taken to sell.	•Temperature moderation. •Use of pesticides in the farm degrade the soil and water quality. •Harmful for wild life. •Change in land use affect the ecosystem.
TEMPLE AND ITS PREMISES	Ram-Krishna mandir in Dhumal Wadi. Ram Mandir in Ramwadi	Religious and cultural activities are carried out in the temple and its premises. Ex. Reading of religious scripture for a week on Ramnavamee. Fair is held in the premises of temple of Goddess Khairai on the birthday of lord Hanuman.	•Temples are located in the settlements which are divided in six divisions.	-	Mango trees and trees with good canopy are seen in the temple premises.	•Place for religious and cultural activities.	•Gives visual pleasure. •Rhythmic sound set the moot and gives listening pleasure.	•Facilitates the community gathering through religious and cultural activities and help to enhance the social bonding. •Through these activity traditional local rituals and social customs are forwarded to the next generation.	Religious beliefs associated with natural elements helps in their conservation.

3.2.8 ANALYSIS OF OPEN SPACES IN THE VILLAGE MANDEDE, MULSHI, PUNE

TYPES OF OPEN SPACES	VISUALS	ACTIVITY	NATURAL ELEMENTS ASSOCIATED WITH OPEN SPACES			VALUES ASSOIATED WITH OPEN SPACES			
			LAND	WATER	VEGETATION	FUNCTIONAL	AESTHETIC	SOCIOCULTURAL	ECOLOGICAL
SCHOOL GROUNDS	Primary school in Ramwadi have ground for PT and play. Primary school in Dhumal Wadi do not have playground.	PT. and prayor is conducted on the ground. Children enjoy playing on ground before school and in the recess.	-School ground is a rammed earth and enclosed by compound wall and surround ce by natural vegetatio n	-School have Grampancha yat water connection	-Schools are surrounded by natural vegetation	-School grounds provides play area without equipment to explore various games and contributes to the physical development.	-School ground are surrounded Ly natural settings which relieves the stress and set the mood.	- Earthen ground with natural surrounding provide a space for children to explore various games, space for interaction, sharing which helps to socialize.	Earthen grounds surrounded by natural environment with minimum human intervention does not creates any bad impacts on ecosystem.
MAIN ROADS, INERNAL LANES AND PATHWAYS	Road to Mandede Pathway to the settlements Pathways within the settlement	Connectivity and movement	Linkages on hilly terrain creates interest.	Stream along the road with vegetation.	Roads are adorn by road side mango plantation and agricultural fields	Road facilitate the pedestrian and vehicular movement in the village and to the surrounding villages and Pune city	Curvilinear roads on the hilly terrain creates interest in the movement	Roads and pathways connects the settlements which are dispersed in six divisions which provide the scope of interaction and information, helps to enhance social bonding.	External road is of tar otherwise all other internal linkages are of soil creating minimum impacts on natural surrounding.

4. Inferrences

- Scale and Typology of Open Spaces

Variation in scale of open spaces is observed (chawadi/ panchayat to river and river bank, school ground to hills and hill slopes). Villages have various types of open spaces most of which are enriched by natural elements with minimum /without human intervention. Usage and user group of these open spaces changes as per time in a day.

Activity pattern in the villages is governed by the type of open space, its location in the village and its usage.

- Association with Natural Element

Indigenous people/villagers still basically rely on wild and traditionally cultivated plant species to supply their needs in terms of food, fibre, fuel wood, wood for houses, medicinal plant etc.

Mountains/hills and their vegetation surrounding the villages provide water and soil to the villages and also contributes to pollution control and climate stabilisation by carbon sequestration. (Carbon sequestration refers to the provision of long term storage of carbon in the terrestrial

communities/ecosystem so that carbon dioxide build up in the atmosphere gets reduced or slows down)

- Relationship with Culture

In village culture species and nature have inspired songs, superstitious beliefs, stories and folktales, dance and drama, poetry, traditional crafts, local rituals, names of places and even family names.

In the villages, behaviour of species (flora and fauna) gives villagers an important indication of events that are of social, environmental or agricultural significance. eg. If insect Murugan is seen then it is considered as vehicle of the God Murugan and it indicates that it will rain soon.

- Landscape Treatment and Material

Special thought or efforts are not given for the landscape development of open spaces. Locally available materials are used for landscape treatment.

eg. Stones are used for constructing tree pit/chawadi, bund in the field, retaining wall etc.

- Threats

Replacement of indigenous varieties of crop species with new hybrids that are higher yielding but less resistant to pests, local conditions and need more fertilisers. Fertilisers, pesticides used in agricultural fields degrade the soil and water resources by sedimentation. It is also harmful to many wild animals.

As many villages are enrich by natural surroundings, people from the nearby cities invests in land as a site for development schemes for human settlements, it changes the land use. It destroys the existing ecosystem. Changes in land use changes the level of atmospheric carbon dioxide which cause the climate change followed by invasive species and air pollution.

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AN INCLUSIVE PLANNING APPROACH TOWARDS INDIGENOUS COMMUNITIES OF A REGION:
A Case of Ziro Valley

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Abstract:

The North East part of India is not only unique in its physiographic features and climate but also is home to a large number of ethnic groups. Among them, a very ancient tribe, the Apatanis, reside in an eco-culturally valued zone, Ziro Valley of the Lower Subansiri District in Arunachal Pradesh. The Apatani Tribe thrive on animistic religious belief system that has dictated the use of natural resources and hence their livelihoods, in a biodiversity hotspot of the Indian subcontinent. The Apatanis practice conservation of flora and fauna as a social norm by valuing the potential role of biodiversity in their rural economy in accordance with their socio-cultural values. The nature-culture linkages are nested in each other in a way that it strengthens their sustainable living practices in an era of climate change. The impact of current developmental activities on the biophysical aspects of the valley is creating a paradigm shift which needs to be addressed. Moreover, there is a need to assess the constant and variable factors responsible for deterioration of natural resources. This paper is an attempt to ensure inclusivity of such indigenous knowledge systems that has been followed religiously in the valley since ages. The research was initiated through mapping of natural and human modified ecosystems, traditional knowledge systems and values, customary practises of the tribe in order to identify the upcoming issues and challenges that might disrupt the nature-culture balance. The study also highlights the multi-layered complexity of the ecosystem and also the role of different stakeholders. Finally, a developmental framework has been proposed highlighting the role of different stakeholders and community participation which altogether ensures the flow of indigenous practices and knowledge base across generations in the Apatani community.

Keywords: *indigenous, traditional knowledge systems, inclusive planning, customary practise*

1. Introduction :

Ziro Valley, located in the foothills of Eastern Himalayas (N27°32 – 27°37; E 93°48 – 92°52), of Lower Subansiri District in Arunachal Pradesh with an altitude of 1564 meters – 2900 metres above sea level; is a part of one of the three recognized biodiverse hotspots in India *(Munilumar 2007)*. Bifurcated by the river Kele, this bowl-shaped region is surrounded by high hills and interspersed with paddy fields and bamboo-pine groves. With more than 1058 square kilometers in area, only 33 square kilometers is cultivated land, while rest is under forests, plantations and setttlements. The region is endowed with an annual rainfall of 2240 millimeters to 2910 millimeters, with temperature variations ranging from 6.3°C – 28.1°C in summers and 1.0°C – 18.4°C in winters.
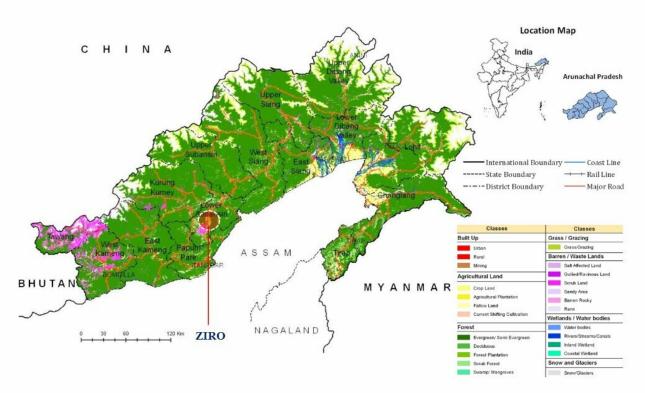
Figure 1 : Land Use/ Land Cover Map of Arunachal Pradesh 2011-12 *using IRS LISS-III Data. Source: National Natural Resources Management System, ISRO, 2014*

It has bamboo and pine forests of various species under sub-tropical and temperate type along with different species of wildlife. This landscape is inhabited by the Apatani Tribe (sharing 2.26% population of the state, 2001 census), considered to be one of the most advanced among the 26 tribal communities in Arunachal Pradesh *(Singh 2008)*. Apatanis, a clan-based society, has developed advanced indigenous farming system, indigenous land-use pattern, customary practises and belief systems, rich cultural expressions and an efficient natural resource management system; and hence are considered as the guardians of the region. As such, the Apatani Valley has been identified as a Cultural Landscape and included on India's Tentative List for World Heritage in 2014 under criterion (iii) unique cultual tradition; and criterion (v): outstanding example of a traditional human settlement and land use with rich ecological knowledge. *(UNESCO)*

As a part of regional planning and policing making proceedings, such knowledge systems with integrated and inherent practices are often not considered. While community participation is said to have an important place in such processes, during actual implementation operations, certain gaps are

observed and the indigenous communities hence do not comply with them. The unregulated developments of such kind hamper the living systems and also pose a threat to such complex ecosystems with century-old nature related traditional wisdom.

Figure 2 : A continumm of agrarian landscape in Ziro Valley. *Source: Author, 2021*

The importance of such immense ecological and cultural value, in an erstwhile high seismic zone, is a peerless specimen of nature and human symbiosis *(UNESCO 2016).*

Therefore, the Apatanis, being the indigenous communities of Ziro Valley, need to be fully recognized considering the web of inter-dependence particularly through ongoing interactions and cultural relationships with their customary aspects. The absence of such framweworks and assessments has had significant consequences for the development and implementation of culturally appropriate and/ or adequate public, sustainable development and welfare policies. *(A. L.-J. Kamaljit K. Sangha)* Such a fabric with multi-layered complexities needs to be looked from an inclusive mindset to flow with the changing times.

2. Understanding the region :

2.1 Evolution Timeline

Ziro, a scenic valley, home to the Apatani tribe is valuable due to its unique land use pattern, resource management and culture of conservation since time immemorial. The growth pattern or the study of the evolution of the town over the time shows that the NH-13 has a major role in guiding the sprawl pattern.

The growth in built-up is due to the presence of highways going through towards Old Ziro. New localities have emerged along South East, North East, and South West direction.
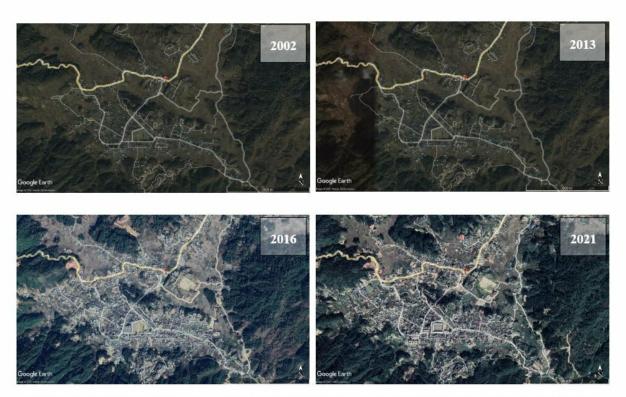
Figure 3 : Google Earth Imagery illustrating the built-mass evolution through a period of 20 years.
Source: Google Earth Pro

The growth and development pattern of Hapoli is mostly seen towards Northeast, northwest and southeast direction. In southern side due to hilly terrain it is not suitable for further development, hence no sprawl towards south.

Figure 4 : Google Earth Imagery of 1960 & 2020 respectively, showing the growth of Old Ziro.
Source: Google Earth Pro

In the Old Ziro area, high growth of built up can be observed on the eastern part. An advanced landing ground came up in 1962. A significant growth in the built-up area in the eastern part and smaller portions has come up on the western side. It is classified under class IV Town with 12806 population (2011 Census). The two major urban settlements are Old ziro and Hapoli (also known as new ziro) in lower Subansiri district.

2.2 Integrated Management Systems

There is a dominance of forest land and agricultural land, which can also be observed in the landuse map. The interactions between the human and nature can be studied through the various indigenous practises they are engaged in. The Apatani's have developed a multipurpose water management system which integrates land, water and farming practise by protecting against soil erosion, conserving water for irrigation and rice-fish culture *(Dabral)*. With the changing times, traces of transformation can be seen which is reflected in the built fabric and new methods of livelihood.
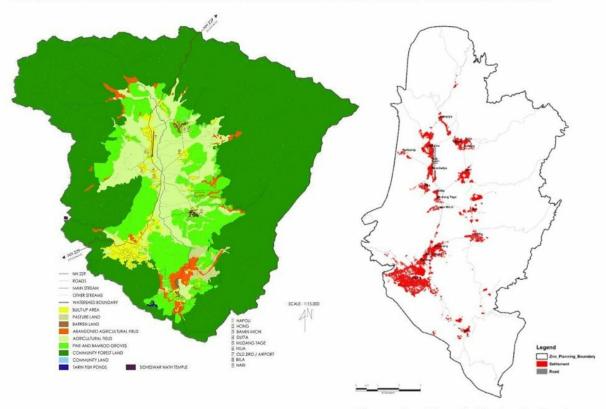
Figure 6 : LULC Map of Ziro.
Source: Ziro Local Planning Authority

Figure 7 : Map (with local planning boundary) showing area under settlements. *Source: AIILSG Consultant*
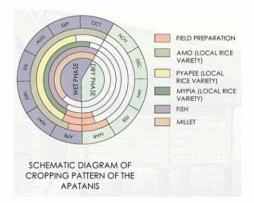
2.3 Customary practices and beliefs
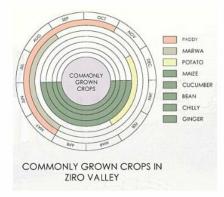
Apatani's believe in Donyi Polo, which is considered to be an ancient form of animistic religion. They worship sun and moon as gods. Till present they have been worshipping nature and are very conscious about environmental hazard occurring due to disruption of environment. It is as a result of such customary practices and beliefs that the landscape has been preserved in a sustainable way.

As a part of the customary practice, the settlements are built on a higher land compared to the paddy fields in the villages. Such kind of a planning system have further advantages to enrich the paddy fields with human waste, animal waste, and other forms of garbage washed down by rainwater. This kind of a system is called *supyu*, which adds manure to the nearby paddy fields.

Moreover, festivals celebrated amongst the tribe revolves around their agricultural activities. *Murung*, the festival of prosperity is celebrated in the month of January. *Dree*, celebrated in July with prayers for a abundant harvest and prosperity of all humankind. Similarly, *Myoko* celebrations start at the end

of March and lasts till end of April where the water from irrigation canals are diverted to the fields. This being a collective activity, celebrates friendship.

Figure 8 : Pie diagrams depicting cropping pattern and commonly grown crops throughtout the year in the valley . *Source: M.L.A Thesis 2017-2019. S.P.A, Bhopal*

2.4 Community Spaces

Public assembly spaces are important for Apatani tribe, starting from the hamlet level to the major arteries, community spaces are spread across. The small spaces and platform within community residential areas are essential for meetings and customs. *Lapang,* is a sacred wooden platform made at the time of community festivals marks the strong community hierarchy all along within the poles and door signs of each family residence. The Lapangs were traditionally made out of pinewood. Presently, RCC bases and tin or aluminium roofs are used. Every Clan has their own lapang within a village. Every Lapang is accompanied by a Babo, a ceremonial tomtem pole. Smaller lapangs are present outside the Apatani houses and signifies the presence of a male child.

2.5 Governance system

The villages in the Valley are governed by traditional village council known as *bulyan,* which has legal oversight of individual activities that might affect the whole community. The efficient supervision is done by addressing the conscience of the people. Rather than opting the method of fear instillation.

Dapos also known as peace treaties originated in thevalley during settlement of the plateau. These treaties came up as they were surrounded by hostile Nishi tribesmen and Apatani's wanted to keep inter-village and inter-tribal disputes to a minimum. In case of disputes arising over boundaries of forest lands, three poles of bamboo about 3-4 feet long are erected in a vertical criss-cross manner to depict a dapo at negotiated boundaries. Several taboos are associated with felling of certain trees and animals.

2.6 Land, Water and Living resources

The apatanis are known for their rational use of natural resources, specifically for the judicious utilisation of limited land area that evolved out of century old experimentation *(UNESCO)*. A wide range of diverse flora and fauna can be seen due to climatic and altitudinal variation in the valley. It has sub tropical and temperate forests. A total of 158 medicinal plants species has been recorded under a study conducted by C.P. Kala in 2005. The valley is mostly covered in bamboo and pine forests. Locals are highly dependent on the forest resources in their vicinity for their livelihood and sustenance.

