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Climate Responsive/Resilient Communities of South India

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Abstract*—In traditional community settlements, buildings were designed with minimum resources and simple methods to respond to their local climate and maintained comfortable indoor conditions for the inhabitants. Therefore climate resilience is a priority in most of the traditional communities as it provides a comfortable shelter in the local climate. It is in the form of built spaces and also unbuilt spaces which are at times termed as cultural landscapes. In spite of the effects of changing climate, these communities have a strong resilience by using passive measures to achieve comfort conditions. These are in the form of courtyards, as a part of built spaces, and ample green spaces with a lot of trees, water bodies in open or unbuilt spaces. They have a walkable environment with trees placed strategically on either side of the pathways and walkways as it reduces heat during summer. Adaptive and cultural condition-based measures, practices, and skills on actual environmental conditions which are always implemented to maintain these cultural landscapes. These green spaces were linked throughout the settlement which shields them even in changing climatic conditions. This concept of climate resilience as a priority is applied at varying scales in most of the community settlements. As it is turning into a necessity to design sustainable buildings, this paper is an attempt to show the adaptive factors of human activities in the green setups with examples from various South Indian traditional communities where climate resilience is always been considered as a priority factor for both built and unbuilt spaces.

***Index Terms*—living condition, inhabitants, traditional community settlement, resilience, cultural landscapes**

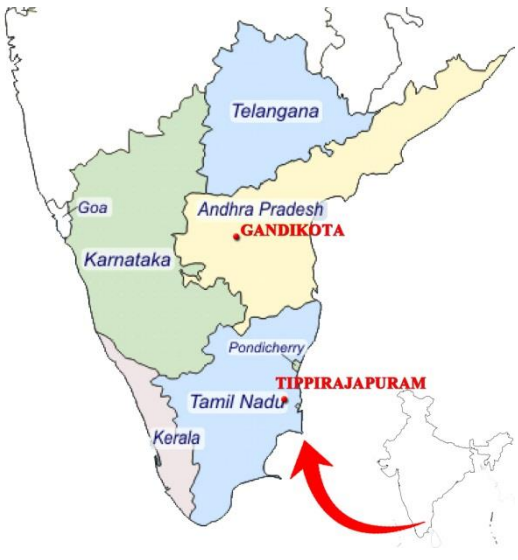
I. INTRODUCTION

Community settlements were an evolution of clan-habitations. It is a place where people live in groups who have most of the things in common such as norms, values, identity, and often a sense of place. These settlements started either near the bank of a river or a place where basic needs could be fulfilled. Hence, landscape settings were molded and also recreated most of the time by the people. The socio-culture and traditions of a community and also of every individual reflect the characteristics of the way they live in the created spaces. In these communities from past hundreds of years man has developed some constructive techniques to obtain indoor and outdoor comfort, using locally available materials, this as a result turned out to be climate-responsive architecture for that region. It provided comfort in close interaction with the dynamic conditions of the environment. The climate-resilient communities are designed in such a way that they consider the climatic conditions and also they are prepared for the changing climatic conditions. The task for the community is to protect and maintain the landscapes with the minimum change, in spite of the continuous changes [1] . Some of these sites in today's context are maintained as cultural landscapes. Ideas from traditional communities can also be used as concepts for designing even in the urban context. These communities are always an inspiration for future designs.

II. STUDY REGION

South India covers the southern part of the peninsular Deccan Plateau; the geography of this region is diverse resulting in different climatic zones. The climatic variations have led to a large range of differences. Agraharam at Tippirajapuram and Gandikota village are two communities from different locations of South India, as shown in Fig. 1, which are selected as study regions based on their diverse factors.

Figure 1. Analyzed community settlements marked on the map of South India



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Each of these community settlements has a vast difference in climate, terrain, landscapes that are in the form of unique biological diversity. Cultural landscapes are found in the form of design, Ethnographic, Historic Sites, and Vernacular Landscapes. This has also influenced the community settlement. They have very interesting socio-culture, customs, and traditions, most of the time based on nature itself. So the people living in these communities always have a close connection with nature. They adapt and blend their community settlements into the natural settings forming climate-resilient communities.

