ECOTOURIM AND ARCHITECTURE: PERSPECTIVE OF CHOTIARI WETLAND COMPLEX-SINDH, PAKISTAN

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ABSTRACT

Ecotourism has the strongest pro-poor effect on people living around wetlands, as the visitors come to the site they create room for direct marketing, thereby incentivizing the development of an economic fiscal multiplier effect. Because of unsustainable incentives, the pattern of "trying livelihoods" in the Chotiari Wetland Complex, which is in Sindh-District Sanghar, has been dwindling. Furthermore, some evolving development actors, as non-governmental organizations (NGOs), Sindh Tourism Development Corporation (STDC), and WWF- Pakistan have attempted to take control of the local community's destiny by recognizing tourism development as a way of enhancing their livelihoods. The objective of the research is to find and explain the current status of tourism development and its impact on the local communities and environment of Chotiari Wetland Complex another objective is to establish the architectural ethics in planning and developing tourist's facilities that bridge the gap between ecotourism and its architecture and is beneficial for the community and genral environment. A review of some of the contemporary literature indicates that the primary factors that connect ecotourism to architecture and contribute to the upliftment of the local community and highlighting the lack of literature that focuses on the architecture of ecotourism in wetlands with a hot arid climate. An analytical study of the hot arid area of the Chotiari Wetlands' Vernacular Architecture is addressed in this research, outlining the factors influencing its significance. This is accompanied by a discussion of the potential of the Chotiari Wetlands' vernacular architecture as a basis for the development of eco-tourism architecture. The methodology adopted for the study was a case study with a combined technique of qualitative research. Data was collected through private walks, surveys, observations, photographs, videos, sketches, focused gathering discussions, on-site meetings with involved stakeholders, and study of existing literature.

Considering the findings of the study, along with the observed natural resources in the area traditional mud straw, and reed houses have been proven to have potential regarding eco-tourism and to be best suited for the area, both for the dwelling of residents and the accommodation of tourists with the elimination of deficiencies. It is also revealed that the current tourism architecture is not user-friendly and does not adapt to the local context and the environment. Moreover, the local community is interested in tourism-related income generation activities.

The paper concludes that architects and resource planners must take the concept of vernacular architecture as a key principle for future development and construction of ecotourism architecture with the involvement of local communities.

Keywords: Ecotourism, Journey, Chotiari Wetland Complex, Sindh, Vernacular Architecture.

INTRODUCTION

Pakistan is a developing country in South Asia and is approachable for tours from many other regions. In Pakistan the tourism industry is developing rapidly because of its many destinations that attract tourists. Among all these destinations, wetlands are the ones that possess unique characteristics. Wetlands are areas that comprise of reservoirs, canals, rivers, lakes, ponds, mangroves, sandy coasts, salt pans, and inland or coastal, artificial, or natural resources. The essential factor that separates wetlands from other landforms or water bodies is the distinctive vegetation of hydrophytic plants, appropriated to the specific hydric soil. In Pakistan, nineteen wetlands Ramsar sites exist, from which nine are locate in the Sindh region and the Chotiari wetland complex is one of them (Wikipedia, 2019).

Technological advancements, physical, socio-economic, and institutional development is the primary force for the development of entertainment, relaxation and leisure activities in any Wetland Complex. The introduction of tourism as a significant sector is one of the most notable

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shifts in post-war financial activity. Travel was previously a privilege for a wealthy few, rich, powerful and curious individuals but now this has changed. Basic resources for tourism are historic, cultural, and natural resources of the host destinations. By protecting and improving these resources and avoiding any negative impact on them from the development of tourism activities and facilities success of tourism can be achieved. Observing the development of tourism in many regions reveals that tourism affects the built environment adversely. Large-scale development of touristic amenities and other infrastructure tends to alter an area's land use and disturbs a destination's natural ecological harmony. For instance, in Chotiari Wetland Complex, tourism facilities are being developed but it poses problems, as the forms are unsuitable symbols of cultural growth. It also adversely affects wetland and its ecosystem, such as ruins the wetland with infrastructures development, inappropriate disposal of waste, extraction of materials for buildings, and so on. To cope with the issue, the concept of Ecotourism is often viewed as a successful method for encouraging sustainable development. Many regard ecotourism as a feasible way to preserve the local environment and provide local communities with social and financial advantages.

Sustainable development in ecotourism facilities and activities could change the life of tourism hosting communities. Sustainable development can be in the form of eco-lodges and small-scale activities that give tourists exposure to the natural and cultural world of the area. It will also give different opportunity to local people to boost their economy. Moreover, sustainable development strategies aid to overcome the issue of the energy crisis of the region through sustainable architecture (TES, 1998).

This study identifies a research gap regarding strategies for the architecture of ecotourism facilities that need to be fulfilled. Besides, there is lacking cultural, environmental, and economic indicators that can be used to make tourism and its related architecture culturally, environmentally and economically sustainable.