Broadly, the land can be categorized into four major types and category has numerous sub-types. The major indicators of indigenous classification of lands having ecological significance, such as forests, sacred groves, agricultural, grasslands etc. *(Mihin Dollo)*. The land is used for, wet-rice cultivation, dry cultivation, burial grounds, community gathering spaces, settlements, pine and bamboo gardens, private gardens and community forests.

Intricate network of water channels and canals irrigate the valley fields. This network of channels is managed in such a way that every field gets equal distribution of water from the channels. These channels are diverted somewhere upstream from the main river and the field lying between irrigation channel and main river becomes the catchment area. In this system every stream that rises from the hill is trapped soon after it emerges from forest and it is channelized at the rim of the valley and diverted by network of primary, secondary or tertiary channels.
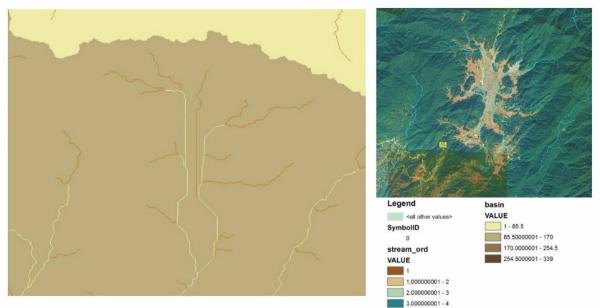
Figure 10 : Stream orders and basin in the Valley (from GIS mapping) & overlapped valley lines on Google Earth Imagery. *Source: Author, 2017*
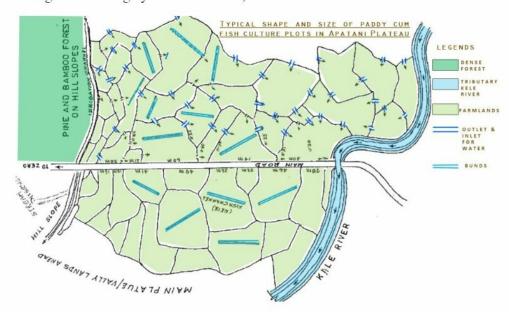
Figure 11 : Schematic layout of paddy cum pisciculture plots spread across in the valley. *Adapted from U.C. Sharma, Centre for Natural Resources Mangament, Jammu*
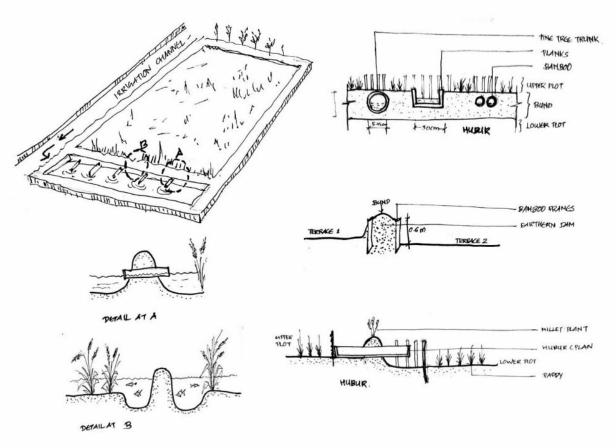
Figure 12 : Sketches illustrating the dual farming system practised by the Apatanis. *Source: Author, 2017*

3. Indigenous practices and compliance with Resource Management

The land parcels between Old Ziro and Hapoli comprise surrounding forests, argicultural lands with a network of century old settlements. The dominance of bonding between human-nature-culture is evident in most of the practices. With the physical expansion going on in the region, changes are observed in the built-fabric and livelihood practises which becomes inevitable. An inclusive approach towards development can help maintaining this balance with the changing dynamics.
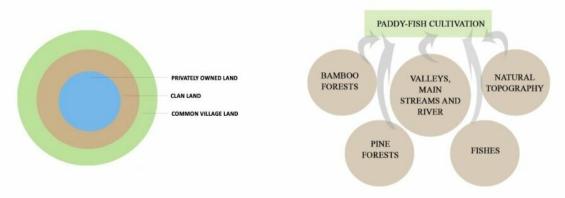
Figure 13 : Diagrams depicting types of land ownership & resource inter-dependancy in the farming practise. *Source: Author, 2021*
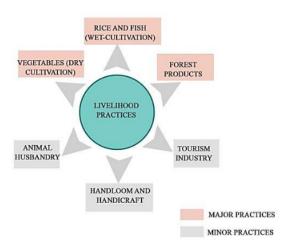
Figure 14 : Major and Minor livelihood practices of communities in Ziro valley. *Source: Author, 2021*

4. Analysis and Challenges

According to the census 2011, the urban growth rate of the state is 37.55% with a population of 83,030 as recorded in Lower Subansiri District; and is expected to increase in the next 10 to 20 years. As a result, Ziro valley is also witnessing urban sprawl as discussed in the previous section.

The trend of development in the valley is shifting towards modern construction techniques and materials such as cement, concrete and glass. Therefore, the dependancy on local materials and sustainable methods is decreasing. The chemical ingredients of building materials during construction phase are sometimes washed down to the adjacent rice fields depleting the soil and/ or water quality; indirectly impacting the agricultural produce. Furthermore, uninformed developmental activities in Hapoli (New Ziro) has caused waterlogging as the natural passage ways for stormwater drainage was blocked.

The tourism inflow in Ziro during the year 2014-2017 shows that the region had witnessed a maximum footfall from August to December; with a record of 3,000 visitors in the month of September in 2017. Moreover, from 2006 to 2017, the number of tourist arrivals escalated from 216 to 19,970 including both domestic and international visitors. *(Source : DTO Ziro, Lower Subansiri, A.P.).* Influx of tourists to such a scenic valley is an inevitable activity which creates infrastructure demand on land. Also, negligence and/ or limited understanding of the indigenous systems and community values of the Apatanis can pose a threat dilluting their customary practises. Unregulated tourist activities can cause the imabalance in the nature-culture linkages.

Apatanis approach towards plantation and ecological conservation, if considered in planning processes, can have a huge impact on the development of the area. But, under the Aanchal Forest Scheme, government are bringing unclassed forests under the umbrella of management with the forest department and the revenue is shared between Department and the community. As a result most unclassed forests have disputed claims where the Apatanis consider these as community owned lands. The ancestral lands of the locals were declared reserved forests by the government in 1976. Such acts without any consultation with the inhabitants of the valley if done in development and planning operations will create disturbances in social as well as ecological setting.

Sustaining economy is one of the major factor in keeping a system alive and functioning. If sustainable development does not take place in an integrated manner, the locals will eventually need to migrate. For instance, the younger generations are leaving the region for better education, employment and infrastructure opportunities and systems respectively. With the shifting demography and migration, the indigenous wisdom and knowledge systems are transfered over to the next generation in a limited manner as it needs hands-on practical experience. Such situations are a threat

to the identity of the tribe. Additionally, the labour intensive agriculture farming practises might see a shift to extensive so as to meet the current demands. For example, a new species of rice was introduced which caused the soil quality to deplete.

A region where sustainance of people is closely knit with their value system and environment, needs to be studied from different lenses to understand its complexity and develop an integrated framework. In the current scenario, the major challange faced by the community is to transfer the knowledge system to future generations when the youth is moving out to other cities with better infrastructure for education and levelihood. The clans have disputes with government over the forests and newer methods of development that does not resonate with the indigenous knowledge. This gap between the development body and locals might lead to decline of such cultural landscape. It is indispensable for the different stakeholders to discuss, study and come up with the most appropriate framework for development.
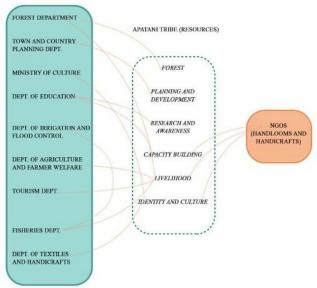
Figure 15 : Stakeholder Analysis. *Source: Author, 2021*

Development is required but not at the cost of such integrated system that is closely knitted with the sustainable practises. The desirable aspects such as efficient transport, time optimisation, economic influx is necessary but at the same time the undesirable aspects such as pollution, over exploitation of available resources, exceeding carrying capacity for tourist inflow etc. needs to be avoided.

Therefore, the valley of such immense value needs a community oriented as well as community driven planning policies. *(Saurabh Tewari)*

5. An Inclusive development framework

Urbanization in the valley is bringing forth new and pressing challanges and it is already taking a toll on the indigenous mangment system. It is substabtial to study and address the devevopmental challenges of such sensitive areas in a systematic manner. Current models, schemes and tools for development overlook the exisiting knowledge system and people. A majority of conservation/ development tools have been prepared till date for practioners, government agencies and community based organisations particularly for the threatened or the declining ones. The following framework is an approach to such development –

a. Identifying key attributes and challenges: The key attributes can range from understanding the context, belief systems, inter-relationships of people and resources; and management techniques. More often than not, the community's physical boundaries are in dispute or not

even marked. In other cases, there might be conflict between two different groups or the community is not communicating effectively or efficiently with governing body. It is also important to look into the current scenario of climate change and its impact over the area. This step can help in developing community goals and possible tools for development.

b. Mapping and physical documentation: It is important to provide information about existence of a community and the system it employs to manage its resources and habitat. Providing spatial references for monitoring and assessment can facilitate effective management. It can also create opportunities for community to come together and discuss about the future development perspectives. Participatory mapping and cultural mapping can help bring cultural communities and developmental body together. Planning on different levels such as management, conservation, community engagement can play a major role when included with mapping. It can help governing agencies understand the needs and aspirations of indigenous communities.
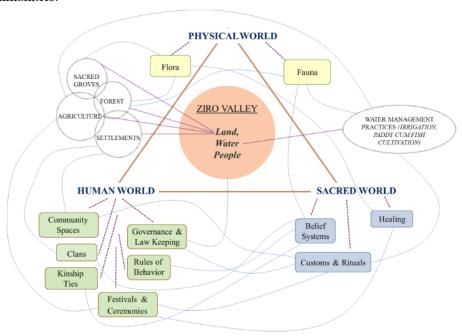
Figure 16 : A relationship model depicting various connections between physical, sacred and human worlds in accordance with Apatani livelihood. *Adapted from Aboriginal Art by the Institute for Aboriginal Development.*

c. Inclusive economic development: Assessing the monetary and non-monetary contributions of Apatani customary practise, benefits to the community's wellbeing in participation with people at local/ appropriate scales. Documenting the past and present modes for economy among the community and assessing its sustainability through the dynamic phases of urbanization can prove to be beneficial. It is important to identify the sustainable modes of economy that resonates with the resources and management system. As already mentioned in previous sections, the younger generations migrate to more developed areas in search of education and employment which leads to obstruction in passing down the knowledge system and hence pose a threat to community empowerment. Incorporating capacity building as a tool can help these communities to adapt and thrive in harmony with their values and systems.

The above describes a mixed approach operating at a pluralistic policy platform enabling policy makers and local planning authorities to understand indigenous values of natural systems above and beyond the livelihood opportunities that are typically considered for development policies by Government as well as Private Agencies. *Adopted from (J. R.-S. Kamaljit K. Sangha)*

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Sustainable Rural Development through Healthcare Infrastructure.

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Abstract : In India, majority of the total inhabitants reside in rural areas. Due to non-accessibility of public health care and low quality of health care services, majority of the population prefers private healthcare facilities, of which maximum are in urban cities. While private providers are expensive, unregulated and variable in quality, they are also unaffordable for the low income rural population. Therefore, to narrow the gap between the people and health care knowledge and facilities, there is a need to develop health centers that will act as the first connection between the villagers and health care centers.

The paper aims to identify such villages in Kutch, Gujarat that are deployed with basic health systems. A study is done to provide solution to them by proposing small health care sub-centers. And finally, a referral primary health care center to these sub centers is designed. The objectives of the paper are to study the climate, culture, lifestyle of the villagers. Moreover, the paper also studies local construction systems and materials prevalent in these villages. This information is obtained through a detailed literature survey. Case studies of the villages and individual houses are carried out so as to meet the objectives. With this knowledge, a central primary health care center and connecting six sub centers are designed in various villages that will use the existing sustainable and climate responsive techniques that is local to the people so as to discard the fear associated with health centers.

Keywords: healthcare infrastructure, local construction techniques, climate responsive.

1. Introduction :

Healthcare is the basic right of every individual. However these rights are unfulfilled when it does not reach the rural population of the country. Around 60% of the Indian population reside in rural areas that is approximately 700 million people where the condition of medical facilities is deplorable. In rural India, where the number of Primary health care centers (PHCs) is limited, 8% of the centers do not have doctors or medical staff, 39% do not have lab technicians and 18% PHCs do not even have a pharmacist.

Kutch, a region sharing the largest coastline in India is one such region where these facilities are not accessible to everyone. Even though there are many development policies made, some villages in this region remain devoid of permanent healthcare facilities. To change these situations, there is a need to revisit rural healthcare systems and provide centers wherever necessary. This paper aims to identify such rural regions with the help of literature review and settlement visit report. The objectives are to study the settlements in the villages, their culture, dwellings, construction systems, post-earthquake policies, medical facilities, etc., and provide sub-centers to a cluster of villages and a PHC (Primary healthcare center) to 6 sub-centers. These sub-centers will act as the first contact point between the villagers and the PHC unit. They will

provide the citizens with professional help and ancillary activity that would enhance their quality of life and emotional well-being.

1. Kutch:

Figure 1. Map showing the Kutch region

1.1 Kutch region :

Kutch is the largest district in India with an area of 45,674 sq. km. Literally "Kutch" means something which becomes wet and dry at irregular intervals. In Sanskrit 'Kutch' also means tortoise. A large part of this district is known as Rann of Kutch, a shallow wetland which submerges in water during the rainy season and becomes dry during the other seasons. It is known for the marshy salt flat lands which appear to be snow white after the water dries up every summer. It is also ecologically known for Asia's largest grassland - Banni grassland. The northern and eastern part is surrounded by Great and Little Rann of Kutch which are the seasonal wetlands of Kutch. The geological survey of India has identified Bhuj and its peripherals as a highly earthquake region (seismic zone 5).

Availability of open lands and water bodies, brought people living in villages around Bhuj to relocate their houses. They shifted in flocks and formed their communities. Thus, many settlements were formed due to this relocation in Kutch.The villages in Kutch were primarily cattle rearing and craft oriented as the climatic conditions and salty lands were not suitable for agriculture. Hence, milching was one of the primary occupations to support the people. Today, Kutch district is inhabited by various nomadic, semi-nomadic, and artisan groups. Their culture, lifestyle, art forms, dwellings, beautiful landscapes, etc. are noticed around the globe and has been a major tourist attraction in India. (SY B. Arch, 2017)

1.2 Climate and Vegetation :

The climate of Rann of Kutch is sub-tropical with average temperature of 45°C during the hot summer months and below freezing in winters. Summers last for eight months of the year which reflects that the region has clear skies for most of the months with 345 days with good sunlight per year.

Annual average rainfall precipitation is about 85.9mm. Rainfall occurs from June to November with maximum precipitation in the month of July. Asia's largest grassland known as Banni grassland can be found in Kutch region. Thorny shrubs dominate the landscape. Babul trees flank either sides of the lanes in villages. Castor trees are also predominantly found in the region.

1.3 People and Culture :

Villages here are divided based on communities they belong to. Hindus and Muslims are segregated into the Harijan and Maldhari community. The Harijans are craft oriented people while Maldharis are cattle oriented people. The nomads belong to the Rabari community. Men engaged in wood carving and leather crafts brought by the Dalit Meghwal community of Rajasthan.

Communities here follow patriarchal system, where women were suppressed and restricted. This led to the existing ritual of the region, where women always covered their faces in dupattas. Post-earthquake in 2001, with the help of government, to revive economy, tourism in Kutch gained immense attention following which people indulged in handicrafts making. Weaving enabled women to work indoors as their skills gained recognition and could generate economy for their families. The Rann Utsav initiated by the government provided a source of income for many families, which led to the development of the villages in Kutch.

1.4 Evolution of dwellings :

Initially, people that inhibited Kutch were nomads that built temporary structures such as tents. The tents were the most primitive dwellings. Due to availability of water, open lands, etc., the nomads could find these conditions favorable for them as well as for their animals. This aroused the need for stability in life as well as dwellings. Also, the instability of tents in extreme climatic conditions and the aspirations for stability gave light to mud as a building material. Dwellings then were built using mud and thatch. In 1819, when the earthquake hit the region, these mud houses could not survive as they lacked reinforcing stability. This led to the birth of circular plan forms of dwellings with thatch roofs called as the Bhungas. (See Fig. 2)

Figure 2 Evolution of Dwellings

1.5 Earthquake :

In 2001, entire Kutch region was affected by 7.7 Mv earthquake, along with the towns and cities like Bhuj, Anjar, Gandhidham, Bhachau, Kandla Port, Rajkot, Ahmedabad, etc. Every natural calamity leaves a stream of miseries by loss of life and destruction caused, but also teaches the human society especially to architects, engineers, builders and in case of Kutch even the local artisans for improving the construction practices and design. The greatest damage due to the earthquake occurred in the region of Kutch, which is spread over an area of 45, 930 km^2 and covers about 22% of the area of Gujarat state. Of the total of 884 villages located in this region, 518 suffered significant damage, 178 were completely destroyed, and another 165 damaged to the extent of 70% or more (Principal Secretary 2001).