A. Traditional Agraharam at Tippirajapuram, Tamil Nadu:

Agraharam is a Brahmin community settlement which was formed and very much recognized during Pallava, Chola, and Pandya Kings [2]. Brahmins are considered as the highest in Hindu society and also leaders in terms of literature. During the ancient and medieval period, exclusive community settlements were established for them called Agraharam which in Sanskrit is described temple as a focal point from the street, with a continuous row of dwelling on either side of the street [2]. The settlement pattern resembles a garland around the temple. Extending from the west of the Brahmin community there is a supportive community with workers for Agraharam. These settlements are situated in a strategic natural environment that over time, shaped by the community settlement's cultural, historical, and social contexts, formed their own cultural landscapes. One such Agraharam is Tippirajapuram, as shown in Fig. 2, located in Thanjavur district of Tamil Nadu state where the people living in the community have well understood the need to maintain a sensible balance between man and nature.

Fig. 2 Settlement - garland around the temple

The settlement is almost on a flat terrain suitable for agriculture with thick vegetation around. On one side there is a tributary of Cauvery River flowing and on the other side, there are water bodies, as shown in Fig. 3.

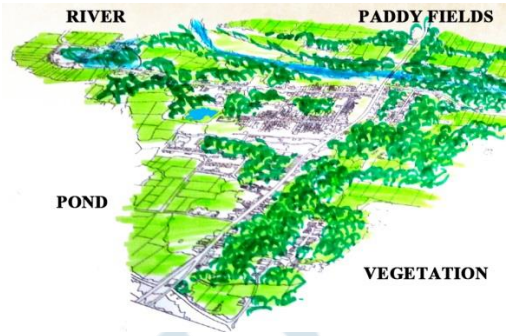

Fig. 3. Tippirajapuram's– River, paddy fields, vegetation and ponds

The cultural landscapes have evolved over time. But even though the community grew with the increase in activities and occupancy [2] they did not make many changes to the natural settings whereas they blend the entire settlement, their socio-culture, and also traditions along with the natural settings. All these natural settings around have been an advantage for the settlement. It gives a sense of place with lively spaces and an unpolluted environment. The climate of this region is generally moderate. The maximum temperature is 40°C and a minimum of up to 20°C.

The arrangement of the settlement is mainly influenced by the traditions, occupation, and built flexible to nature, it never made any drastic changes to the natural topography and the surroundings. Hence the settlement exists in such a way that it blends with nature, as shown in Fig. 4.

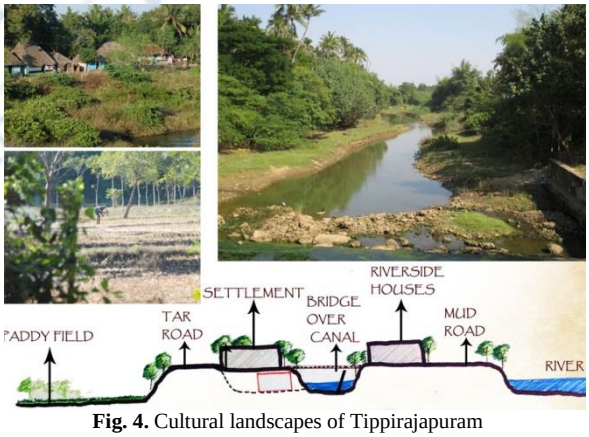

Fig. 4. Cultural landscapes of Tippirajapuram

The major streets in the settlement are in East-West direction and the dwellings are in North-South direction taking advantage of North lighting and southeast breeze. This maintains the microclimate inside the dwelling and keeps the front and backyard cool throughout the day. The backyard and the courtyard spaces being open areas, they bring in nature into the dwellings by connecting outdoors with indoors. These spaces are major elements of climate-responsive architecture. The cool breeze enters the house through the courtyard forming an excellent thermal regulator [3]. Traditional courtyards are a vital space inside the dwelling which is most often a multifunctional space

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where various activities take place throughout the day. Most of the dwellings have multiple courtyards which are very effective for cross ventilation and also bring in natural light. The traditional architecture has created an interesting settlement pattern, unique typology of dwellings with interesting construction techniques, and use of local materials such as mud, lime plaster, bricks, bamboo, and thatch. They have also considered various socio-economic and socio-cultural factors to make this community. Hence, this community exists till today in almost the same condition with very few changes, as shown in Fig. 5. [3]

Fig. 5. Settlement merging with the landscapes of Tippirajapuram

B. Gandikota village, Andhra Pradesh:

Gandikota is an extensive landscape that endeavors the history and nature on its lap. It is a small village on the right bank of the river Pennar West of Jammalamadugu in Cuddapah District of Andhra Pradesh. The name comprises two Telugu Words, 'Gandi' a gorge, and 'Kota' a fort. In these two words lies all the interest and importance of the place. The gorgeously enveloped folk occupants have an extensive living heritage. They have a narrative that embodies their built and landscapes. The intricacy woven built structures within the monumental structure makes its character. A whole village exists inside the complex – houses, shops, and even a primary school, as shown in Fig. 6.