LITERATURE STUDY

Wetlands, ecotourism and sustainable development

Wetlands are precious ecosystems covering approximately six percent of the land surface of the world (Ramsar Convention, 2018). They offer significant tourism and recreation facilities and are one of the vital elements of the worldwide tourism experience. Therefore, they are likely to be the main component of the development in demand for touristic places as well. As per the Ramsar Convention wetlands are, “Areas of the marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with static or flowing water, fresh, brackish or salt, including regions of marine water not exceeding six meters in depth at low tide.”

Individuals are naturally attracted to water, to coastal wetlands such as coral reefs and beaches, and inland wetlands, for example lakes and rivers. Wetlands give important tourism possibilities that can be a source of revenue for many developing countries, bringing financial advantages for domestic and local economies (Figure 1). Well-managed development of tourism guarantes sustainable livelihoods of local communities and this demanded ecotourism. The Ecotourism Society (TES, 1998) describes ecotourism as "a responsible journey to natural territories, which preserves the environment and supports the health of the local individuals." Therefore, it is now one of the most common and quickest developing tourism fields. Development rates for ecotourism are assessed to go around to yearly, in contrast to for tourism in general, with the best development in the ecotourism business expected to occur in the worldwide business. (Dimanche and Smith 1996; Lindberg 1997; Mader 1998; Reingold 1993).

There are many wetland destinations around the globe that host eco tourists and one of them is Lake Ichkeul, in the Mediterranean wetlands. It has a National Park, a Ramsar Site, a Biosphere Reserve, and a World Heritage site of UNESCO. It is a major stopover for hundreds and thousands of migrant birds who come to eat and nest there, including ducks, geese, storks, and pink flamingos. The lake is a famous location for tourism and recreation, because of its ecological significance. Every year, Lake Ichkeul National

Figure-1: Main Principles of Eco-Tourism.

Park gets around fifty thousand tourists. The tourist attractions include nature paths and guided tours, a museum, douars sightseeing (tented camps), local villages visits, bird watching, mountain biking, hiking, and sports trekking on Djebel Ichkeul (Figure 2). A welcome center (Figure 3) is built there using locally available materials that are contextual and environment responsive and facilitate tourists with all necessities (Tripadvisor, 2019).

Sustainable development in and around wetlands is necessary for supporting wetland's stakeholders (Panda.org, 2018). "Sustainable development is a strategy that responds to the needs of today without harming the ability of coming generations to fulfill their own needs." (World Commission on Environment and Development, 1987). Additionally, sustainability is presented as a multifaceted phenomenon that has three pillars: environmental, social, and economic. In sustainable development, these three pillars work together to protect resources of the environment, preserve socio-cultural capital and heritage and build up the system of the economy So that it responds to the requirements of present and coming generations (Mason, 2014). The World Conservation Strategy (referred to in Robin and Poon, 2009) in 1991, defined the principles of sustainable development in detail. The principles comprised; looking after and care for the society and communities; upgrading human life quality; saving the earth's liveliness and diversity; limiting the consumption of non-renewable resources; changing mentalities and practices; empowering communities to take care of their environments; giving a national system to coordinating development and protection and making a worldwide union. Therefore, ecotourism development's dimensions in relation to sustainable development related to the environmental, economic and social aspects of tourism growth and an appropriate balance must be developed between these dimensions to preserve its long-term sustainability (Figure 4).

Figure-2: Activities for Tourists.
Source: Trip Advisor, 2019

Ecotourism and Architecture

Sustainability and 'being sustainable' can be considered as key drivers that create a close connection between ecotourism and architecture. Ecotourism and vernacular architecture each try to react to the societal requirements of a given group or a community in an environmentally harmonious, socially suitable and economically feasible way. Architecture's sustainability philosophy is expressed through various activities aimed at reducing a building's adverse effect on its surroundings and taking care of its users and adjacent community's quality of life. Each region has its sustainability profiles, sometimes linked to vernacular architecture and ancient traditional building methods.

Considering the case of Feynan Ecolodge that is situated in Jordan's biggest nature reserve, the Dana Biosphere Reserve facilitaties tourists around the globe (Figure 5). The lodge consists of thirty rooms and is designed in arid landscape

Figure-3: Welcome Centre.
Source: Trip Advisor, 2019

Figure-4: Sustainable Development Through Eco-Tourism.
Source: Kiper, T, 2013

based on the research of desert architecture. It utilizes architectural components that are ecologically shaped like traditional houses in Jordan, by using locally available materials and techniques. The use of domes, vaults and mud skin is all linked to the region's local and traditional building architectural style. Concrete blocks with double layers are used for its construction, with the air cavity in between for good heat insulation. In the southern and western sides, sculpture type stone chips are used as shading devices (Figures 6). It maximizes solar energy utilization and generaties electricity using photovoltaic (PV) panels that can store up to three days of electricity to account for cloudy days. Additionally, all biodegradable waste is transfered into fertilizer by composte and uses reusable containers to collect supplies and minimize all other packaging waste. There is a decentralized wastewater treatment solution. The objective of reusing water is to create a micro-ecosystem around the lodge, with plantation of native trees that not only creates a vista, but also gives shade and sitting spaces to the visitors and local community. To bring economic benefits to the local community, the lodge employs locals from the community and supplies up to eighty percent of food and products from neighboring villages. This generates jobs, promotes the local economy, and generates an authentic local guest experience. A lodge store also displays and sells local crafts and artwork that helps promote the region's wealthy Bedouin culture.