1.6 Post-Earthquake :

With the help of government, to revive economy, tourism in Kutch gained immense attention. It soon became a prime occupation of the Kutch. Their art and culture gained more popularity. Moreover, women who were kept in *purdah* for very long were now recognised for their skills and could generate economy for their families. The Rann Utsav initiated by the government provided a source of income for many families that led to the development of these villages.

1.7 Settlement patterns and construction of Bhunga :
  1.7.1   Settlement study :

The village settlements towards the northern part of Kutch are segregated based on the communities they belong to. Hindus and Muslims are segregated into the Harijan and Maldhari community. The Harijans are craft oriented people while Maldharis are cattle oriented people. The nomads belong to the Rabari community. Men engaged in wood carving and leather crafts brought by the Dalit Meghwal community of Rajasthan. There are two types of settlements found in these villages – organically developed settlements. The settlement of Hodka village was studied as an example of organically developed settlement. (Fig. 3a)
Other type of settlement is an organised settlement where there is a central axis which is the main road of the village branching out to secondary and tertiary pathways. The houses are situated on either sides of these pathways. (Fig. 3b)

Figure 3. 1 Cluster Plan of an Organically Developed Village Settlement (Hodka Village)

Figure 3. 2 Cluster Plan of an Organised Settlement (Bhirandiara Village)
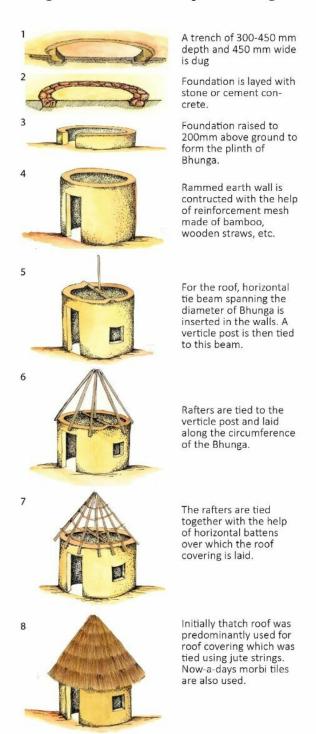
1.7.2   Construction of Bhunga :

Bhungas are the traditional houses found in villages in Kutch. The Construction system of Bhungas was developed after the earthquake of 1819. However, in order to gain the status of *'pakka'* house, people used concrete and bricks as building materials that were not suitable for such extreme climates and earthquake resistant. After the earthquake in 2001, people realised that these *'pakka'* houses are not resistant to it, as they were not built using the right methods. Therefore with help of government authority, local artisans brought

back the traditional construction system of constructing the houses. (See fig. 4 for detailed construction steps)

Figure 4. Construction steps of a Bhunga

1	A trench of 300-450 mm depth and 450 mm wide is dug
2	Foundation is layed with stone or cement concrete.
3	Foundation raised to 200mm above ground to form the plinth of Bhunga.
4	Rammed earth wall is contructed with the help of reinforcement mesh made of bamboo, wooden straws, etc.
5	For the roof, horizontal tie beam spanning the diameter of Bhunga is inserted in the walls. A verticle post is then tied to this beam.
6	Rafters are tied to the verticle post and laid along the circumference of the Bhunga.
7	The rafters are tied together with the help of horizontal battens over which the roof covering is laid.
8	Initially thatch roof was predominantly used for roof covering which was tied using jute strings. Now-a-days morbi tiles are also used.

1.8 Current Healthcare situation :

Pravara Rural College Of Architecture, Loni

Even though development in Kutch has increased, it still has a long way to go. As the villages are segregated according to communities, they do not intervene in other communities. Literacy rate is very poor compared to the main cities of Gujarat. Especially, women here are not allowed to attend schools after fourth class. As people here still believe in the patriarchal system, women are supressed. Negligence towards education has led to negligence towards basic health care knowledge. Therefore, there is a need to introduce a health center which will provide them with knowledge to a healthy lifestyle.

According to National informatics center, Government of India there are 20 health care centres in Kutch District. These centres are majorly located towards the central and southern part of the district. However, as shown (Fig. 5) the northern part including villages like Bhirandiara, Godpar, Soyla, Misariyado, Bhojordo, Hodka and 12 more neighbouring villages are devoid of any health facilities.

Figure 5. Map showing available PHC centres in Kutch region.

Source: Google Earth

2. Proposed outcome:

Healthcare being the right to every individual, rural areas of Kutch lack the infrastructure and qualifies medical functionaries as well as basic medicine facilities. Post the disaster, many development policies were made which helped the region in reviving the economy. Tourism came in and changed the overall scenario of these community villages. Eventually the population of these villages has increased but still lacks basic health care knowledge as well as facilities. Considering the facts there is a need to set by new practices and procedure to ensure that these settlements receive quality and timely healthcare. Therefore, aim of the intervention is to uplift these villages in terms of good health care facilities not such physically but mentally as well. This healthcare infrastructure includes 6 sub centres located such that they are accessible to neighbouring 2-3 settlements and a single referral unit (Primary Healthcare Centre) located centrally to these sub-centres.

2.1 Primary Healthcare Center at Bhirandiara :

By studying these villages and the non-availability of health care facilities, the site chosen for Primary Health care center is in the village called Bhirandiara. Currently people have to travel around 30 Km. to reach the Bhuj city where the facilities are located. The PHC is located such that it is accessible by all the 6 sub centres situated around it. (See Fig.6)

Figure 6. Map showing proposed PHC and sub-centers

Figure 7. Location and site for PHC

Site for PHC, Bhirandiara.

The site for primary healthcare centre is situated right by a main village road in Bhirandiara. The proposed PHC is a 4-6 bedded centre maned with Medical officer and 14 sub-ordinate staff. Aim of the PHC is to provide an environment to rural communities that encourages healthy lifestyle access to healthcare services for physical, mental and emotional well-being. Fig. 8 shows the proposed plan for PHC. Inspired by the close planning of the villages in Kutch the PHC centre is designed such that all the building blocks are close to each other. To make the structure earthquake resistant, the massing is broken down leaving some gap in-between the rectangular blocks, which will be covered with jaali walls to avoid dry winds from entering the structure.

Figure 7. Layout of PHC

1. ENTRANCE
2. REGISTRATION
3. PHARMACY
4. PATHOLOGY
5. GENEREAL WARDS (MALE/FEMALE)
6. TOILETS
7. NURSE STATION
8. LINEN
9. LAUNDRY
10. CANTEEN
11. LABOUR ROOM
12. STORE
13. MINOR OT
14. HEALTH EDUCATOR
15. HEALTH ASSISTANT
16. MEDICAL OFFICER
17. MANAGER
18. ACCOUNTANT
19. HALL

Materials and construction system used is local to the Kutchi people so as to discard the fear associated with health care centres. The proposal also includes a 5 sensory garden that will contribute to the emotional well-being for the patients. Fig. 8 shows the construction steps of an individual block. The centre will also undertake seminars for empowerment so as to burst the patriarchy system prevailing in these villages.

Figure 7. Exploded view showing the construction process of an individual block

THATCH ROOF
WOODEN TRUSS
RING BEAM
RAMMED EARTH WALL
SILL BAND
WALLS
RAMMED EARTH
BIO-FLOORING
PLINTH
STONE FOUNDATION

3. Conclusion :

With the help of these healthcare systems, the overall development of the villages take place. The sub- centres can act as the first contact point between the patient and the PHC providing them with a professional care. Also, seminars for the women could help empower them and provide them with basic knowledge of sanitation and healthcare. Using local construction techniques can eradicate the fear associated with medical infrastructure. Spreading knowledge with the help of these centres can help increase the literacy rates as

well. Therefore, providing medical infrastructure to these rural areas can prove helpful in overall development of the state and eventually the nation.

4. Future Scope :

Design of sub-centres with similar though process could be done. Also these sub-centres could have an ancillary activity/space that could help maximum participation of the village population. These spaces can cater to the need of the village at the same time attempt to enhance the quality of life of local citizens.

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SUSTAINABLE RURAL DEVELOPEMENT

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Abstract :

Rural communities in India have depopulated and become deprived due to rural-to-urban migration for over half a century. Buildings have fallen into disrepair with little or no investment in infrastructure. That, however, is now changing as many urban migrants are returning to their home communities. Government funding has recently supported this and there is significant evidence of reverse migration in recent times. The increased population in rural communities results in a need for improved educational buildings, housing, small businesses, traditional commerce, and farming. However, migrants have little capital to fund construction and government support is not adequate

One needs to understand the trends in migration, identifying the demands for redevelopment of rural villages. For research, a typical village should be selected, surveyed and investigated concerning future needs. A desktop analysis should be carried out into self-build techniques, materials appropriate for that area and the local skills for construction. One needs to understand how architectural design can assist low-income communities & foster to contribute towards education, commerce and building sustainable structures in response to growth in rural areas. Here, the architecture is defined in relation to the skills of the villagers, the climate, the available materials and technologies, the future needs of the village population & their cultural desires.

It must be noted that it is not an easy task to persuade the public to change their values and habits towards sustainable development by advocating what is possible by living in such communities. In such cases, it becomes must that people should be given social learning in early days of life about the relation of sustainability and the built environment. Finally, it is not the responsibility of the architects only, to ensure a sustainable future. In fact it depends upon all humans, through the decisions they take and actions they make.

Keywords: Research, Challenegs, Approach, Priority, Inhibitants

- **Introduction :**

India is acclaimed for its culture, tradition and heritage. While Indian cities like Delhi, Calcutta, Mumbai and Bangalore are losing their traditional touch, it is the villages that are a true mirror of Indian culture and tradition. However, we do not talk about Indian villages as much as we should. About 67 % of the Indian population still resides in its villages.

Imbalance growth between rural and urban landscapes leads to the challenge of rapid urbanization in already crowed Indian urban masses. One of the main consequences of uncontrolled urbanization is lack of livelihoods, lack of good standard of living and amenities in the villages of India. Urban population density is increasing in uncontrolled manner, while the numbers of cities are still inadequate to accommodate the migrating population from villages. This needs to be reversed and suitably managed to improve quality of life in Indian cities

It is a general observation that the architects always limit their services to the wealthy and powerful people from urban areas. But the truth is that, it is the poor from the villages who need his services. The rural population in India have various shortcomings associated with their shelters. Architects need to step forward to help them tackle various shelter related issues that will ultimately lead to a healthy environment and living.

The sustainable development of villages is based on its socio-economic, political and physical development. This development should take place along the key words of culture, society, economy, health, education, technology, built environment etc. It includes developing and empowering the

human resource in terms of their psychology, skills, knowledge, attitude and other abilities. The development cannot take place without the provision of basic amenities and services which include drinking water, electricity, education, transportation etc. To promote the development it is necessary to work out the role of local level institutions and restructure their role to facilitate the development objectives.

Above all, poverty eradication should be a central objective of the development program as it can create a basic ground for the other non- economic developments. At local level, efforts are required to promote rural art and crafts through local resources. Alternate employment opportunities need to be created to tackle the unstable nature of agricultural economy.

There may be variations in the role of the architects depending upon particular situations. His main duty is to try to preserve, improve and create the required quality of built environment for the users towards the creation of sustainable world. Their role as citizens should be to become sustainable member of their own community.

1. Objectives of the Research

1) To understand the need of sustainable planning for villages.

2) To study the existing role of architects in rural planning and design.

3) Finding solution through local & sustainable material & building techniques.

4) To implant cost effective & climate centric practices.

5) To ensure cultural preservation by implementing traditional architectural practices.

6) Involvement of local inhibitants to understand their requirements & aspirations.

6) Flexible approach to ensure needs of future.

(1.1) Research Questions

1) Are the architects responsible to bring about the sustainable rural planning? If yes, how?

2) Can the architects plan the villages or are the villages grown organically?

2) How is the current architectural practice frame work matches with reference to the rural development?

3) What measures can be taken to improve and redefine the architect's role to enhance the rural planning?

2. Role of an Architect

It is an architect's responsibility to combine practices from formal education along with traditional wisdom of the local population. It is to create innovative climate-centric practices which should have flexibility to evolve over time. Also to improve infrastructure of the region and for generating livelihoods in response to the issue of de-urbanization.

Architects have knowledge and are experts in design and construction field, but they need to share their knowledge and skills with the community to make them more useful through their ideas and experiences. The community is no doubt gifted with its own vernacular system and has more knowledge about their own needs, but need to share this with the expert (architect) who can help them with scientific appropriateness and visualization of their ideas.

2.1 Architectural Education

The school education must have a course on Built Environment that spreads the awareness on the various issues related to the built environment from the childhood days. The basic education should give emphasis on social sciences. Architecture and planning are the vehicles to

deliver the promised quality of urban life. The educational institutes must emphasizes on the remodeling of architectural education.They should also engage in dialogue with endusers, develop and test alternate design methodologies, and create new models for design and delivery of habitants.

The designers and planners must also care for the built environment and thereby the quality of life in villages.The architect can be an important actor who handles the complex process and transferring of the end-users needs into the building process. Architectural knowledge can maintain the holistic view during the process and add both social and human values. The tools and preparations for this role must be handed during the architectural education stages.

Future role as practicing architect with the current education system holds these   two interpretations: one is that the current education system will not make them able enough or encourage them to work with (rural) community and other is may be in future they want to make money out of profession which is possible only in cities.

Most of the practioners feel it is important to teach the subjects in sustainable built environment to improve awareness and knowledge. Also the introduction of design topics for rural planning and design in university will help to orient their creativity in this direction.

2.2 Architect's responsibility towards rural developemement:

- Architects must understand needs, changes with time frame,have dialogue, diagnosis, analyze, propose, discuss and evaluate. They must see how people are living in their context, use of spaces, develop basic ideas, and improve skills through workshops.They should sit with community, live with them, interact, educate, improve awareness.

- They should observe and operate; clear the goals, group conversations, explain the project, informal discussions, observations, formal meetings, private conversations with key informants, making groups: gender wise and age wise, without any assumptions or fixed ideas

- They should analyze social fabric, check the acceptance levels, create the environment, awareness campaigns, build office on site, make rational decision, guide, offer insights, negotiate, agree & disagree.

- People should tell their problems and needs about their exisitng infrastructure issues to the Architect like they do to the Doctor regarding their health, and let the architect diagnose the issues and find a solution which will involve his experience and expertise and follow the suggestions for the betterment of the health of their own built environment

2.3 Architect's approach towards community planning:

- Raising awareness among the villagers regarding sustainable development.

- Study and respect for people's culture: customs and traditions, ways of life, social manners, economic activities etc.

- Study of the physical aspects of community: Housing layout, space planning measures, climate, topography,use of spaces/ space behavioral studies, available natural resources etc.

- Study of the various housing theories: suitability to the context, acceptance by the community, affordability issues etc.

- Study and application of low cost materials and methods:

- allow the selection of local material, the technique responding to local climate and suiting to the economic status the locals throughout the life span

- Respect the vernacular trends of design in the local area.

3) Research

(3.1) Framework for on site analysis :

Identify an existing village with needs that require immediate attention. It will require -

Location (with maps) , History & Culture , Geographic features , Demographic Features, Administrative Profile of the Gram Panchayat , Economic Resources , Infrastructure & Civic Facilities.

(3.2) Plan of action for the challenges :

1. Challenges to be identified
2. Priorities determined by the people
3. Strategies to address the challenges identified as priorities
4. Plans and projects to convert the strategies into action
5. Costs and source of funds.
6. Roles and responsibilities of different actors
7. Timelines
8. Targets/Outputs and Monitoring arrangements
9. Anticipated outcomes

4) Suggestions

(4.1) Material

Sustainable building materials can be defined as materials with overall superior performance in terms of specified criteria. For Selection of Sustainable building materials the following criteria are commonly used:

- Locally produced and sourced materials

- Transport costs and environmental impact

- Thermal efficiency

- Occupant needs and health considerations

- Financial viability

- Recyclability of building materials and the demolished building

- Waste and pollution generated in the manufacturing process

- Energy required in the manufacturing process

- Use of renewable resources

- Toxic emissions generated by the product

- Maintenance costs

Few of the materials are described below

1) Lime

2) Fly Ash Bricks

3) Eco-Friendly Tiles

4) Bamboo

5) Ferro Cement

(4.2) Technique

With green building becoming a critical part of today's world, more and more new construction technologies are being developed to keep upwith this escalating shift to sustainability. The following list is the commonly adopted some of the techniques recognized in sustainable construction:

- Low volatile organic compounds (V.O.C.) paint.

- Plywood processed without using formaldehyde.

- Install big windows that provide plenty of fresh air and natural light.

- Install energy and water efficient appliances.

- Proper site selection and prevention of pollution on the construction site.

- **Water Systems Store, Recycle, Reuse** : This includes using low water use appliances, toilets, and faucets, recycling grey water (water produced by sinks, showers, and laundry), and eliminating irrigation. Recycled grey water can be used to irrigate the landscape rather than being discharged into the municipal sewer system.