Fig. 6 Aerial view of Gandikota Village and the Gorge

The village is situated amidst beautiful landscapes and wild forests. It is endowed with great potentialities of natural strength surrounded by a deep valley and hills [4][5] with lavish resources and minerals unexplored, massive boulders of red granite and the river Pennar flows about 300 Feet below on the West and Northern side [6][5] . It has a tropical wet and dry climate characterized by high temperatures of even about 50°C. Summers are especially uncomfortable with a hot and humid climate. Rainfall is from both the Southwest and North-East monsoon brings substantial rain to the area. The fort was constructed during the 12th century by a subordinate of a Chalukyan king and has also served a crucial role during the reign of the Vijayanagara, QutubShahi, and Kakatiya dynasties [6] . The type of cultural landscapes at Gandikota is ethnographic Landscapes containing a variety of natural and cultural resources where the associated people define as heritage resources [7]. The locally available material being granite, the entire settlement, and the historic monuments have structures made up of different layers of granite with dry stone stacking method of construction, as shown in Fig. 7. The structures have camouflaged well with the gorge and the natural setup.

Fig. 7. GandikotaEthnographic cultural landscapes

The setting of stone upon a stone with mortar packed into voids lends weight and insulation. This makes it a highly durable, low maintenance building material with high thermal mass and they are great in hot climates where the thick stones keep the inside cool, but heat doesn't get effectively trapped by stone [8] . Creating an insulation layer of either wood or rendering of lime can help this [9]. These stone buildings merge with the surroundings and the cultural landscapes, as shown in Fig. 8. A stone constructed dwelling outlasts any other kind of construction by hundreds of years.

Fig. 8. Structures inGandikotacamouflaged with the landscapes

Apart from the existing village and the fort, there is Gandikota APTDC complex which is a heritage resort, as shown in Fig. 9, just outside the fort walls of the village. It covers an area of about 10 acres. Following the sustainable

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strategies, climate-responsive factors, and also to match with the fort, village, and cultural landscapes, the whole complex is built in stone. This heritage resort is adapted factors between various activities of inhabitants and their spatial environment [1] of Gandikota.

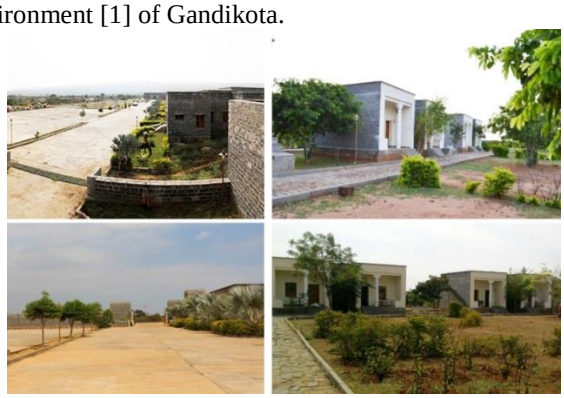

Fig. 9. Gandikota APTDC complex-Heritage resort

III. CONCLUSIONS

This study is about climate resilient communities of South India with two sample case studies Tippirajapuram and Gandikota. These community settlements are designed considering the natural factors and climatic conditions in that region. The communities have responded well in terms of shaping the spine considering the social and cultural factors. They are well blended with the natural settings which should be undisturbed in the future as well and retain its integrity; rather the contemporary ideas should be integrated well with the traditional set up which has stood till today. Human comfort is considered as the priority, while designing the spaces and also used locally available materials and techniques. All these factors blended well with the existing conditions. Hence, these methods and techniques well merged and relate with each other forming a climate resilient community and could be adapted in the current design concepts. The Gandikota APTDC complex which is a Heritage resort is one such example inspired by the culture of the land and the unparalleled intellectual history of its region.

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