The reviewed literature and examples of wetlands, ecotourism, and eco-lodge, reveal found that architecture holds a crucial role in ecotourism as a reflection of the natural environment through space. Eco lodges and sustainable resorts it well blended with the surroundings espond to local livelihoods, culture, and art. However, a knowledge gap regarding strategies for the development of ecotourism architecture exists, this can make a connection between the key features of both ecotourism and architecture as being sustainable, in Wetlands with hot, arid climate is still existing that is presented in this research as the key gap in knowledge in these fields while focusing the valuable destination of Chotiari Wetland of the hot, arid climate.

Figure-5: Sustainable Eco Lodge.
Source: Sarah, 2015

RESEARCH METHODOLOG

The combined technique, case study, and qualitative approach are used to attain the study goals. Secondary data collection sources comprised of relevant books, published journals, blogs, research papers, and reliable news articles, and websites, etc.

Primary data is collected by selecting a case study of the Chotiari Wetland Complex. Three villages of Chotiari namely, Baqar *Goth*, Phulail *Goth*, and Faqir Wanhyal Mangrio *Goth* were chosen due to having the potential for ecotourism. Field visit in the selected villages was done from March 28 to April 1, 2019. The objectives of the visit were to understand the design of built forms for tourists, to analyse Baqar lake resort, and a tourist's welcome center. In addition, vernacular architecture was studied to get knowledge of local materials and construction strategies. For qualitative research, the sample size was fifteen local people from which twelve male and three females and two officials. The objective of these interview was to know about the lifestyle, culture, way of earning of local communities and initiatives taken by the government to upgrade the area for tourism development. Results were derived by google mapping, pie charts, bar graphs, and analiycial tables are taken.

CASE STUDY AREA (IDENTIFICATION OF SITES)

Chotiari is situated approximately two hundred and eithy-seven kilometers from Karachi and spread over four thousand

Figure-6: Sun Shading Devices.
Source: Audleytravel.com, T, 2019

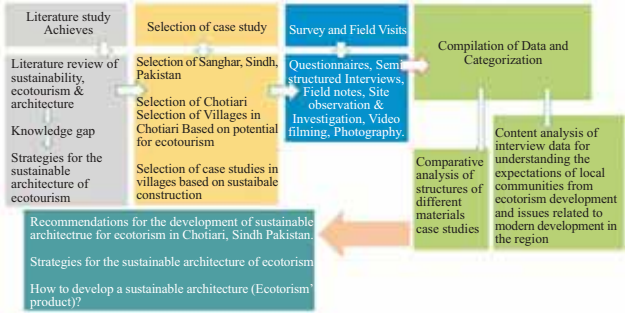


Figure-7: Framework of Research Methodology.

eight hundred and five square kilometers along the Indian boundary in the district of Sanghar near Achro Thar Desert, Sindh (Figures 8 & 9).

The climate of Chotiari Wetland is that of a "desert." There is virtually no rainfall all year long. May and June are the hottest months, when the temperature rises to 40 to 45 °C and December to February are the coolest months. Normally nights are relatively colder than days.

There are three villages of Chotiari that have tourism potential and selected for study namely Baqar Goth, Phulail Goth, and Faqir Wanhyal Mangrio *Goth* (Figure 10). Baqar village is easily accessible from Sanghar city by a link road, while the rest of the two *Goths*, Phulail and Faqir Wanhyal Mangrio *Goth* have no road access. In Phulail *Goth* people can access only by boats and in Faqir Wanhyal Mangrio *Goth* a naturally made path serves as a road that can be used by four wheel special jeeps.

Considering the basic infrastructure facilities of the *Goths*, responses of local community indicate that they have not provided basic infrastructure facilities (Graph 01).

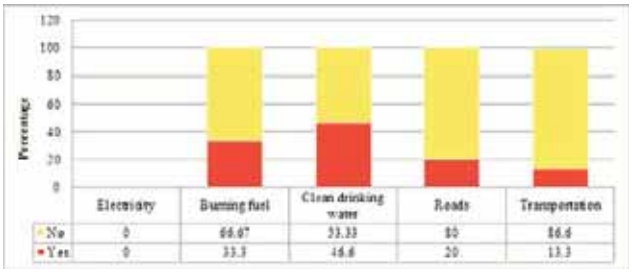
Chotiari Wetland and Ecotourism

The ecofriendly area, especially the three selected villages, are famous locations for tourism and recreation, regarding their ecological significance and tourism development activities by the local government, NGO and WWF Pakistan.