- **Composting Toilets** : These can reduce the waste volume by 90%. When human wastes are mixed with enough plant matter (i.e.kitchen scraps, garden wastes, etc.) and when exposed to enough air, will decompose and become nutrient-rich fertilizer.

- **Solar Water Heating** : In this system the panels collect heat from the sun and transfer it to aglycol solution in copper coils. The coils travel to a heat exchanger to deliver heat to the water tank. Most systems use flat plate collectors that are mounted to face the sun.

- **Indoor Air Quality** : The best strategy for improving indoor air quality is through controlling the pollutants at their source. Sustainable ways to improve indoor Air Quality are - selecting low-emission materials, Plants as Environmental Air Cleaners, Use Sustainable Building Materials etc.

- **Cool Roof :** A cool roof is a roof designed to maintain a lower surface temperature in bright sunshine than a traditional roof. The surface of a cool roof reflects more sunlight and releases more heat than a so-called hot or dark roof.

(4.3) Climate responsive Architecture

The goal of climate-responsive architecture is to create a comfortable interior while reducing the building's reliance on artificial energy. A climate-responsive building design reflects the weather conditions in the precise area where the building is constructed. The design utilizes data on the region's weather patterns and accounts for factors like seasonality, intensity of the sun, wind, rainfall and humidity.

Several elements play a role in limiting a building's energy use based on its site-specific conditions. For example, the building envelope is an important mediator between the indoor and outdoor condition. Envelopes in different climate zones require different assemblies to minimize unwanted energy loss.

(4.3.1) Solar Control

Strategic building orientation and data-informed fenestration are critical to maximizing the climate-responsive abilities of smart glass. In general, the east direction receives maximum solar radiation in the morning. Around noon, most light is directed onto the south façade, and by the afternoon, direct light is on the west façade. In colder climates, it follows that a building with more of its windows on the southern-facing façade will benefit from passive heating. Using fenestration to access high-quality daylighting can also reduce the amount of energy a building expends on artificial lighting.

Yet general guidelines like these are only so helpful. The altitude of a project site will affect glare and daylight levels, as will the season and the ever-changing sky condition, which is contingent on cloud cover and the probability of precipitation.

(4.3.2) Site specific analysis

Many variables come into play when considering how climate, orientation and site-specific conditions will affect a building's comfort and energy use. Consequently, the most effective implementation of climate-responsive architecture is achieved using project-specific insights developed through a series of detailed analysis. An environmental analysis, for example, includes a review of the project's local weather data. The environmental analysis looks at historical temperature, humidity level, solar radiation and sky condition to inform decisions made during the schematic design phase and to improve the climate-responsive features of the building.

Other types of analyses can help solve, or avoid, problems affecting how occupants will experience the building. A glare analysis of the interior space helps to determine the areas that will be subject to direct sun glare and the duration of time that glare exists. Glare analysis is very important for the areas where occupants spend long hours, like office spaces. Staying for long hours in spaces that are not visually or thermally comfortable can affect occupant health and productivity. Glare analysis is also helpful to accurately determine areas of the project that require some type of shading strategies.

(4.4) Traditional Architecture

Traditional architecture has evolved over generations in response to the local climate, topography, culture and context. It employs locally available natural materials and indigenous construction techniques. Hence, it is sustainable, cost-effective and has a strong aesthetic character.

(4.4.1) Courtyard

Internal courtyard was an integral part of a traditional Indian home layout. It provided ample natural light and ventilation to the home interiors.

(4.4.2) Jaalis

In the hot climate of India jaalies or lattice screens have been widely used in traditional architecture for ventilation, diffused light, shade and privacy. These screens let in the cool breeze but keep out the harsh sun and the dust.

(4.4.3) Verandah

It is a covered and partially enclosed structure attached to a house. Traditional homes usually had a verandah at the entrance to receive guests. These provide shade and keep out the hot sun and rain.

(4.4.4) Chajjas

Chhajjas are projections over window and door openings to protect them from sun and the rain. Due to the shade provided by the chhajjas on the openings, they contribute to the reduction of heat entering the interiors of the home

(4.4.5) Arches

Arches lend a lovely charm due to their soft curves that provide a welcome change from the straight lines and right angles. Arches also offer the advantage of being structurally stable due to their form. This means that arches can be constructed without the lintel that is used over all door and window openings. They can be made in bricks or stone thereby saving on the amount of concrete used in the lintels.

(4.4.6) Sloping roofs

Sloping roofs have always been employed in areas receiving heavy rainfall and snowfall. In the Southern states, sloping roofs were built to drain the heavy monsoon rain. They were usually covered with terracotta tiles, the elegant Mangalore tiles being the most famous. In the mountains of Northern India, sloping roofs were made of stone tiles like slate.

(4.4.7) In built furniture

In traditional Indian architecture some of the furniture used to be built while constructing the house. In Kerala homes, there used to be built-in seating in the front verandah known as charupaddi Inside most homes there used to be niches, alcoves and shelves for storage and display. The built-in furniture was extremely durable and also saved on the woodwork.

5) Culture & Architecture :

Undoubtedly, one of the greatest achievements of Indian civilizations is the rich diversity of cultural and traditional dialect, influenced by the socio-economic and geographic conditions of that era. This has, in turn, influenced the architecture in a way that each style becomes the beacon of the technology. If one were to notice, the most important buildings of any era were always built based on the traditional building methods with a strong sense of cultural importance.

History shows that these *(nearly)* 2000-year-old structures withstand the tests of time and hence are still studied as best examples of Indian architecture. Various studies are currently focusing on decoding these building techniques and establish a formal method to apply them in the present era.

In a brief span of 500 years, transportation and information exchange have improved greatly, which partly led to the dilution of cultural principles. The exchange of information greatly influenced the style of buildings and the materials selected. Thus, a new culture arose at the end of every era. Special craftsmen and artisans were then the key members of construction, while merchants acted as the seeds of influence.

The traditions of the past have had deep roots in their cultural practices. In the era where human-made materials were unheard of, people naturally resorted to locally available materials, and available in excess. For example, The North-eastern regions of India host a variety of Bamboo, Timber, and Mud

constructions (*Wattle and Daub*) as its native architecture while the Southern regions have resorted to Stones, Boulders, and sometimes entirely of Clay/Mud.

(5.1) The Modern Culture

Today's culture highly revolves around economics, technology, energy efficiency, and formal science. We no longer follow the age-old cultural practices, but only carry forward a few select aspects as tradition. For example, we have moved from Traditional Bricks to Wire cut – kiln baked ones, from terracotta to vitrified tiles, etc. For the – so-called – modern civilization, the importance of the end product is greater than the importance of the process. This cultural mind-set arises as a result of extensive population growth and the need to accommodate the masses.

(5.2) A shift in the design sensibilities

Recent advancements in the field of material studies, as well as construction techniques, have proved that the way to go forward is to have the right mix of current *(modern)* technology and past principles. Various businesses today are focussed on low-impact designs, sustainable architecture, and on adapting traditional designs, keeping in mind today's requirements such as economics, speed of constructability, and maintenance.

(5.3) The right foot forward

One of the optimal directions to move forward would be to identify new points of balance between historical practices and modern requirements. The thought of experimentation needs to be encouraged more – in architectural schools as well in practice – to make sure while one group of people can validate the ideas, the other can keep inventing new methods. Cultural and Traditional Indian architecture needs to be sustainable.

But the definition of sustainability changes with time, and highly depends on the socio-economic and cultural aspects of the civilization in that era. Today, our cultural principles are changing once again as we become more aware of the harm our technology has brought upon this planet. We are resorting to green and sustainable architecture once again. In Parallel, we are also rapidly exploring new methods and techniques that contribute to the same goals.

To sum it up, Architecture is an ever-evolving dialogue between the past and the future. Indian architecture has all the necessary tools and resources to progress, and at the same time, learn from its rich history. All it requires is a push from the right influencing factor in the right direction. One such factor might be media, trying to promote public awareness.

It is high time that the common man is made aware of the direction, Indian Architecture is tilted towards. As we continue to find the right balance between history and futurism, we also need to cater to the current needs and restore the values of the cultural identity of each individual. Such an approach to architecture will definitely withstand the test of time, and in turn, become sustainable.

6) Study of Exisiting Sustainable Eco Villages :

(6.1) Dharnai, Bihar

Once struggling to get basic electricity like most villages in India, Dharnai has now changed its fate and become the first village in India to completely run on solar power. Residents of Dharnai had been using diesel-based generators and hazardous fuel like cow dung to meet the electricity requirement for decades, which were both costly and unhealthy. Since the launch of Greenpeace's

solar-powered 100 kilowatt micro-grid in 2014, quality electricity is being provided to more than 2,400 people living in this village in Jehanabad district.

(6.2) Payvihir, Maharashtra

An obscure village in the foothills of Melghat region of Amravati district in Maharashtra, Payvihir, has set an example for the country by consistently showing how communities and NGOs can work together to conserve the environment and ensure sustainable livelihood for people. In 2014, Payvihir bagged the Biodiversity Award from the United Nation's Development Programme for turning a barren, 182-hectare land into a community forest.

(6.3) Hiware Bazaar, Maharashtra

Amid the desperate denizens scrounging for water in the drought-affected parts of Maharashtra stands a village that has not felt the need to call a single water tanker – in fact, it hasn't called for one since 1995. The village also has 60 millionaires and the highest per-capita income in India. Facing a major water crisis each year because of the measly rainfall it gets, the village decided to shun water-intensive crops and opted for horticulture and dairy farming. Their consistent water conservation initiatives led to rising groundwater levels and the village started to prosper. Today, the village has 294 open wells, each brimming with water.

(6.4) Odanthurai, Tamil Nadu

Odanthurai, a panchayat situated in Mettupalayam taluk of Coimbatore district, has been a model village for the other villages for more than a decade. The panchayat has not only been generating electricity for their own use, but also selling power to Tamil Nadu Electricity Board. Having already won international acclaim through its unique welfare schemes and energy self-sufficiency drives, Odanthurai near Mettupalayam has begun efforts to develop a corpus of Rs 5 crore to install wind and solar energy farms. This project will enable free supply of electricity to over 8,000 residents.

(6.5) Gangadevipalli, Andhra Pradesh

If India lives in its villages, then the model it perhaps must follow is Gangadevipalli, a hamlet in Andhra Pradesh's Warangal district where every house has the bare necessities of life, and more. From regular power and water supply to a scientific water filtration plant, a community-owned cable TV service and concrete, well-lit roads, this model village has been steadily gaining in prosperity thanks to a disciplined and determined community that has also managed to work in harmony towards goals set collectively.

Conclusions

The challenge to work successfully with a sustainable development of our society requires a better cooperation between the actors involved. All inhabitants have the right to be part of the planning process in order to create a safe, healthy and social sustainable environment. All the knowledge that is available must be used in order to solve the complicated problems concerning energy efficiency and the environment. The actors can share the responsibility and the Government authorities or NGOs can give the necessary resources to the project. Quality in the end-product comes from using the available knowledge and skills from all the actors involved.

It can be concluded that, the architects have the ability to understand the consequences of the design process and hence can advise and educate local people in any additions and improvements to their built environment. The local people can share their knowledge, but their knowledge is limited and based on the circumstantial experiences which are not always enough. Therefore, the knowledge and expertise of architects can assist the community in their decisions and initiatives.

Possibilities can be found in rural projects where a process with a joint ambition of rural society and the architects gives the right product. The possibilities can be the joy of working together with an important objective - to create a sustainable environment with benefits to the villagers who need an up- liftment in their status: socially and economically.

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SIGNIFICANCE OF CULTURAL ATTRIBUTES FOR SUSTAINABLE URBAN DEVELOPMENT OF PILGRIMAGE TOWNS OF INDIA: A CASE OF PAITHAN, MAHARASHTRA, INDIA

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Abstract: India is a land of religions having many large and small pilgrimage centers situated all over its map. The small pilgrimage towns are accommodated with the pilgrimage events and allied cultural and traditional activities as a part of daily routine of the communities. These allied activities are inseparable and have connect and significance at regional level. Taking into consideration the Smart Urban Development process such small pilgrimage towns are less talked about. The paper put forward study of one such small Pilgrimage town Paithan of Maharashtra, India. The sacred town of Paithan is graced with rich and diverse natural, historic, and cultural heritage. The social, cultural, and communal diversity of Paithan led to the formation of different architectural styles and the development of art and culture over the past glorious eras. During the Metamorphosis of this town, it has experienced the downfall, industrial development, migration, changing environmental circumstances, hypocritical social conventions, rigid class stratifications, and urban development. The inheritance of the culture can be experienced in this 'Land of Saints' with the writings of Sant Dnyaneshwar and Sant Eknath which exhibits 'Wisdom and Power'. It is to be noted that, while urbanization is beneficial, it is necessary to understand the significance of inherent cultural attributes in the urban planning and designing process for the sustainability of the pilgrimage towns. The research aims to understand the linkage of existing cultural dimensions with urban planning and designing. The intended contribution of this research is to provide a body of case study which can be used as a tool for designing strategies for revitalization of Indian Urbanism enhancing inherent cultural attributes for sustainable development of small pilgrimage towns in India.

Keywords: Pilgrimage, Cultural Heritage, Indian urbanism, Urban Development.

1. Introduction:

In a rapidly urbanizing world, there is an increasing discussion on sustainability of urban areas. The UN-Habitat New Urban Agenda of 2030 has adopted the Sustainable Development Goal to achieve "sustainability and a better quality of life for all in an urbanizing world". It aims to build inclusive, safe, resilient, and sustainable cities and communities. "Sustainable urbanization is advanced as a driver of development and peace, to improve living conditions for all" is the main objective of this Agenda. Urbanization has been widely acknowledged for its transformative power, even though urban and rural areas depend on each other, rural areas often lag vision for sustainable development worldwide. "Urbanization is not about simply increasing the number of urban residents or expanding the area of cities. More importantly, it's about a complete change from rural to urban style in terms of

industry structure, employment, living environment and social security" (Li Keqiang). As per the new strategic plan 2020-23, urban-rural linkages touch on a broad variety of thematic areas ranging from urban and territorial planning, strengthening small and intermediate towns, from enabling spatial flows of people, products, services and information to fostering food security systems as well as touching mobility and migration, reducing the environmental impact in urban-rural convergences, developing legislation and governance structures and promoting inclusive financial investments among others (UN-Habitat New Urban Agenda 2030).

India is the second largest urban system in the world with almost 11% of the total global urban population living in Indian cities. In absolute numbers, the urban population in India is more than highly urbanized countries/regions across the globe (REFORMS IN URBAN PLANNING CAPACITY IN INDIA, Report-September 2021). The process of urbanization in India is considered transformative as it is driven by many indigenious aspects such as changing demographics, size of cities and towns, income inequality and cultural diversity. Embedded in the local discourse, culture has emerged as a significant local, place-based determinant in the urban planning process necessary for achieving sustainable urban development. UNESCO has initiated preparation of a 'Global Report on Culture and Sustainable Urban Development' which aims to provide guidelines and recommendations aimed to foster culture-based urban sustainable development initiatives at the different levels (UNESCO, 2015). India is graced with the rich and diverse natural, historic, and cultural heritage which awaits to be explored to its full potential.

2. Pilgrimage: a sacred and cultural activity

Great centers of pilgrimage attract visitors from widely dispersed cultural backgrounds and geographic locations, often enabling them to commemorate the origins of their particular faith (Britannica). Pilgrimage, a journey undertaken for a religious motive. Although some pilgrims have wandered continuously with no fixed destination, pilgrims more commonly seek a specific place that has been sanctified by association with a divinity or other holy personage (Britannica).

India is a land of religions having many large and small pilgrimage centers situated all over the map. Such pilgrimage centers show the human – water – culture relationships which is an important determinant of urban planning and designing. The small pilgrimage towns are accommodated with the pilgrimage events and allied cultural and traditional activities as a part of daily routine of the communities. These allied activities are inseparable and have connection and significance at regional level. Altering frequencies of the visitation of the pilgrims offers peculiar character to the urban form of the pilgrimage town. The urban planning and designing of this pilgrimage town need to address the frequent conversions which creates disharmony in the existing environment. Taking into consideration the Smart Urban Development process, these small pilgrimage towns are less talked about. The need for pilgrimage infrastructure results in urban growth, which, in absence of appropriate planning regulations, threatens cultural and environmental sustainability of the pilgrimage town (Shinde, 2012).

A recent Government of India scheme – PRASHAD (National Mission on Pilgrimage Rejuvenation and Spiritual, Heritage Augmentation Drive) states that, 'Rejuvenate pilgrimage and spiritual experience of the tourists through availability of well-planned tourism infrastructure enabling tourist convenience, accessibility, security, cleanliness, experience and revitalize / preserve the soul of the pilgrimage / heritage city through integrated, inclusive and sustainable developments that would spur employment opportunities for the local communities' (Ministry of Tourism). Most of the Indian cities are shortlisted for the scheme involving an element of sacrality and attract pilgrims at varying scales. There are some more such towns and cities which are enriched with similar indigenous heritage characters. They have emerged into remarkable urban settings in a certain way which gives the sense of Indian Urbanism through its characteristics.

