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A STUDY OF TRADITIONAL AND INDIGENOUS CONSTRUCTION STYLES IN HIMACHAL PRADESH

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Abstract - *The architecture of a specific place is always an outcome of geography, availability of materials and resources, climate, socio-economic conditions, and most importantly, culture. While discussing about Himachal Pradesh, it has very scrutinized mountain ranges intermingled with valleys and gorges. Considering the harsh conditions, indigenous architecture forms the spine of its social and cultural setup. Indigenous architecture is sustainable as it does not exhaust local reserves. Resources that are in abundance are preferably used. On the one hand, it provides structure resilience against earthquakes, on the other, it is low maintenance. The state falls under the seismic Zones IV and V with the huge risk of earthquakes. When designed appropriately, the proper use of wood assemblies in indigenous Kath Khuni architecture offers a very high strength-to-weight ratio paralleled with other available modern work materials.*

Key Words*: *Stone, Himachal Pradesh, Traditional Architecture, Aesthetics, Indigenous architecture, Earthquakes, Seismic Endurance

1. INTRODUCTION

As Himachal Pradesh is adjacent to northern plains in India, the altitude of this region rises from mean sea level of 350 meters in the Southwest till the altitude of 6816 meters in the East.

While it has such huge range of altitude in such small region, this is the reason we find many different types of unique construction techniques here.

1.1 Hazard Profile

When it comes to hazards, Himachal is prone to many, be it natural or manmade. Natural hazards mainly consist of landslides, draughts, flash floods, earthquakes, fires, cloud bursts, avalanches and much more. However, the hazard which poses the biggest threat in this region is earthquake. As per the history of the earthquakes that has been recorded in the state, 80 times there were earthquakes with magnitude 4 and above as per Richter scale.

1.2 Seismic Zones

The state of Himachal Pradesh falls in the Zone IV and V, according to BIS seismic zonation map. Moreover from the view of seismicity, this region forms a part of North West Himalayas, which are very sensitive. From the mountains in the North East to low lying northern plains in the South West, there is enormous change in altitude, which is a considerable outcome of mounting thrust caused by collision and grinding of Eurasian and Indian tectonic plates. This specific phenomenon of drifting has been causing the rise of Himalayas, which is accompanied by the seismic activity.

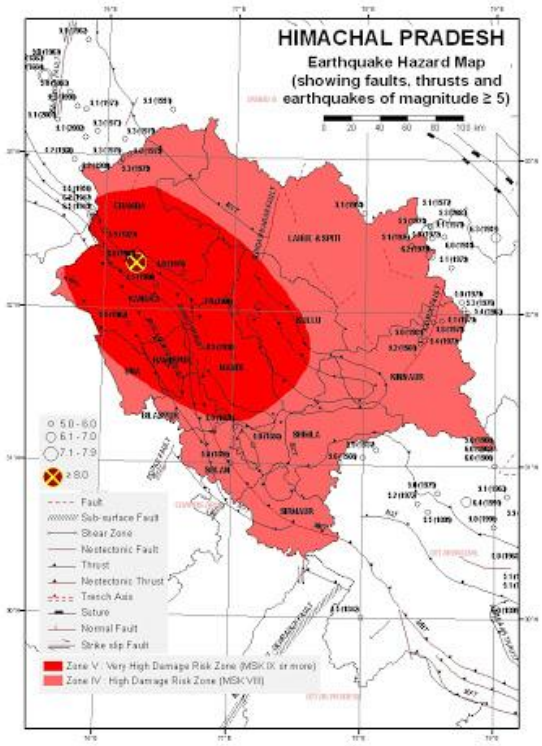

Fig- 1 Earthquake Hazard Map of Himachal Pradesh
(Source:http://hp.gov.in/hpsdma/ResourceList/Maps.html)

1.3 Topography

The state of Himachal Pradesh has been divided into three zones topographically.

1.3.1 Alpine Zone (Greater Himalayas)

It is the region with altitude above 4500 meters at mean sea level. It majorly consists of areas of different districts i.e. Kinnaur, Chamba and Lahaul & Spiti district.