Figure-9: Map showing location of Chotiari region in District Sanghar

Figure-8: Map showing geography of Pakistan and location of Sanghar

After the development of tourism facilities, Chotiari Wetland has been receiving around two thusand tourists every year since 2012. It has a diverse variety of deep-water wetlands, shallow marches, historical lakes (*dhands*) that hit a maximum depth of furty five meters, (Figure 11), and historical buildings (Figure 12). The old and historic shrine of Hazrat Shah Mardan Shah Pir Pagaro Shrine in Bakar *Goth* is also of great significance as followers of Pir Pagaro, (a leader of the Hur Movement against British Rule in Sindh), show great reverence towards it. Activities for tourists include local village's visits with meeting local people and experiencing their culture, bird watching, wildlife surveillance, hiking on dunes with panoramic views of the marshes, nature trail walking in the deserted area, launching boat tours on the lakes and waterways (Figure 13).



Graph-1: Infrastructure of Chotiari's Selected Goths

Figure-10: Map showing 3 selected villages of Chotiari

Figure-11: Baqaar Lake

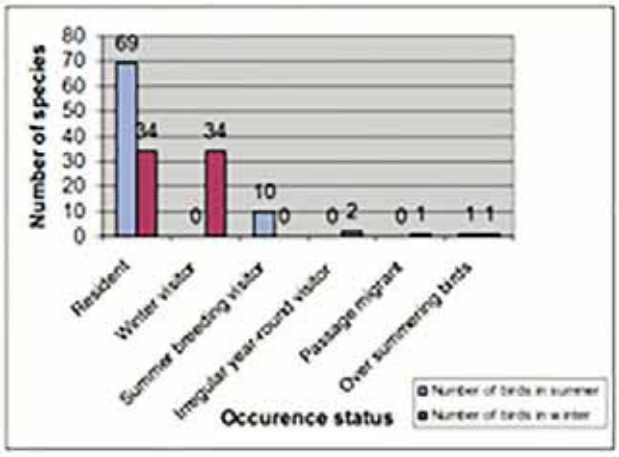


Figure-14: Species occurrence in Chotiari Reservoir showing seasonal status of birds.
Source: WWF-Pakistan

The Nara canal, situated in the surrounding area, offers an amazing natural sight of riverine forest fields. Additionally, Chotiari Wetland Complex is home to a wide variety of flora and fauna (Figure 14) and a significant stopping point for thousands of migratory birds who come to eat and breed there, including Great egret, Desert Lark, Houbara Bustard, Bay backed Shrike, that add value to the overall pleasure of the trip of tourists (Figure 15).

Ecotourism and its Architecture in Chotiari Wetland Complex

For the development of tourism, a welcome center named

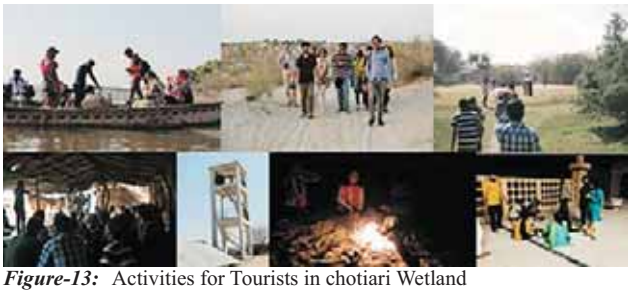


Figure-13: Activities for Tourists in chotiari Wetland

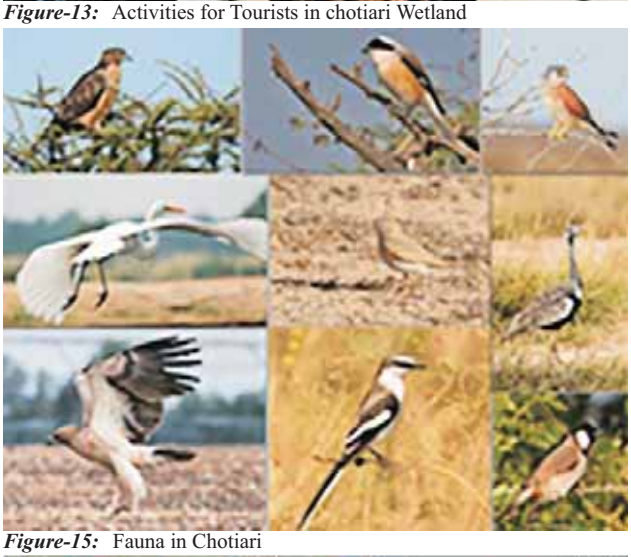


Figure-15: Fauna in Chotiari

Figure-16: Map of Baqar Goth with Highlighted Tourist's Facilities

Chotiari conservation and information center with a small wetland museum, having different artifacts like models of birds and their information for researchers and tourists was built by WWF-Pakistan in Baqar village (Figure 16). This center uses locally available materials (mud, straw, and reed), that is contextual and environment responsive and

Figure-12: A Century Old Structures of Junejo Tribes Attract Tourists

facilitates tourists with all necessities (Figure 17). Besides, the Baqar Lake Resort is also built in this *Goth* by Sindh Tourism Development Corporation (STDC) for the accommodation of tourists. This resort consists of four suites with a common shared boundary wall. Concrete blocks are used in the construction of this resort, that is not responding to the local context, and not environment responsive and user friendly (Figures 18-20).