This research explores the relevance of identifying the place-specific cultural characteristics and intends to manifest it as a tool for designing strategies for the revitalization of Indian urbanism enhancing the inherent cultural attributes for sustainable development of small pilgrimage towns in India. The synergies between the cultural characteristics - values, aspirations, activities, processes and patterns of a place, and urban planning and designing are examined with a case study of one Hindu pilgrimage town – Paithan. The case study will express the religious significance, sacredness of the place, riverine geography, riverine pilgrimage, associated rituals, cultural vitality, dynamic demographic patterns (during special events). Along with the literature, there is a need for the additional empirical data for the affirmation and must have methodological synergies with investigating such small Hindu Pilgrimage towns like Paithan.

The research is organized into 4 sections, where Section 1 provides a thematic inter-linkage between culture, community, and sustainable development. Section 2 will identify the role of culture in the case study with future indications. Section 3 discusses the Indian Urbanism characteristics of the Hindu Pilgrimage town to contextualize the case study in a place specific milieu. It will provide a theoretical narrative of urban setting through the explanation of different culture led attributes. Section 4 includes discussions and conclusions along with the recommendation for the future development.

3. Thematic inter-linkages between culture, community, and sustainable development

Development divorced from its human or cultural context is growth without a soul. – (Our Creative diversity, UNESCO 1995).

To understand the interlinkage between culture-community-sustainable development a broad conceptualization is required. Culture is perceived as a 'way of life' and a way of living together (UNU-IAS and IICRC, 2002). It includes a diverse set of activities responding to the place, values, and aspirations of the communities. Basically, it is a process and medium through which the activities are performed. Culture can be perceived through the tangible and intangible factors as well. The cultural diversity, its uniqueness and sensitivity towards other cultures manifests its significance in every aspect of living.
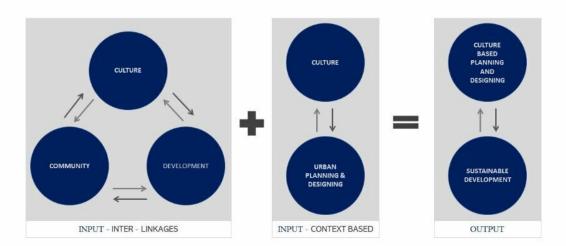
Figure 1: Thematic inter-linkages between culture, community, and sustainable development
Source- Authors

The three recognized pillars of sustainable development include economic development, social justice, and ecological responsibility; though their weightages vary and are largely determined by the local context and philosophy driving development (Varma Anurag, Shaleen Singhal, 2016). On the

similar line, culture is interlinked with the community, its values, and aspirations along with sustainable development. When the culture – community – development is combined with the urban planning and designing it could be expected to result in a more comprehensive sustainable development.

4. Study of Paithan: through a lens of culture - community – development

Paithan is one such small pilgrimage town in Maharashtra state of India which shows significant characteristics of Indian Urbanism. The existing urban setting of this town has been influenced because of the various historic events. The sacred town of Paithan is graced with rich and diverse natural, historic, and cultural heritage. The social, cultural, and communal diversity of Paithan led to the formation of different architectural styles and the development of art and culture over the past glorious eras. During the Metamorphosis of this town, it has experienced the downfall, industrial development, migration, changing environmental circumstances, hypocritical social conventions, rigid class stratifications, and urban development. The inheritance of the culture can be experienced in this 'Land of Saints' with the writings of Sant Dnyaneshwar and Sant Eknath which exhibits 'Wisdom and Power'. In the process of urbanization, predominant in the adjacent urban centers Paithan too is experiencing rapid transformations. In absence of an appropriate and envisioned inclusive approach there will always be a threat of losing this rich cultural heritage. This will affect the overall growth of the town and the identity of the town will be endangered.

4.1. Paithan: Dakshin-Kashi of India

Paithan is a small pilgrimage town situated on the banks of River 'Godavari' and it is Located 56 kilometers (35 mi) south of present-day Aurangabad, Maharashtra, India. It is a town with municipal council in Aurangabad district.
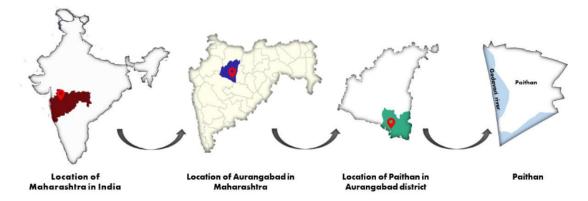
Figure 2: Location maps of Paithan
Source- Authors

Paithan has been one of the largest religious and political centers along Godavari since ages. The religious importance of Paithan finds mention in many mythological narratives. Referred to as 'Brahma-Nagari' hundreds of temples were developed in this river bank town. In addition to this, Paithan has experienced many historical ups and downs during its long stay. Therefore, the regimes that took place in this area had a close relationship with this town. Due to the geographical prosperity of the area, the city of 'Mahajanapada' was the center of the capital. In the later Satavahana era, the city has been the center of the capital for four centuries. After the Satavahana, the area was ruled by the Vakatakas which became the place of the district. Later, during the Chalukya (Badami) rule, the city was honored with the importance of becoming the political center of the Northern Empire of the Chalukyas. Paithan was a town center during the Rashtrakuta period while during the Yadav period the importance of this area was increased, and it was given the honour of 'Dakshin-Kashi'. It was a

major trading destination in the medieval period after Yadava. In the later Maratha period, the special Northern Peshwa was re-released of its importance and 'Paithani' here gained importance in the Indian market.

Ancient town through the eras
Source - Morphological study of Paithan: Some aspects .– Ar. Jayashree Gogte

Location of old town of Paithan
Source - Author
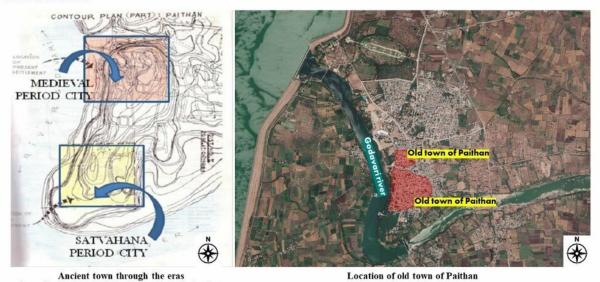
Figure 3: Paithan through ages
Source- Authors

4.2. Paithan: Historical background

Paithan remained the center of the capital for four centuries and was very closely associated with the political, socio-economic, and religious movement in the area. The Acharyas of Hinduism, Buddhism and Jainism were constantly visiting Paithan to get royal patronage, so Paithan became the main center of the religious movement in a short span of time. Paithan was the main center of the Nath, Mahanubhav, Warkari sects during the medieval period. It Includes Sant Dnyaneshwar, Sant Bhanudas, Sant Eknath, Sant Shivdinanath Kesari, Krushna - Dayavarna, etc. Paithan along with the trading center of Paithani and other clothing was an education center too. Many scholars from different regions of India were found to have settled in Paithan. It includes Rameshwar-Bhatta, Gaga-Bhatta, Kamalakar-Bhatta, etc. Apart from the useful area, Paithan's contribution to literary, art, and architecture is also huge.

In the Indian Culture rivers are considered as mother because around these riverbanks the Indian decency was developed. Likewise in southern India, Pratishthan (today's Paithan) was developed around the River Godavari. 'Pratishthan' was an archaic center of southern India where the 'Goda-valley civilization' was dawned. With the assistance of Godavari, this center has gained sanctity from the beginning. Godavari completely covers Paithan which gives it double protection and it also connects to its other five sub rivers which attracted different civilizations into Paithan. After the development of their settlement Paithan was converted into an economic center which then became a Capital town. Therefore, the center was equally precious to the ancient Indian preachers of Hindu, Buddhists, and Jains. According to Hindu tradition, there are two types of pilgrimages – 'Jaltirtha' and 'Sthal Tirtha', whereas Paithan is a 'Jaltirtha'. It is further classified into 'Moksha Tirtha'. From Hindu literature, Northern India has 'Uttar-Kashi' likewise Southern India has Paithan which was considered as 'Dakshin – Kashi'. The common Hindu wanted to bathe in this pilgrimage at least once in his life because at that time, it was believed that the one who dies in this pilgrimage attains salvation immediately.

4.3. Paithan: Changing urban scenario through ages

Paithan's spatial growth was predominantly influenced by the availability of natural resources, religious patterns, different rulers, art forms, natural or man-made hazards, cultural influence, architectural styles, industrial development. During the Metamorphosis of this town, it has experienced the downfall, industrial development, migration, changing environmental circumstances, hypocritical social conventions, rigid class stratifications, and urban development. The morphological study of this town shows that the town has evolved based on the requirements of handloom weaving over the years. It had evolved in response to the prevailing economic (weaving industry- flow of raw material, process involved) social (communities involved in the skilled processes) and political (rulers and their aspirations) conditions (Swapna Dhavale, 2017). Traditionally, many families over there have taken up weaving as their source of income and livelihood. The working space is in their house itself where they accommodate the handlooms, machinery, and processes. The old town has been divided into different 'Puras' or suburbs belonging to people of different communities. There are different 'Alis' named after professions of their people (Swapna Dhavale, 2017). The settlement is typically based on occupation.

Paithani Center	Weaver's loom	Paithani weaving at a loom
Source – Survey report of town Paithan, 1988	Source – Swapna Dhavale	Source – Book: Pratishthan to Paithan by Dr. R. S. Morvanchikar

Figure 4: Paithani weaving at various locations in Paithan

Source- Authors

Paithan has witnessed various cultural changes over the years. This cultural diversity led to the formation of different architectural styles like medieval architectural style, and it is then converted into secular architecture post-independence. There are certain architectural characteristics that can be seen even today. The Wada's of Paithan, the Paithan style doors, the Gujarati, Mughal, and Southern style of 'Stambha' (Columns), stylish arches, different styles of chandelier, Mosques and Muslim style Haveli's, temples, Math (a special type of Wada), etc. The architecture of the old temples and mosques, Wada's, Haveli's retrospect the architectural elegance, skills, and craftsmanship.

Streets of old town	Compact streets	Old Wada's of Paithan	Wada	Tirthastambha
Source – Swapna Dhavale	Source – Swapna Dhavale	Source – https://www.dreamstime.com/photos-images/paithan.html	Source – Swapna Dhavale	Source – Swapna Dhavale

Figure 5: Urban scenario of Paithan

Source- Authors

4.4. Paithan: Pilgrim town

The temporal activities in this town are supported by the past memories, community traditions, beliefs and values which impacts the urban form. The faith of the communities or pilgrims makes them visit a specific religious structure for a specific period. During the festivals and events like Eknathshashti, Gangapujan, Sinhastha, Godaparikrama many pilgrims visit the significant activity nodes (Palkhi Otta) and landmarks which follows a spatial pattern. During the Eknath Shashti, the palanquins circumambulate from the Palkhi Otta to the Eknath Mandir. The path which it follows is surrounded by other land use which provides a network for livelihood options to the residents who develop trade and services. A mixed land use pattern emerges with a rich mosaic of activities that impart vibrancy to the place, and simultaneously congests meagre spatial capacity available (Varma Anurag, Shaleen Singhal, 2016). These rituals and traditions-based activities and the influence of spatial patterns are the significant consideration for interventions in the urban development process.

Since Paithan is a religious site, many festivals are continuously celebrated there. Nagpanchami – 'Naga' is worshipped at Naag ghat; Shiralshashti – celebrated on the urban squares; Gangapujan and Deepdan – celebrated on the Godavari's riverbank; Champashashti - on this day, a fair is held at Paithan; Sinhastha - during this period, a fair is held at Paithan, Urus – Muslim community fair. Due to the increase in temple devotion, small and big fairs of different deities are constantly being filled in Paithan. Due to the celebration of various such festivals, the local population, and large visitations of pilgrims from the surrounding areas contribute to the livelihood of the local communities. Urban planning in accordance with the existing patterns of the community and the pilgrim's activities reduces conflicts, and enables not only an enhanced quality of life for the residents but improves the pilgrim experience as well (Varma Anurag, Shaleen Singhal, 2016).

Rituals on the Ghats of Godavari
Source – https://www.indiatoday.in/india/story/coronavirus-annual-paithan-pilgrimage-aurangabad-suspended-1654477-2020-03-11

Celebration of Eknath Shashti
Source – https://www.lokmat.com/aurangabad/story-nath-shasht-paithan/

Palkhi ceremony
Source – https://www.youtube.com/watch?v=q5NAv0JiAzU

Figure 6: Rituals and events at Paithan
Source- Authors

Paithan has a population of three lakhs forty-eight thousand in the 2011 census, and annually five lakhs' pilgrims visit Paithan which creates a pilgrimage based cultural economy. Due to the following beliefs, culture, and traditions about this 'Moksha Tirtha' several allied activities generate local economy out of it. Along with this cultural economy, people visit the old 'Nathsagar Dam' and 'Dnayeshwar Udyan' which creates a tourism economy. The documentation of these allied activities and generation of cultural and tourism economy is an important component of urban planning and designing to lead towards sustainability.

5. Characteristics of Indian Urbanism in the Hindu Pilgrimage Towns

Indian urban conditions are characterized by abundant diversity that results from a combination of multiple planning processes and spatial overlapping - vernacular, indigenous urbanism, formal planned and extra-legal 'pirate modernity' (Sundaram, 2010). These planning processes express various themes like planned and unplanned development, formal and informal development, static and kinetic development. Un-planned activities are a formidable presence in Indian urban conditions and are normally ignored or not included in the formal planning process (Roy, 2009). While dealing with urban development, the problems which occur due to additional or artificial efforts in urban planning

and designing are considered ignoring the inert character of that place. Therefore, it is required to closely evaluate the nature of Indian urbanism which is characterized by heterogeneity, plurality, and multiple cultural synergies.

Hindu pilgrimage towns in India indicate these qualities through the traditional core of the place, vibrant culture, high visitations of pilgrims on the specific events and inadequate hygiene and infrastructure. There are several pilgrimage related activities like rituals and practices, accommodation, food, and transportation functions over there informally and in an unplanned way. These activities can be used as an opportunity and catalyst which will help into the revitalization of the Indian Urbanism characteristics and a place itself. A relevant approach for studying such towns is by exploring it culturally with the people-time-place framework. It will help in inquiring anthropological, historical and the geographical narrative of the city.

Pilgrimage has had a long tradition and continuity as a large civil society movement for religious/ spiritual experiences in the Hindu tradition of India (Singh, 2013). Due to the improvement of connectivity, pilgrim visitations to the pilgrimage towns have increased over the period. This massive increase in the floating population affects the pilgrimage site and therefore the pilgrimage site lacks the infrastructure facilities for the tourists. These resulting transformations are affecting physical, social, cultural, and environmental quality which creates a bad impact on the pilgrims. It ultimately fails to offer significant experience and loses the identity of the place for the residents and visitors.

Ghats of Godavari
Source – https://www.youtube.com/watch?v=6unq5Z2zpI4

Kirtan – a performing art
Source – https://readingsexy.com/paithan-35-crore-bridge-to-be-built-on-godavari-river-for-naths-palanquin-proposal-submitted-to-public-works-department-new-bridge-and-road-to-be-built-on-godavari-river-in-paithan-for-nath-palk/

Culture based event
Source – https://www.youtube.com/watch?v=5RqTTz8EJoY

Figure 7: Characteristics of Indian Urbanism
Source- Authors

6. Conclusion

The study examines the potential of cultural characteristics of Indian pilgrimage sites in urban planning which aims to achieve sustainability. The study analyses the interlinkage between culture, community, and sustainable development. The empirical study will help in evaluating the contribution of culture to urban planning and designing.

The case study of Paithan identifies various diverse attributes which manifest the significance of cultural dimension in spatial planning. The identified attributes are the significance of natural resources; historic evolution and its influence on urban morphology and spatial growth; architectural development, community values, beliefs, needs, and aspirations; tangible and intangible heritage; urban governance; economy. Considering the natural, historic and cultural potential, there is a need for the emergence of urban planners and designers with different ideas to address divergent issues in Paithan. These issues include cleaning and revitalization of Godavari River; riverfront development; improvement of existing Ghat condition; conservation and restoration of built heritage; facilitating and promoting pilgrim based cultural activities; creation and promotion of local arts and crafts, protection of tourism-based activities. The initiative taken for addressing such issues could be utilized as a framework for urban planning and designing to achieve needs and aspirations of the communities.

The morphology and the spatial patterns evolved in Paithan are influenced due to the cultural and traditional diversity of the communities. This diversity is a significant characteristic of Pilgrimage

town which influences urban contexts. The development of spatial pattern and morphology is one of the main constituents of urban planning and designing. The architectural development of Paithan has seen cultural impact on the structures over the years. Even today, the small detailing expresses the glory of the past eras. The development of the new urban projects is helping in the development of the local and tourism economy where the community values and beliefs become the important domain for the sustainable urban development. Accordingly, the inclusion of culture as a significant attribute in urban planning and designing anticipates the requirement of a flexible framework.

At Paithan, while development is happening at various levels, the need is to bring about a comprehensive approach to this ongoing development process which shall have the culture and community at its core. The richness of culture and tradition has to be circumvented from the urban development process. The needs and aspirations of the people are threatened in absence of a coherent vision. The cultural dimension while developing a particular place impacts the sustainable future of that place. It is to be noted that, while urbanization is beneficial, it is necessary to understand the significance of inherent cultural attributes in the urban planning and designing process for the sustainability of the pilgrimage towns. These small pilgrimage towns like Paithan have a powerful regional connection and thus prove to be an important loop for the urban-rural linkage for a sustainable development.

Three conceptual possibilities of engaging culture with the existing sustainable development framework are conceptualized (Soini, 2013) as below:

Self-Standing: Culture as the fourth pillar of sustainability

Transversal: Culture as a catalyst in sustainable development

Fundamental: Culture as a new paradigm of sustainability

Considering the above conceptualization, culture of Paithan is a self-standing attribute due to its religious significance, sacredness of the place, riverine geography, pilgrimage and associated rituals, cultural viability, altering demographic patterns. It is observed that, the culture and community are the interlinking factors where culture and development are also connected. Accordingly, it makes culture the central key theme for sustainable urban development. The conceptual thematic interlinkages between culture-community-development reiterate that, the culture is the catalyst for the sustainable urban development. It establishes the culture as a significant transversal attribute of sustainable urban development of Pilgrimage towns in India through the case of Paithan.

Acknowledgement

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Role Of Context In Development Of Rural Housing In Junnar,

Pune District, Maharashtra.

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Abstract: Junnar is a taluka in Pune district, Maharashtra and it was declared as first tourism taluka in Pune by Maharashtra government in 2018. The research focus on aspects of rural housing, growth pattern of their settlement, issues like planning, orientation, form, surface, architectural typology of structure .This research to find out the role of context in development of rural housing at Junnar covers the introduction of traditional rural houses, architectural features, context, street grid pattern, study of climate responsive materials, their properties and co-ordination with respect to local climate etc. The study deals with the social, political, economic and climatical background by live case-studies and book case-studies, etc. Methodology would be conducted by survey, live case-studies, discussion with residents, settlement evolution study and then identifying their problems, define their solutions like construction techniques. This study is limited to Junnar town and it include only the study of old houses and Wada. Modern architecture noticed here has control the new developments are inappropriate because it may be introduced without consideration for local climate and cultural need of the people. Most of the old structures get renovated by new techniques so this will be beneficent to maintain these structures with their original old techniques. This research will also beneficiate to the people who work here related to construction.

Keywords: rural housing, context, settlement grid pattern.

1. Introduction-

Junnar has heritage places and historical background, as it has 2000years old prosperous history as Junnar was sub capital of Satvahana dynasty. there is the birthplace of Chhatrapati Shivaji Maharaja, Shivneri fort, and also have other six forts as Jivdhan fort, Shindola fort, Nimgiri fort , Chavand fort, Hadsar fort, Narayangad fort , Lenyadri caves, more than 350 caves of Buddhist , Jain , and Hindu caves with ancient inscriptions . it has religious places as Vigneshwara temple , Shri Girijatmka Ganpati temple etc. Naneghat is an ancient place in Junnar it has 2000 years old importance. Leyadri caves, Darya ghat, so many waterfalls   are there. There are five main dams and 183 villages in Junnar taluka.

1.1 Introduction to the topic-

1. To study the relationship between the settlement pattern & surrounding context at the macro level & the effect of natural & cultural variables on architecture.
2. Motivation of research is cluster planning & traditional housing of Jaisalmer city & try to find out such characteristics of Junnar village.

3. The study deals with the issues like planning, orientation, form, surface, architectural typologies, and building techniques with respect to surrounding context.
4. It deals with the growth pattern of settlement.
5. The research focuses on aspects of traditional structures in Junnar.
6. It deals with the study of different types of houses.
7. The only gap in literature is there are modern houses present in large scale as compared to traditional houses.
8. This research will beneficiate to the people who work here related to construction.
9. It is also help to visitors / tourist to get familiar with this region.

1.2 Introduction to the study area-

1. Study area is the main village Junnar.
2. It is an ancient village and therefore there are so many old structures such as Wada, forts, two floor houses, and ground floor houses, with their original characteristics of Maratha architecture.
3. Settlement pattern of village is also different which is developed according to surrounding factors from ancient time.
4. Architecture of this region is a result of social, cultural, economic, climatic factors.

1.3 Aim-

To find the role of context in development of rural housing in Junnar.

1.4 Objective-

1. To collect the information related to climate analysis & surrounding factors, historical background, cultural factors etc.
2. Comparative study of current houses & old houses.
3. To develop a table format for techniques observed during live case studies.
4. Study of climate responsive materials, their properties & co-ordination with respect to local climate.
5. To study the grid pattern of settlement.
6. Find out merits & demerits of techniques used in Junnar for warm & humid climate.

1.5 Scope-

General purpose of the study is that find out the special features in structures with respect to surrounding context in this town. Why the structures found here are differ with structures in other region / towns. Study include only main village Junnar & no other sub villages. Duration of study is 3 to 4 weeks. Topic & theories – growth pattern of settlement, climate responsive local materials, study of traditional houses & Wada
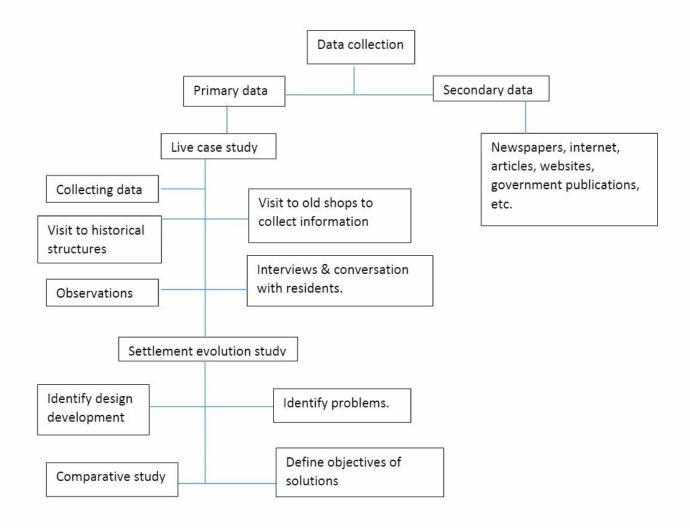
1.6 Limitations-

The study area would be limited to Junnar and all the techniques that have been observed in this village.

1.7 Methodology-

It include the primary and secondary data collection by various methods as follows-