In Faqir Wanhyal Mangrio *Goth*, an *otaq*, which comprises a *Landhi* and two *Chowrna*, is also built by a local NGO (Sindh development foundation), for tourists by using locally available materials and local techniques. However, lack of sun shading devices, and proper mud plastering of structure, makes the structure very not during the day explained. (Figure 21 & 22). *Chowrnas* are built for selling local crafts. The concept of kitchen gardening is also introduced to empower the local community.

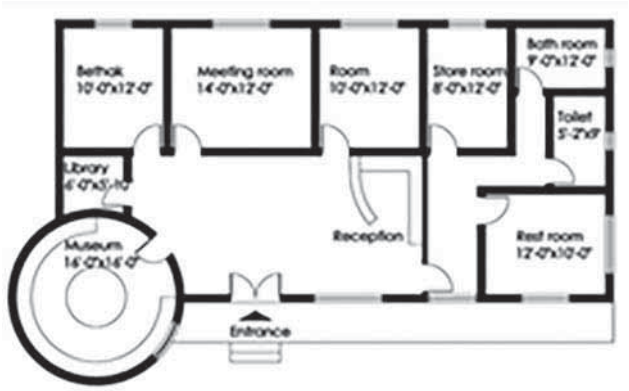


Figure-19: Floor Plan of Resort

Figure-20: Exterior and interior Views of Resort

Figure-17: Plan of Visitor's Center

Figure-18: Exterior View of Visitor's Center

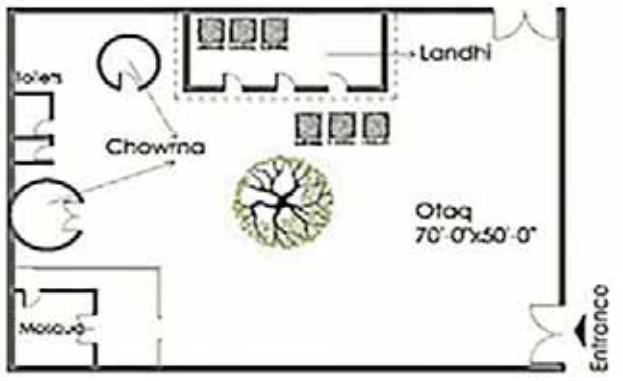


Figure-21: Plan of Otaq

Figure-22: Exterior of Landhi+ Chowrna & Entrance of Otaq

Traditional Architecture of Chotiari Wetland

The following materials are readily available in Chotiari and considered local materials of the region (Figure 23). Three plant species Typha sp. along with Phragmites and Saccharum sp. provide refuge shelter, and breeding grounds to the locals.

Materials of local architecture are straw, reed and bamboo for structural frames and roofs with thatch and mud plaster which lower the cost and environmental impact (Figure 24).

Untrained people and locals without any professional input usually participate in the construction process, without incorporating new technology and techniques to cope with negative impact of the current construction techniques, like termite attack on wood, destruction of structures due to wind storms, no sufficient bed plates top leveling or consideration for distribution of load heat insulation and water penetration through walls and roof.

Impact of Tourism Development on the Economy of the Region

The livelihood of the individuals residing around the Chotiari wetland complex is depended on natural resources Figure 25 shows the daily wages of the major professions which help to suggest economic opportunities for the people through promoting ecotourism.

However, the construction of the Chotiari Dam adversely affected the lives of natives and their economy. The area's beautiful lakes have been transformed into a bigger storage dam, called the Chotiari Reservoir, that has resulted in dying fishes due to diversion of water of natural lakes an other negative impact as shown in Figure 26, is that it forced people to migrate to other areas for survival. This scenario indicates that to bring advantage to the local community there is a requirement for sustainable development with overed facilities and activities should be economically beneficial, socially responsive and environmentally friendly.

Conversely, locals do not consider current tourism development as an activity that brings benefits for them and they find negative impacts of tourism in the region. Unsustainable construction is done to facilitate tourists that in return does not encourage them to revisit the area, Figure 27 shows the data collected from locals to understand the impact of tourism in the area.