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                        ┌──────────────────┐
                        │ Data collection  │
                        └──────────────────┘
            ┌────────────────┐      ┌──────────────────┐
            │  Primary data  │      │  Secondary data  │
            └────────────────┘      └──────────────────┘
                                     ┌──────────────────────────┐
            ┌────────────────┐       │ Newspapers, internet,    │
            │ Live case study│       │ articles, websites,      │
            └────────────────┘       │ government publications, │
  ┌──────────────┐                   │ etc.                     │
  │Collecting data│                  └──────────────────────────┘
  └──────────────┘     ┌──────────────────────┐
  ┌──────────────┐     │ Visit to old shops to │
  │Visit to       │    │ collect information   │
  │historical     │    └──────────────────────┘
  │structures     │    ┌──────────────────────┐
  └──────────────┘     │ Interviews & conversation│
  ┌──────────────┐     │ with residents.      │
  │ Observations │     └──────────────────────┘
  └──────────────┘
        ┌──────────────────────────┐
        │ Settlement evolution study│
        └──────────────────────────┘
  ┌──────────────┐         ┌──────────────────┐
  │Identify design│        │ Identify problems.│
  │development   │         └──────────────────┘
  └──────────────┘
  ┌──────────────┐         ┌──────────────────┐
  │Comparative   │         │ Define objectives of│
  │study         │         │ solutions        │
  └──────────────┘         └──────────────────┘
```

1.8 Need of the topic-

To well-maintained traditional houses, with their original features. Most of the old structures get renovated by new techniques, so this research will helpful for them to use the original old techniques. This will be beneficent in future & in present for the people who wants to work here related to construction. To conserve and cultivate structures socially, economically, climatically .Modern architecture observed here has dominated the new developments are inappropriate because it may be introduced without consideration for the local climate & cultural need of the people.

1.9 Case studies-

1.9.1 Case studies of -Wada

1.9.1.1   Deshmukh wada-

- **Orientation** – this Wada is north-south orientated, which is ideal orientation in point of view of blocking solar radiation.
- **Open space-**there is no courtyard as open space but outside there is a lot of space around the Wada.
- **Semi--open spaces-** balconies , verandah , porches can be used advantageously for day time activties as well as give protection from rainfall
- **Wall-**all four walls are exposed to sun as there is no other structures connected to it.the walls are built from rectangular stones, bricks. The thickness of wall is 400 mm.
- **Roof-**Mangalore tiles are used for roof and it is a sloped roof, hip roof. A.c. sheets are also used for porch.
- **Shading device-**the projections of balcony & windows on walls are the shading device. Plants & trees around the wada act as shading device.
- **Ventilation & light-** windows of sizes 1.2x 0.9 m are provided they are shaded by external overhangs. Sufficient light comes in and cross ventilation done by this openings.
- **Landform-**almost flat site with small slope from n-s direction.
- **Materials-** stones, wood.

Fig 3: front view of wada

Fig 4: from living room

1.9.1.2 Joglekar wada -

- **Orientation-**north south to east west oriented.
- **Built form-** the plan of wada is rectangular in shape, giving 2 walls exposed. Plinth is 300 mm.
- **Zoning-** entry is through otta which is not covered by any projections. There is central court around it all rooms are situated. There is a staircase near to entrance to first floor.
- **Open space-**there is a open to sky courtyard at center. At front & at back there is a verandah, which is used for sit outs.
- **Walls-** for foundation dress stone masonry from plinth 300 mm rubble (undressed) masonry stones are used & then brick work is done at first floor front facades having wooden facades with windows. This wooden windows at the central part of first floor, remaining walls are brick worked.
- **Roof-**sloped roof with Mangalore tiles. Projected to work as chajja for windows & walls to protect from heavy rain & sunrays.
- **Shading device-**roof projections.
- **Ventilation / light-**sufficient light & air is provided inside as open courtyard is present at ground floor. There are two windows of door size present. At f. Floor there are also many windows to the front facades so cross ventilation work done perfectly.
- **Landform** – flat land.
- **Materials-**cement , stones (dressed , undressed) , bricks , wood (door , windows , frames , beams , columns , rafters. Etc.

Fig 5: Front view of wada

Fig 6: right view of front facade

1.9.1.3 Jogalekar wada-

- **Orientation-** the structure is oriented towards north-south.
- **Built form-** built form of structure is rectangular in shape. Plint is 600 mm.
- **Zoning-**entrance is through south face through semi covered space as otta from the road.
- **Open space-**no courtyard, only at front & at back, open space is available. Other two side walls are common between adjacent structures as row house.
- **Semi-open space-**front porch is used as sit outs, there is no Balconies on front side it create a barrier between house and sunrays from south.
- **Walls-**wall thickness is 400 mm. From foundation to plinth level stones are used & form plinth bricks are used for construction.
- **Roof-**Mangalore tiles used for roof. Sloped roof.
- **Shading device-** front façade, first floor is projected so, otta , entry doors, windows get shade & protection from sunrays. For first floor roof is projected (800-1000) mm to work as shading for windows.
- **Ventilation / light-**ventilation & light is only entered from front & back door, windows, no courtyard. At first floor front facades is constructed by large windows, sufficient light & air comes inside & from back windows, door cross ventilation occurs.
- **Landform** –little sloped land.
- **Materials-**stone, bricks, wood. Wood is used for door, windows, columns, beam, and some decorative parts. At first floor, front façade is totally constructed by wooden windows.

Fig 8: front view of wada

Fig 9: backyard view

Fig 10: view of otta

Fig 11: view of front façade

1.9.2 Case studies of - old houses

1.9.2.1 Surekha Niwas-

- **Orientation-**north south oriented.
- **Built form-** the plan of house is rectangular in Shape, giving 3 walls exposed. Plinth is 450 mm.

Fig 11: front view of house

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- **Zoning-** entry is from west with small otta .there is a staircase between living hall & kitchen to first floor. There is a utility area after kitchen & then backyard.
- **Open space-**there is a big open space at front side & at back of the structure. For parking.
- **Walls-** for foundation dress stone masonry up to plinth 450 mm are used & then brick work is done at first floor front facades having wooden facades with windows. This wooden windows at the central part of first floor, remaining walls

Fig 12: view of wall

- **Roof-**sloped roof with Mangalore tiles. Projected to work as chajja for windows & walls to protect from heavy rain & sunrays.
- **Shading device-**roof projections.
- **Ventilation / light-**sufficient light & air is provided inside as small windows at ground floor. There are many windows to the front facades and back wall so cross ventilation work done perfectly.
- **Landform –** flat land.
- **Materials-**cement, stone, wood, bricks. Stone used in large quantity.

Fig 13: stone steps.

Fig 14: wooden ceiling.
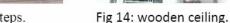
1.9.2.2 Shinde Niwas-

- **Orientation-**east- west oriented.
- **Built form-** the plan of house is rectangular in shape, giving 4 walls exposed. Plinth is 150 mm.
- **Zoning-** entry is through a wooden door which is covered by 600 mm roof projections .it is a small structure of single room having small windows at front & back walls.
- **Open space-**there is an open space at front & at back there is a verandah, which is used for sit outs.

- **Walls-** for foundation dress stone masonry is used.
- **Roof-**sloped roof with Mangalore tiles. Projected to work as chajja for windows & walls to protect from heavy rain & sunrays.
- **Shading device-**roof projections & small chajja.
- **Ventilation** / light-sufficient light & air is provided inside from door & windows.
- **Landform –** flat land.
- **Materials-**cement , stones (dressed) , bricks , wood (door , windows , frames , beams , columns , rafters.

Fig 15: view of house

1.10   Observations , findings , inferences –
1.9.1 Wada

Fig 16: back side view of structure   Fig 17: Windows & roof purlins rafters

Sr.no	1.8.1.1	1.8.1.2	1.8.1.3
Wada	Deshmukh wada	Jogalekar wada	Joglekar wada
Orientation	N-s oriented	N-s oriented	N-s oriented
Built form	Rectangular	Rectangular	Rectangular
Wall	400mm. all sides exposed to sun. stone used	400 mm. from foundation to plinth –stones used. & From plinth bricks used for construction	300 mm. For foundation dress stone masonry, from plinth rubble masonary stone used. Then brick work done.
Roof	Mangalore tiles, A.c sheets. Sloped roof	Sloped roof, Mangalore tiles.	Sloped roof with Mangalore tiles ,
Materials	Dress stone masonary, wood , bricks	Stone, bricks, wood. At F.F. Façade is totally constructed in wood.	Cement, stone (dressed, undressed) , bricks , wood , etc.
Open space	No courtyard , open space is around the structure	Open space is available at front & at back, no courtyard.	Central open to sky courtyard. At front & at back there is a verandah
Ventilation & light	Sufficient light comes from doors balconies , big windows , otta , cross ventilation done	At f.F. Sufficient light comes from front facade windows , also cross ventilation occurs	Sufficient light & air comes inside from court , big windows & at f.f there is a front façade which is made up from wooden windows

1.9.2. Old houses-

Sr.no	1.8.2.1	1.8.2.2
Old houses	Surekha Niwas	Shinde Niwas
Orientation	N-s oriented	E-w oriented
Built form	Rectangular. G+1 structure , flat land	Rectangular. Ground floor structure. Plinth level is 150 mm , it is a small structure
Wall	600mm. Foundation- dress stone masonary , then brick work At f.f. brick work is done , having wooden facades windows for light & ventilation plinth level 450 mm	450 mm thick stone walls. Dress stone masonary is used.
Roof	Sloped roof , Mangalore tiles	Sloped roof , Mangalore tiles used

Materials	Cement , stone , wood , bricks , stone used in large scale	Stone, bricks, wood, etc.
Open space	No courtyard ,big open space at front & at back of structure	Open space at front & back side
Ventilation & light	Sufficient light & air come inside at ground floor through small windows. At f.f. windows At front facades and big windows at back wall form cross ventilation.	Sufficient light & air comes inside from small windows & doors.

1.11 Inference and findings -

- From case studies and matrix it is observed that most of the structures are north -South oriented, with rectangular plans.
- Having sloped roof due to heavy rainfall with Mangalore tiles.
- Stones are used for constructions, front facades made with big wooden windows for light and ventilation.

2   Understanding the context-

Fig 18: map of India highlighting Maharashtra
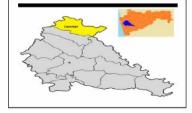
Fig 19: map of Maharashtra highlighting Junnar.

Fig 18: map of Junnar

- Villages- 183
- Population –36,567 (2011)
- Language- Marathi

2.1 historical background-

Junnar is an ancient village and therefore there are so many old structures such as Wada, forts, two floor houses, and ground floor houses, with their original characteristics of Maratha architecture. Junnar has heritage places and historical background, as it has 2000years old prosperous history as Junnar was sub capital of Satvahana dynasty. There is the birthplace of Chhatrapati Shivaji Maharaja, Shivneri fort, and other six forts. So many ancient temples, caves, wada etc.

2.2 geography-

Junnar is located in the northern part of pune district. Latitude is 19^0 .00' to 19^0 .24' north and longitude is 73^0 .40' to 74^0 .18' east. Geographical area of Junnar s 1579.84 sq. in Junnar there are 183 villages and one urban area. Western part has irregular geography. Harishchandragarh is located at north-western corner, a highest point (1422 m) and lowest point (600m) is located at south-east corner. Kukadi and Meena are the main rivers in this zone. There are five dams as irrigation projects like pimpalgavjoga dam, Manikdoh, Yedgaon, Vadaj reservior, they provide irrigation facility to the Junnar.

2.3 Climate-

Junnar come in the zone of hilly isohytal slope. It has rainfall in between 50 to 250 cm. climate of Junnar is warm and humid. Over course of the year, temperature typically varies from 53^0F to 96^0 F and is rarely blow 47^0 F or above 100^0 F. wet season is warm, harsh, windy, and cloudy and the dry season is hot and mostly clear.

2.9 Social, Economic, Cultural Factors-

Junnar is one of the tourist attraction in Maharashtra, as it has historical significance, there are so many waterfalls observed in rainy season. Daryghat, Naneghat are tourist spot of them, there are ancient temples like Kukadeshwar and holy places as Ozer, Lenyadry, kaprdikeshwar temple at Otur, bull Samadhi at Ale. Number of cave groups as Amba-Ambika cave, Bhutleni, Shivneri caves, Lenyadry caves, manmodi caves, and Tulja caves are neighborhood to this area, hence tourism is one of the source of economy in Junnar. Sugar factory, Shri Vighnahar Sahakari Sakhar Karkhana, is located here and therefore it promote to sugarcane farming. Agriculture is the main occupation of the residents.

Junnar is also known for its cultural activities like narayangaon is famous for Tamasha fad, Tamasha is a traditional folk dance of Maharashtra.

3   Introduction to warm and humid climate-

Characteristics of this climate are high humidity, strong sun, glare from the sky and horizon, there is the long monsoon period with heavy rainfall. Solar radiations in such a area, Due to vapors in air and cloud cover defused radiations reach to earth surface and intense radiation on clear day.

4.   Settlement pattern of Junnar –

Similar to other villages Junnar also start develop around the river ''Kukadi', from ancient time. There are two rivers Kukadi and Meena around this research area. Two National highway pass are passing through it NH-50 (Pune – Nasik) running north-south n eastern part of Junnar.NH-222 (Ahmednagar- Kalyan) runs east –west in Northern part of Junnar. Due to huge forest and rough topography west part of it shows low density of roads.
Mostly houses observed rectangular in plan and sloping roof with covering of Mangalore tiles as suitable to climate. Structures are situated on both sides of roads, secondary roads. With width of houses parallel to road length. Due to radiation of sunrays mostly structures having one common wall, hence in summer shadows of adjoining structures are helpful in cooling of roads, otta, and courtyards. Most of the structures are north-south oriented very few structures

oriented according to area available for construction. Green plants seen at least two sides of structures in front and backyards.

Kukadi river flows in North side of research area, where agricultural land is present and barren land present on south-west side of Junnar village.

Settlement pattern of research area is a combination of linear pattern and cross shape pattern as houses present.

Highway

KUKADI RIVER
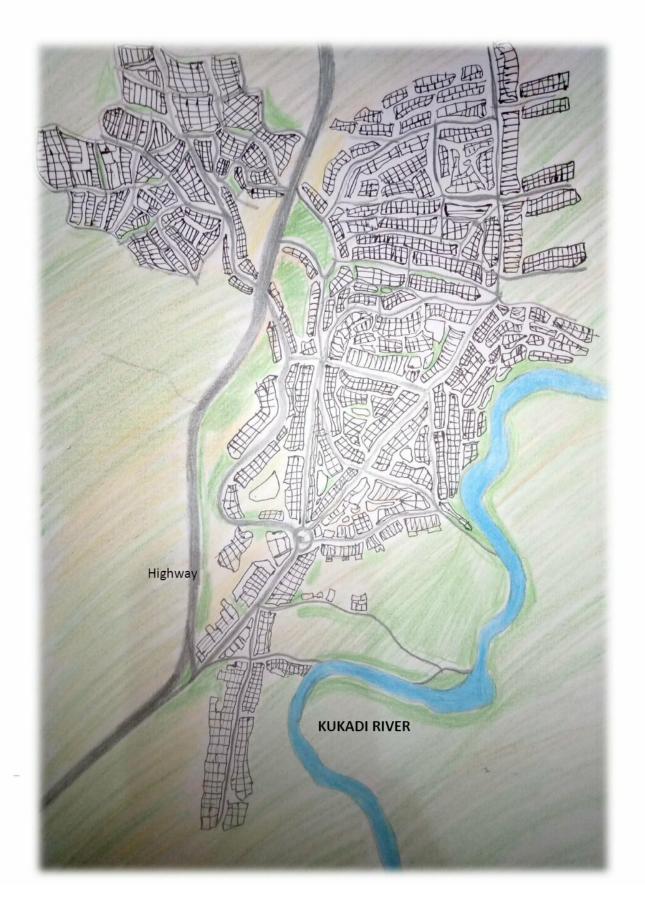
Fig 21: settlement pattern map research area Junnar)

5. Introduction to building problems in warm & humid climate-

The problems faced by some inhabitants find out during live case studies are mostly old structures walls are plaster with mud, and its need to be regularly redecorate with same materials. Due to mud used if there is no proper waterproofing done, water come inside by capillary action. In this area winds with dust particles flows in winter , structures having Mangalore tiles with sloping roof most of time this dust enter through the open spaces like courtyard and from below the Mangalore tiles where small gaps present between battens and tiles.

6. Techniques for controlling temperature, sunlight, heavy rainfall in Junnar-

	Techniques	**Conceptual Sketches**
Temperature control	• Temperature is controlled by various methods by using various materials for wall roof, openings , etc.	
Orientation and street width	• N-S orientation is ideal for blocking solar radiation. • In summer to avoid solar heat during late morning and early afternoon road width should be appropriate.	
Built form	• Mostly square and rectangular plans are best, the structure should be long and narrow to allow cross ventilation.	
Building covers	• Due to heavy rainfall sloping roof is best to remove water from roof surface. • Mangalore tiles are the traditional element as it help to resist heat and also keep structure cool during summer. Vents at roof used to induce ventilation and remove out rising hot air. • Broken tiles can be used for roof to reflect harsh rays from sun.	
Walls	• The walls should designed to promote air flow so as to counter the prevalent humidity. • Baffle walls, both inside and outside can help to divert the flow of wind inside.	

	• They should be protected from the heavy rainfall prevalent in such areas. • Careful water proofing and drainage of water is necessary in design due to heavy rain.	
Shading devices	• Shading devices are very essential in such areas, due to heavy rainfall and harsh sunlight's. • Chajja and roof projections and plants near to wall.	
Open space (courtyard, otta)	• • Courtyards play important role in rising hot air away. • If possible structure should be spread out over the site to create open space between to promote free air movement.	
Surrounding landscape	• • Various types of plants used which are capable to protect structure from heavy rainfall, sun glare, and heat. • Though temperature is not very high free plants are applicable for shading. • Water-bodies are not essential because they increase humidity.	
Openings (window, door)	o • Openings like door, windows, vents should be covered by overhangs like chajja. • Outlets at higher level serve to draw out hot air.	
Ventilation	• Cross ventilation plays important role in warm and humid climate. • All door, windows should kept open for maximum ventilation. • Various sizes of openings are used like inlets are small as compared to outlets.	

6.1 To resist heat gain-

Mostly used materials which reflect the heat, concrete and bricks in which bricks are observed in old constructions. The materials which take long time to heat up are good for such a climate. Shading of building is necessary.

6.2 To promote heat loss-

Devices used to promote heat loss like windows, courtyards, are well ventilated and try to reduce humidity level as possible. Sufficient ventilation required throughout the day.

7. Conclusion-

1. During case studies and after study find out the solutions of modern problems faced by inhabitants because most of the structures were 80 to 100 years old.
2. Finding out the renovation techniques which are suitable for them.
3. In order to build suitable structure in present and in future according to surrounding factors.

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KATHI-KUNI CONSTRUCTION TECHNIQUE AND CLT (CROSS LAMINATED TIMBER) CONSTRUCTION TECHNIQUE FOR RURAL SETTLEMENT – IN CASE OF SHIMLA HIMACHAL PRADESH

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Abstract: Comparative analysis of Kathi-kuni construction technique and CLT (Cross Laminated Timber) construction technique for a residential unit. This research is aiming to do the comparative analysis of 2 construction technique which is Kathi-kuni and CLT which is best suited in Himachal Pradesh. Objectives of study are to calculate the cost, structural framework and availability of material, then classify data and analyze it, to identify today's need of users on various aspects. The general purpose of the study is to compare the 2-construction techniques. This research needs to study the Residential unit. This research needs a duration of 1-2 months. The study is going to cover the aspects like cost, safety, environmental aspects, earthquake resistant, horizontal spread and its vertical spread. The Geographical location covered in the study is Himachal Pradesh. Methodology would be conducted through literature review and book case study. This research is necessary to get best possible outcome as the regional people will be hugely benefitted due to affordance of cost and can reduce and lock carbon emission. This research is not going to cover any type of building except residential buildings. The research will throw light on the Kathi kuni and CLT Construction technique its impact of wood and its awareness. This research will show how CLT will change the people's life. From this research it is found that Reason for building (Kathi-Kuni) is getting older and the advancement of material led to occupants to consume more energy to create a comfortable zone for themselves.

Keywords: CLT, Kathi-kuni, Himachal Pradesh, Construction technique

1. Introduction :

1. Problem statement: Studying Kathi kuni and CLT construction technique for comparative analysis to identify and understand today's need of users on various aspects like cost, occupants comfort and availability.
2. Motivation of research: This research focuses on things which can harm less to environment so then came across a processed wood (CLT) video which caught my attention due to its enormous benefits
   Then thought about comparing it with regional techniques
3. Brief summary: Kathi kuni is the native construction technique of Himachal Pradesh and CLT is been used in Australia and western countries and is immensely liked over those area due to its cost reduction and can be used in sky scrapers.
4. Description of gap in literature:
   The research did not include approximate cost of CLT construction technique as well as kathi-kuni

5. How important is it for the industry practice /knowledge advancement: Industry practice or knowledge advancement will increase employment of skilled labor?

6.

Map showing selected region

2. Aim:

The comparative analysis of 2 construction technique which is Kathi-kuni and CLT which is best suited in Himachal Pradesh.

3. Objectives:

1. To study the Cost, structural framework and availability of material.
2. Then classify data and analyse it.
3. To identify today's need of users on various aspects.

4. Scope:

The general purpose of the study is to compare the 2-construction techniques. This research needs to study the Residential unit. This research needs a duration of 1-2 months. The study is going to cover the cost, economical, less hazardous, earthquake resistant, horizontal spread and its vertical spread. The Geographical location covered in the study is Himachal Pradesh.

5. Limitation:

This research is not going to cover any type of building except residential buildings.

6.Methodology:

Literature review by reading various research papers

Data collection by selecting appropriate data for the research

Data analysis for proper selection

↓

Conclusion on the basis of data analysis

7.Need of the Topic:

This research is necessary because to get best possible outcome as the regional people will be hugely benefitted due to affordance of cost and can reduce and lock carbon emission.

PARAMETER	KATHI KUNI	CLT	INFERENCE	CONCLUSION
Meaning	kashth or kath' for wood in Sanskrit and	Cross-Laminated Timber engineered wood product consisting of layers of kiln-	--	--

		'kona' for corner.	dried dimension lumber		
Origin		Himachal Pradesh	Austria and Germany	Due to its climate the need of this techniques emerged	--
Year of origin		**no less than 500-years-old** according to local legend	1990	Kathi kuni has deeper roots than CLT	--
Type of wood used		Deodar/ kali	Spruce	Both are soft wood which grow quicker than hardwood and are cheaper, softer and easier to work	We can use those 2 types of wood
Materials used for construction		Stone (igneous), Wood and Slate (metamorphic).	Solid wood panels clad with other materials such as timber, brick, render or composite panels.	Kathi kuni has natural materials and CLT has processed materials	Materials used in Kathi kuni can cheaper and affordable
Spread of technique		It has been transmitted orally and empirically from one generation to the next, through apprenticeships spanning a number of years	Early engineering research occurred first in Switzerland and then in Austria during 1990's It is now been accepted by many countries.	Kathi kuni is spread orally and CLT is spread by research publication	--
Labor costs		Construction of the houses is done by hands with the help of people from neighboring villages or by the residents themselves and is passed on from generation to generation.	Labor demands for CLT projects are also less. In a tight labor market, this can be significant.	In percentage vise the kathi kuni is 50% Cheaper than CLT	kathi kuni is cheaper than CLT
Interior		It is can be left exposed from interior or can be covered with mud plaster giving these	CLT can be left exposed in building interiors up to 8 stories	No interior finishing is needed in case of kathi kuni and CLT can be left	In both the techniques walls can be left exposed

	structure excellent insulation		exposed up to 8 stories	
Horizontal spread	7m×4m - Rectangular 5m×5m- Square Till now seen	As per requirement any size	There is a limitation in kathi kuni and but in case of CLT the structure is of any size	CLT has no limitation horizontal spread
Vertical spread	Allows the structure to rise up to as high as 7 floors	Allows the structure to rise up to 650 meters	Height is restricted up to 7th floor unlike the CLT which can go up to 20th floor	CLT has no limitation vertical spread
Type of structure	Load bearing	Framed structure	Framed structure is considered more stable than load bearing	In CLT space required is less as stable
Elements of house	Ground level- Work as storage or shed for cattle 1st 2nd & 3rd Floor- House rise up to 3rd floor only Low Height of the rooms (2.1-2.4), keeps interior warmer from heat released by individuals, also low surface to volume ratio reducing heat loss from surfaces	It has structural components like floor, roof, and wall which are prefabricated in factories	The kathi kuni can be fully made of vernacular	
Climate Influence	Small window size and low ceiling height to prevent heat loss and keep the interiors warmer. Terrace in all around the building should have proper slope for efficient	No restriction of sizes of window or ceiling or roof	In case of kathi kuni vernacular technique is adapted to tackle the climate and in CLT the vernacular with respect to modern aspects are considered	In case of CLT window sizes can be kept large as per users need no size restriction

	drainage, in heavy rain fall and snow fall areas. 			
Foundation	The foundation consists of hand packing of stones without any mortar. The foundation depth ranges from 3-4 feet for loose soil. First the owner is given the area where he can construct his own house. The owner brings all the materials needed to construct his house. The owner also hires the carpenter and 2-3 workers for constructing his house. The carpenter sets the area for constructing the houses as a square or a rectangle accordingly, and checks all the dimensions with	It consists of a lightweight construction where the concrete slab is replaced by a 138 mm thick CLT panel with an underlying layer of cellular plastic which gives an average U value of 0.089 [W/m2 .K]. The edges of the foundation structure have been fitted with fiber cement clad cellular plastic boards. In view of its light weight the foundation is anchored by four earth anchors to prevent the foundation from moving under high wind loads. The earth anchors are attached to fittings in the	The foundation of kathi kuni is bigger than the CLT. The material used in foundation of building in kathi kuni is just stones without mortar unlike the CLT where concrete slab, CLT panel are used.	In both of the technique's foundations are appropriate

	measure tape and verifies it by measuring the diagonals set. Then he lays a thread as line out (for the boundary) and starts arranging stones in the trenches. Small stones are fixed in between the large ones for proper bounding.	CLT foundation panels.		
Flooring	Material used for flooring are wooden plank and Nails, Cow dung and mud plaster is done on the ground floor Wooden beam is used as a support for the wooden planks laid and nailed on wooden beam which acts as the floor. There are two wooden beams on the top of opposite walls and on in the middle laid parallel to the walls and on in the middle laid	Pre-fabricated floor is fitted	Mud flooring and wooden flooring is used in kathi kuni and prefabricated flooring can be seen in CLT flooring	Life span of kathi kuni flooring is less than CLT as Kathi Kuni has lesser life span

	parallel to the wall. Then wooden planks are laid on the beam in the other direction (horizontally) and connected with nails. 			
Wall construction	The stone walls are load bearing with a thickness of 480mm. It involves laying of two wooden beams longitudinally parallel to each other with a gap in between. This gap is filled with aggregates. The walls are constructed with an alternate course of dry masonry and wood without any cementing mortar. These wall provide a very good thermal insulation by giving high time lag of more than 8 hours. The wall above the plinth level is strong with an alternate layer	Multiple layers use with CLT for such as **weather protection** (on the outermost wall), **insulation**, **CLT Panel**, and **Internal Lining** (From the inside). This is very important for external walls. CLT is an environmental-friendly building material. Its use does not cause any harm. This material is used to reduce energy consumption.	Walls are very thick in kathi kuni as compare to CLT Walls of kathi kuni are cast in-situ and in case of CLT it is prefabricated	Space required is more in case of kathi kuni for the wall construction and in case of CLT less space is required as Prefabricated planes are used

	of stones and wood. This distributes the mass equally. So the construction of walls without use of cement mortar and dry stone masonry allows the stone to oscillate within the flexible wooden frame work to allow the energy of earthquake to disperse, leading to settlement of energy and the structure staying intact. 			
Roofing	The constructing from foundation to roof does not involve the use of mortar in the courses of stone, the sheer weight of dry masonry and the roof in slate stones holds the structure down in place. Traditionally no metal nails were used in wood courses instead strategically inserted wooden	It is factory made 	No mortar in used in both cases as in kathi kuni interlocking of slate stones is done and in CLT prefabricated panel are used	In case of kathi kuni hand picked tiles are used which are easily available and in case of CLT the need to be brought from factory

	braces and joints held the structure together. Nail-less framework without rivets and not rigid construction allows the building flex with the seismic waves and effectively dissipate the energy of earthquake.		
Details	Images of wall construction at Devi Dhar village, which show the dry masonry construction with in-fill and lap jointed members at the corner. Corner detail; wooden members are notched and lap jointed so that they intersect at the corner and further supported by cantilevered		Different details can be seen in both the techniques	In kathi kuni there is no requirement of skilled labor and in case of CLT skilled labor are required to installations.

	member fixed at one end in the wall.			

8.Conclusions:

Reason for building (Kathi-Kuni) is getting older and the advancement of material led to occupants to consume more energy to create a comfortable zone for themselves.

9. References:

1. https://www.theb1m.com
2. The Himalayan Vernacular: Kath-Khuni Architecture | Sahapedia
3. (PDF) Prathaa: Kath-khuni Architecture of Himachal Pradesh (researchgate.net)
4. Is Cross-Laminated Timber (CLT) the Concrete of the Future? | ArchDaily
5. FULLTEXT01.pdf (diva-portal.org)
6. GreenSpec: Timber and the Environment

VIRTUAL NATIONAL CONFERENCE ON
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FEBRUARY 2022

▪ABOUT US

Pravara Rural College of Architecture, Loni Established in 1996 under Pravara Rural Education Society (1964), Affiliated to Savitribai Phule Pune University and Council Of Architecture, New Delhi.

▪ VISION :

To create an excellent professional graduates for the contemporary architectural industry and socially responsible Architect who will play a key role in shaping the rural and urban sustainable development.

▪ MISSION :

- To develop the students for professional excellence and personal development in the field of architecture.
- To develop professionals in the field of architecture, who can serve as innovators and creators of national and global economic growth.
- To develop the students for leadership roles with skills & knowledge to improve the quality of the built environment on both national and international level through collaborations in the field of architecture.

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4. Ar.Ashwini Gholap - (B. Arch)
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India is A nation with considerable rural area and population. It shows A good variety in rural architecture that is developed by local people based upon their needs and way of living. Study of rural architecture in the form of documentation and analysis will be helpful to understand it for appreciation as well as improvement as and when appropriate. As planning policy rural areas are the part of regional planning which is the further part of study. Comprehensive study will lead to inclusive guidelines as an outcome of the conference proceedings with ISBN NUMBER : 978-93-92774-00-3.

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IMPORTANT DATES

▪Extended Date for Paper Submission – 10 January 2022
▪Full Paper Acceptance - 20 January 2022
▪Last date of Registration - 20January 2022

VIRTUAL NATIONAL CONFERENCE DATE

Day 1: Thursday, 3rd February 2022
Day 2 : Friday, 4th February 2022

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HOD
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College of Architecture (BKPS), Pune

Today it is extremely important to develop rural architecture and regional planning. The multidisciplinary focus of this event aims to bring together presenters and attendees from different fields with expertise in various areas of Rural Architecture and Regional Planning , providing an excellent opportunity to participate in the national exchange of ideas on current strategies, concepts and best practices, collaborations, and cooperation, offering a broader perspective and more enriching experience.

The main objectives of conference are to explore discursive representation of rurality in architectural theory and practice and to share and exchange ideas on the role of architects in rural development process.

I would like to congratulate the organizers for hosting the conference on a very relevant topic. It's an open ended topic inviting a variety of professionals, together making it more interesting and inclusive. Good number of papers were received on various sub-themes of the conference. The papers were evaluated on the basis of relevance and significance to the theme and research method adopted to complete the study. Most of them were written appropriately and contextually. It was a good experience to see the participation of young as well as senior professionals and teachers in writing for the conference. Presentations of these papers in conference would surely bring forth interesting findings contributing to the body of knowledge in fraternity of Architecture, Design and Planning. I will like to appreciate all the efforts of committee working on preparation of conference proceedings.

It was equally interesting to work as an Advisor for the conference, as a part of advisory board, to guide the team whenever and wherever necessary while preparing for conference. The role of advisory board was to support, encourage and advise the committee for making a conference well organized and successful event. I am sure the advisory board have tried its best for the same.

I sincerely thank to the organizers for giving me an opportunity to contribute as an advisor and reviewer for the conference. It was really an enjoyable experience while working with the organizing committee. I wish for the great success of the conference.

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Dr. Shivanand N. Hiremath
Additional C.E.O.
Pravara Rural Education Society

CONVENOR'S WORDS

Prof. Sonali Chaskar
M. Arch. Landscape
Associate Professor , PRCA

INTENT OF THE CONFERENCE:

The major intent of the conference is to provide research forum to discuss Rural Architecture and Regional Planning. The conference intends corroboration of the existing Rural Architectural potentials , issues, challenges, Heritage , culture and Innovation.
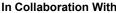
The conference on "Rural Architecture and Regional Planning" aimed to bring together leading academician, professionals, researchers and research scholars to share and exchange their experiences, research results about all the aspects of Rural Architecture and Regional Planning.

Objectives of the conference are to:

1. Explore various research needs, discourse and impact on Rural Architecture and Regional Planning.
2. Explore concerns, practical challenges encountered and the solution adopted in the field of Rural Architecture.
3. Establish theoretical researches that can be implemented to ensure sustainable rural development.

Sessions related to specific topics of the conference will be introduced by keynote lectures which will be complimented by contributed papers.

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KEY NOTE SPEAKERS

Dr. SS Bhatti
Former Principal, Chandigarh
College of Architecture

Dr. Abhijit Natu
Chairman, -Board Of Studies In Architecture
Professor and Principal I/C - Bharatiya Kala
Prasarini Sabha's College of Architecture,
Pune

Dr. Ashwini Pethe
Principal,
MIT ADT University's School
of Architecture, Pune.

Dr. Anshul Gujarathi
Founder Director, Eco-solutions

Dr. Sujata Karve
Professor, HOD
(Environmental Architecture),
Dr. Bhanuben Nanavati College of
Architecture (BNCA) for Women, MKSSS,
Pune

Prof. Shubhashri Upasani
Asst. Professor, Shivaji Maratha Society's,
College Of Architecture, Pune

Dr. Arati Petkar
Assistant Professor,
College Of Engineering (COEP), Pune

RESEARCH AREAS

- Design Theory,
- Landscape Design
- Architecture Criticism,
- Architectural Conservation,
- Cultural heritage,

- Landscape Architecture,
- Environmental Behaviour.

- Cultural landscape,
- Rural settlements,
- Traditional Indian Knowledge Systems.

- Sustainability,
- Green Buildings,
- Environmental Architecture,
- Solar Passive design.

- Environmental planning,
- Environmental behaviour,
- Housing,
- Healthcare,
- Sustainability.

- Architectural Conservation,
- Cultural heritage,
- Special interest in research activities related to the river bank cultures like Godawari, Narmada.

- Urban Planning,
- Town and country planning,
- Housing.

SESSION CHAIR

Dr. Neeti Trivedi
Professor
MIT ADT University's
School of Architecture,
Pune.

Dr. Roshni Udyavar
President-Institute of
Environmental Architecture
and Research Director-Roshni
Udyavar and Associates

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M. Arch. Landscape,
Professor , PRCA

THEMES FOR PAPER PRESENTATION

Theme I: Sustainability

1. Sustainable Rural Development
2. Rural Architecture through Agriculture

Theme II: Environment

1. Ecological Landscape
2. Eco Villages
3. Climate Responsive Architecture

Theme III: Economy

1. Impact of Architecture on Rural Economy
2. Low cost Rural Housing

Theme IV: Conservation

1. Conservation of Rural Heritage
2. Art and Culture

Theme V: Current Issues in Rural and Regional Planning

1. Challenges for Current Architectural Practice in Rural Context
2. Innovation in Rural Architecture

Theme VI: Regional Planning

1. Inclusive Planning
2. Rural Planning
3. Environmental Aspects of Regional Planning
4. Regional and Rural Economics
5. Sociology and Regional Planning
6. Settlement Pattern

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CONFERENCE TIMELINE

Day 1: Thursday, 3rd February 2022

No	Time	Event	Resource Person
1	09:30 AM - 09:40 AM	Welcome Note	Anuj Rabade
		INAUGURATION CEREMONY	
2	09:40 AM - 09:50 AM	Address By The Convener	Prof. Sonali Chaskar
	09:50 AM - 10:00AM	Address By Ar. Arshad Shaikh	Ar. Arshad Shaikh
	10:00AM - 10:05AM	Introduction of Guest of honor Dr. Manohar Chaskar	Prof. Sonali Chaskar
	10:05AM - 10:15AM	Address By Dr. Manohar Chaskar	Dr. Manohar Chaskar
	10:15AM - 10:20AM	Introduction of chief Guest Dr. Ujwala Chakradeo	Prof. Sonali Chaskar
	10:20AM - 11:00AM	Address By Dr. Ujwala Chakradeo	Dr. Ujwala Chakradeo
	11:00AM - 11:05AM	Introduction of Key note speaker	Ar. Pradeep Deshmukh
	11:05AM - 11:45AM	Presentation by Key note speaker	Ar. Arti Petkar

SESSION-1- SUSTAINABILITY

No	Time	Topic Of Paper Presentation	Resource Person
3	11:45AM - 11:50AM	Introduction of Key note speaker	Ar. Pravin Jamdade
	11:50AM - 12:30PM	Presentation on **'Rural Sustainability and Development- A holistic Approach'**	**Prof. Anshul Gujarathi**
	12:30PM - 01:30PM	Sustainable Rural Development	Ar. Poorti Pawar
		Roll of Context in Development of Rural Housing in Junnar, Pune	Ms. Nishigandha Dumbre
		Kathi-Kuni Construction Technique And CLT(Cross Laminated Timber) Construction Technique for Rural Settlement – In Case of Shimla Himachal Pradesh	Ms. Apeksha Aher
		Understanding Nature-Culture Relation in Temple Settings at Konkan, Maharashtra	Ar. Poorva Patil
	01:30PM - 02:00PM	**Question & Answer Session; Summary by the Session Chair**	**Prof. Pradnya Patki**
		Lunch Break (2:00PM - 2:30PM)	

SESSION-2- ENVIRONMENT

No	Time	Topic Of Paper Presentation	Resource Person
4	02:30PM - 02:35PM	Introduction of Key note speaker	Ar. Tejeswini Gholap
	02:35PM - 03:15PM	Presentation on '**Environment: Changing Paradigm'**	**Prof. Sujata Karve**
	03:15PM - 04:15PM	Role of Opening in Different Climatic Zones in India to Make the Building Sustainable	Ms. Janhavi Wackchaure
		Eco-Village- Just Another Tourism Strategy in India?	Ar. Tanvi Patil
		'NAADBRAMH' Sound scape of a Temple Precinct' Case – Temples of Ahmednagar, Maharashtra	Ar. Shreekrishna Dolase
		Creating Inclusive and Sustainable Public Open Spaces : A Step Towards Making Smart Villages in India	Ar. Pritam Ahirrao
	04:15PM - 04:45PM	**Question & Answer Session; Summary by the Session Chair**	**Prof. Swati Sahasrabudhe**
		Tea break (4:45PM - 5:00PM)	

SESSION-3- ECONOMY

No	Time	Topic Of Paper Presentation	Resource Person
5	05:00PM - 05:05PM	Introduction of key note speaker Dr.SS Bhatti	Ar. Kapil Burhade
	05:05PM - 05:45PM	Presentation on **'The Indian Rural Habitat: Holistic Planning and Indigenous Architecture'**	**Dr. SS Bhatti**
	05:45PM - 06:00PM	Question & Answer Session; Summary by the Session Chair	Prof. Neeti Trivedi
		DAY 1 END	

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CONFERENCE TIMELINE

Day 2 : Friday, 4th February 2022

SESSION-4- CONSERVATION

No	Time	Topic Of Paper Presentation	Resource Person
6	09:30 AM - 09:35 AM	Introduction of Key note speaker	Ar. Ashwini Gholap
	09:35 AM - 10:15 AM	Presentation on **'The interwoven fabric of Nature and Cultural Heritage around Ashtang Places of River Godawari'**	**Prof. Shubhashri Upasani**
	10:15 AM – 11:15AM	Conservation and Promotion of Rural heritage of Historic Town Aundh (District-Satara) for CulturalTourism.	Ar. Maithili Kulkarni
		To Outline the "Cultural Landscape" of the Krishna River in Maharashtra and Emphasize the Need for Planning Conservation Strategies for the Same so as to Conserve Associated "Rural Heritage" at a Regional Scale	Ar. Yogita Pandit
		Development of Dado Ornamentation in Mughal Architecture	Ms. Ruchita Gharate
		Evaluating Settlement Form and Pattern of Estado da India (Old Goa), A Mediaval Portuguese Town Using Guidelines for Medieval Cities by MorrisA.E.J.	Ar. Ajit Madkaikar
	11:15AM - 11:45AM	**Question & Answer Session; Summary by the Session Chair**	**Prof. Manas Marathe**

SESSION-5- CURRENT ISSUE

No	Time	Topic Of Paper Presentation	Resource Person
7	11:45AM - 11:50AM	Introduction of Key note speaker	Ar. Rahul Deshmukh
	11:50AM - 12:30PM	Presentation on **'Villagers Perception of Aspects of Pride and Preferences for Development'**	**Prof. Abhijit Natu**
	12:30PM - 01:30PM	Changing Character of Peri Urban Areas: The Case of Pune City	Ar. Anuja Shinde
		The Impact of Lockdown on the Movement of Disable People in Rural Region, Akola	Ms. Shwetali Kotkar
		Innovative Ideas for Using Vernacular Building Materials in Rural area: A case of Maharashtra	Ar. Piyush Agarwal
	01:30PM - 02.00PM	**Question & Answer Session; Summary by the Session Chair**	**Prof. Roshni Udyavar**

Lunch Break (2:00PM - 2:30PM)

SESSION-6- REGIONAL PLANNING

No	Time	Topic Of Paper Presentation	Resource Person
8	02:30PM - 02:35PM	Introduction of Key note speaker	Ar. Kapil Burhade
	02:35PM - 03:05PM	Presentation on **'Planning and the Rural Environment: Emerging Approaches'**	**Dr. Ashwini Pethe**
	03:05PM - 04:05PM	Architecture as Nuclei of Social Systems: Past and Future.	Dr. Seemantini Chaphelkar
		Exploring the Cultural Geography of the Built Environment of a Traditional Settlement: Walawal in Konkan	Ar. Sonal Nirmal
		Study of Traditional Occupation of Vadar Community with New Transform	Ar. Anupama Sonpitole
		Analysis of Urban Heat Island Effect of Streets in Pune City.	Ar. Priyanka Jamdade
	04:05PM - 04:30PM	**Question & Answer Session; Summary by the Session Chair**	**Prof. Shilpa Nagapurkar**

Tea break (4:30PM - 4:45PM)

VALIDICTORY SESSION

No	Time	Topic Of Paper Presentation	Resource Person
9	04:45PM - 04:50PM	Introduction of chief Guest - Prof. Jayashree Deshpande	Ar. Rahul Deshmukh
	04:50PM - 05:05PM	Address by Prof. Jayashree Deshpande	Prof. Jayashree Deshpande
	05:05PM - 05:10PM	Introduction of Advisor - Dr.Parag Narkhede	Ar. Rahul Deshmukh
	05:10PM - 05:25PM	Address by Dr. Parag Narkhede	Prof. Parag Narkhede
	05:25PM - 05:45PM	Valedictory Session and Book Release	Prof. Jayashree Deshpande
	05:45PM - 05:50PM	Vote of Thanks	Prof. Sonali Chaskar

DAY 2 END

LOKNETE. DR. BALASAHEB VIKHE PATIL
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