Tourists were interviewed to understand their experiences about the area. Figure 28 shows the response of the tourists

Figure-23: Map Showing Availability of Materials with the Name of Nearby Places of Chotiari

Figure-24: Tuck Show Plastered with Mud in Phulail Goth

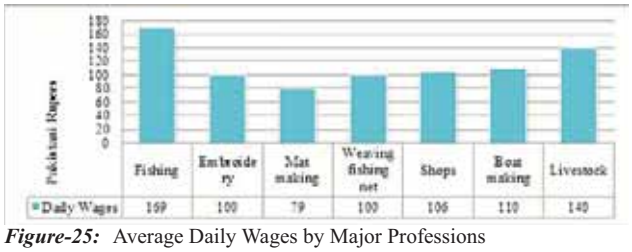


Figure-25: Average Daily Wages by Major Professions

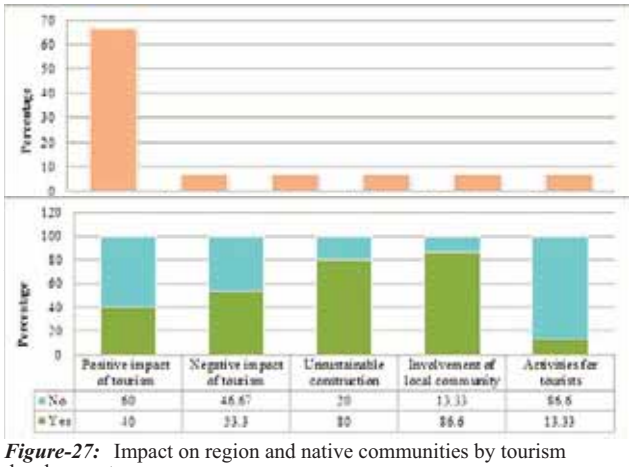


Figure-27: Impact on region and native communities by tourism development

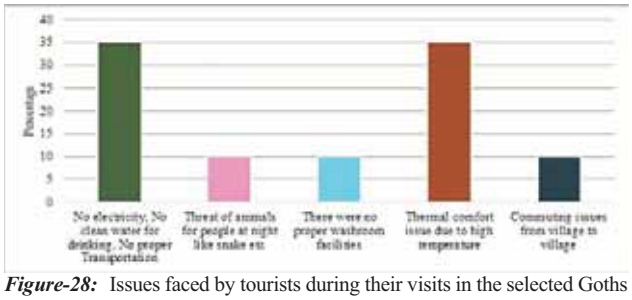


Figure-28: Issues faced by tourists during their visits in the selected Goths

to the question related to the Baqar Lake Resort structures being appropriate for the weather conditions of the region.

Figure 29 shows the response of tourists to the question related to the current touristic architecture of Chotiari wetland complex and it being related to the vernacular architecture of Chotiari.

All responses of the tourists pointed towards the need to construct architecture in accordance with the local climate and available infrastructure facilities, so that users can feel comfortable during their stay in this region and be encouraged to revisit the area.

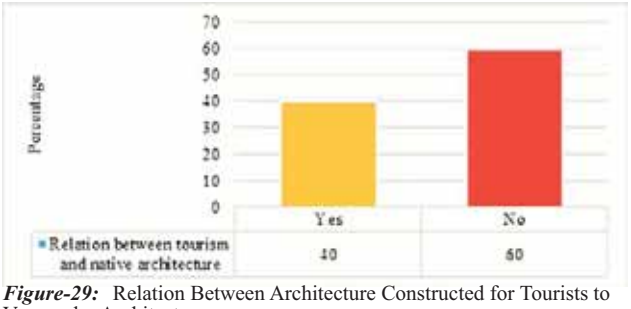


Figure-29: Relation Between Architecture Constructed for Tourists to Vernacular Architecture.

ANALYSIS

This study identified that this region has a potential for ecotourism but the development of tourism failed to create a connection between ecotourism and its architecture. Construction of local structures in the region should mostly be based on the accessible local materials as the cost of transporting materials is not affordable. Natural materials that are used in Chotiari are not only economical but also do not affect the environment negatively.

Mud, straw and reed are incredibly efficient materials that can be utilized successfully to construct speedy shelters. These all are sustainable material, accessible locally and the use of it is common to all villagers of Chotiari Wetland. Mud can be utilized for walls, including in finishing coats or by forming sun-dried bricks, the manufacturing of which is also very quick and easy and it is a good insulating material. Mud plaster acts as a barrier against regular rainfall, but the wall that becomes weak after the plaster is removed. If the wall starts to lose its exterior plaster, it is susceptible to decay. Mud has a strong thermal mass, particularly clay; it is very good for keeping temperature changes at a moderate level. In the desert heat, buildings built with mud and reed tend to be normally cool and hot in cold temperatures. Clay retains heat releasing it over a specific period. Adobe's thermal conductivity is specified as 0.24 KW/m /K and adobe as 0.18 KW/m/K (Goodhew and Griffiths, 2005). Research on adobe reveals that the high specific heat of the adobe helps heat to be absorbed throughout the day, contributing to cooler indoor spaces. The heat is released at night, keeping the interior warm (Parra-Saldivar and Batty, 2006). The ability to conduct heat is linked to moisture content (Rees et al., 2001). U-value, on the other hand, also plays an important role in the selection of materials. The lower the U-value, the better the heat insulation. Sun-baked bricks have excellent insulating properties. Sun-baked brick with both sides plaster have a U Value of 0.63 W/m²K and baked brick on plaster on the inside with U Value of 1.19 W/m²K. Timber roof with straw and 154 mm coating of mud has a U-value 0.3785 W/m²K. Reinforced brick concrete, with 154 mm mud coating, has U-Value of 1,0215 W/m²K. The least U-value is found when reed and straw matt are added to the structure. The thermal conductivity of Hemp Straw is given as 0.039-0.040 W/m²K and the embodied energy is given as 10MJ / kg (Greenspec, 2017). The inhabitants living in reed and bamboo structures reported that their homes offered more thermal comfort than the neighboring dwellings. This indicates that the usage of straw matt and reed is common and continues in contemporary practice, however, to prevent the degradation of buildings, precautionary measures need to be considered.

DISCUSSION

The study points out that the issues regarding tourism and sustainable development at chotiari and the following strategies are proposed for sustainable development:

* Local villagers should be trained in proper construction techniques to build sustainable lodges. The objective of constructing lodges via involving local communities, should be to support and promote the area's vernacular and environmentally friendly architecture. In this way, the local community can be supported economically and it will allow them to establish their independent local business and use appropriate construction technique to other construction projects.

* Local technical expertise, methods and natural and locally available materials should be used to construct lodges for tourists. Responsive materials used for construction can return to nature at the end of the lifespan of the building and establish a close natural cycle to achieve environmental sustainability. Tourists staying in these lodges can learn about new technologies. The key sustainable objective should be conveyed by the structure of the building by it camouflages around the cliffs and the surrounding scenery.

* Additionally, lodge's should hire staff from local

community and provide them up to 80% of surrounding village's food and products. This will help promote local micro-enterprise by organizing open days to sell local craft and products to tourists. This will also create jobs, foster the local economy, and create an enjoyable experience for guests. Besides, cab be facilitated tourists with boating and fishing activities, that can be run by the local community.

* Solar photovoltaic (PV) systems have demonstrated their efficiency in Chotiari but on a smaller scale. It is proposed that local businesses utilize solar energy at a larger scale with a decentralized renewable energy system. This system consists of a mini-grid, a solar photovoltaic plant, based on solar energy with a regional supply system to a village. Therefore, local organizers with the help of the government must install a decentralized energy system in this region. Additionally, provide Solar Stoves for cooking should be provided to local communities. This will save their time and energy wasted in the collection of wood for cooking. Furthermore, solar pumps for irrigation and solar hand pumps should be installed at a common location for drinking water.

* In-situ (make an artificial natural environment for birds), and ex-situ (make seed banks, by pruning off seeds bearing branches, gene banks, and captive breeding), conservation strategies to maintain the biodiversity of the region should be adopted.

* The following architectural principles, based on a understanding of local centext, should be implemented.

→ Orientation: The east-west direction is the best orientation. Configuration along this direction reduces heat gain (Figure 30).

→ Forms: Rectangular or circular structures with greater wind penetration are favored over irregular shapes (Figure 31).

→ Walls: Must be solid and made by natural or recycled building materials, such as clay, sand, straw, burnt mud bricks, sun-dried mud bricks, wood and reed. If the use of other materials such as solid or hollow blocks of concrete cannot be avoidabed then they should be used with a cavity. Surfaces must be coated with mud plaster, cement mortar and lime wash.

→ Roof: Hip or conical roof structures should be built (Figure 32), to minimize the load of heat. Additionally, a double roof can also be used to eliminate the re-radiation of heat to the inside.

Figure-30: East-West Orientation.

Figure-31: Circular and Square Forms Must be Preferred than Irregular Forms.

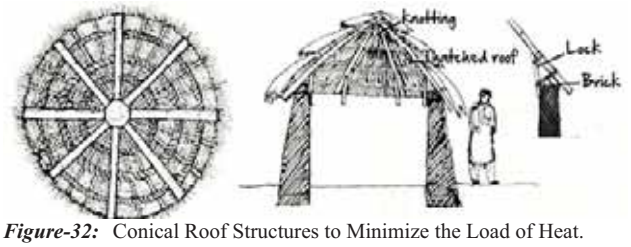


Figure-32: Conical Roof Structures to Minimize the Load of Heat.

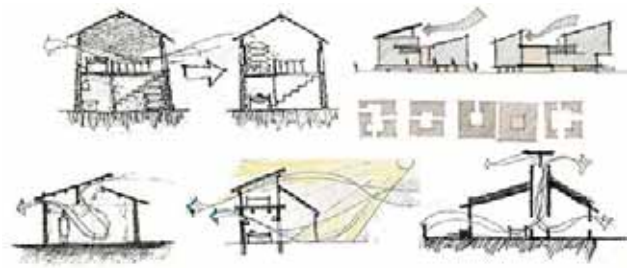


Figure-33: Fulfill energy Requirements by Passive Design.

→ Energy efficiency: Utilize Renewable Energy Sources to generate electricity, i.e. solar energy. energy requirements should be full filled by passive design, and choose energy-efficient appliances (Figure 33).

→ Natural setting: use existing terrains to fit in the new structures (Figure 34).

→ Courtyard: It should be part of the layout for natural ventilation and light. It must also be equipped with trees to increase the level of humidity (Figures- 35, 36).

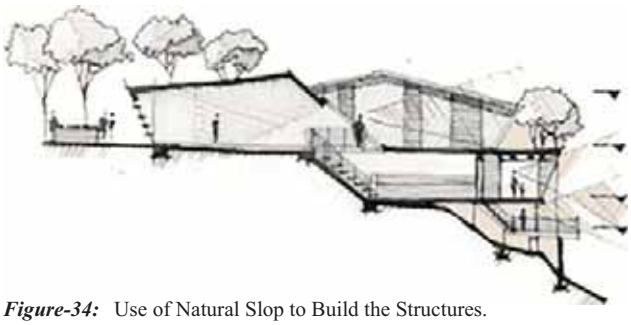


Figure-34: Use of Natural Slop to Build the Structures.

→ Shading devices: The size and number of openings facing the sun and the openings should be couered with traditional architectural elements/ overhangs. Necessary vegetation around the eco-lodges for shadingshould be used. No roof should be built without eaves (Figures 37).

∗ Some other significant points to be considered when developing ecotourism architecture/facilities are discussed below.

→ Water resources must be properly monitored and managed, along with waste processing and disposal that can deter the lodge from polluting its natural resources.

→ Design for the more economical utilization of building materials blends the unique physical and cultural environments, by careful consideration to design, landscaping, color, and the utilization of vernacular architecture.

CONCLUSION

Wetlands around the globe have great potential for tourism that are being developed through sustainable strategies and eco-measures in tourism architecture. This supports the native communities through economic stability and culture growth and to raises public awareness about the ecosystem while protecting the natural resources. Although the Wetland Complex of Chotiari is a rich tourism spot, ecotourism, however, can be seen to be in its infancy, and existing facilities of tourism hare resulted in inappropriate design for this region. As the ecotourism industry is growing, the demand for well-planned and sustainable facilities is high and there seem to be a necessity in this region that is abundant in many bio-diversity and ecologic characteristics.

Ecotourism can produce significant economic benefits for local communities and will ultimately guarantee the area's sustainable development and turn it to be an eco-touristic region. One of the criteria for the development of a sustainable eco-tourist area is the development of architecture, derived from local architecture, following the ecotourism's principles, and termed as "eco-lodge". This type of architecture is

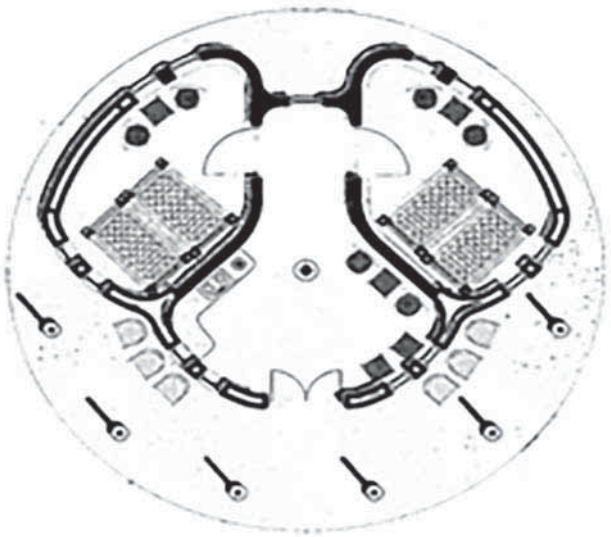


Figure-35: Solid Thick Walls Must be Used for Construction in Hot-Dry Climatic Regions.

Figure-36: Courtyard with Trees to Increase Level of Humidity

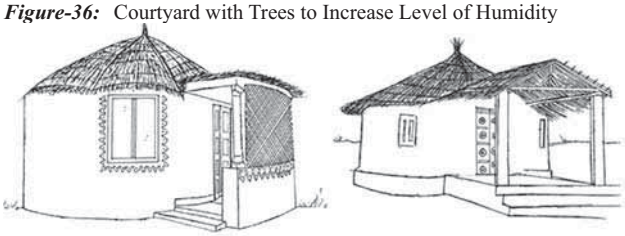


Figure-37: Use Overhangs and Sun-Screens for Providing Shadow in Summer and Sun in Winter.

designed and maintained in an environmentally sensitive way to protect its operating environment, and reflects back in time to the context and culture of the area. Therefore, it is the need of time to introduce sustainable ecotourism and eco-lodges culture across the various areas of the Chotiari Wetland Complex. Local governments, the private sector, developers, and local people can efficiently and actively be engaged and benefit from such an initiative. The Eco-lodges in the area should include the traditional construction methods, architectural style, and identity of the wetland to retain the personality of the wetland area.

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