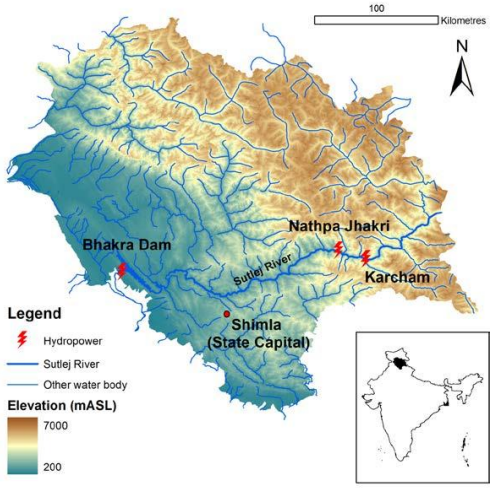

Fig- 2 Altitude Level of Himachal Pradesh
(Source:https://www.researchgate.net/publication/270448984_Harnessing_Hydropower_Himachal_Pradesh_India_Case_Study/figures?lo=1)

1.3.2 Mid Mountains (Inner Himalayas)

In this region, there is an altitude variation from 1500 meters to 4500 meters at mean sea level. Major districts in this category are Sirmour, Mandi, Kullu and Chamba.

1.3.3 Shiwaliks (Outer Himalayas)

The altitude variation from 350 meters to 1500 meters at mean sea level falls in this region. Hamirpur, Bilaspur, Una, Kangra majorly fall in this category.

1.4 Climate

A huge dissimilarity in the climate circumstances of the state is due to the disparity in altitude (350 – 6816 meters). There is a range of climate variation.

- Alpine and cold glacial in the mountain ranges of North and East (2400-4800 meters)
- Temperate and cold (1900-2400 meters)
- Warm and temperate (900-1800 meters)
- Sub humid tropical and Hot in the southern low tracts (450-900 meters)

In colder regions, windows size is small and height of ceiling is low for preventing loss of heat to have warmer interiors. Proper sloping in the terrace of the building is given for proficient drainage, in substantial snowfall and rainfall.

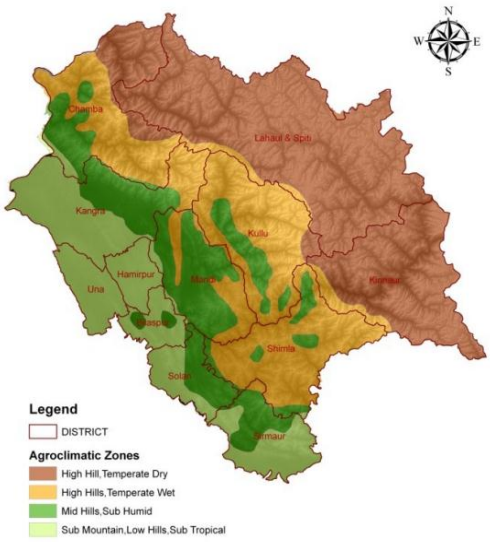

Fig- 3 Climate Map of Himachal Pradesh
(Source : https://himcivils.com/425-2/)

1.5 Forest Cover

In Himachal Pradesh, 64% of the land area is masked with the forests. Hence, it leads wood being most prominent construction material in all construction techniques, be it kath-khuni or dry stone masonry construction.

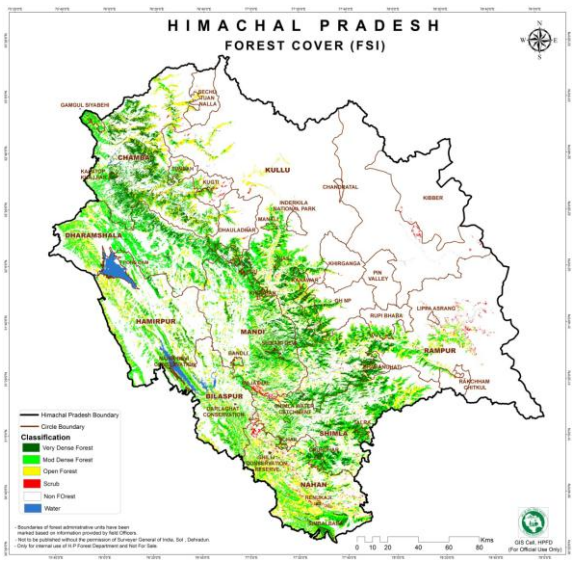

Fig- 4 Forest Cover of Himachal Pradesh
(Source:https://hpforest.nic.in/pages/display/NHNkZmFpiWY2NTRz-the-forests)

1.6 Construction Material

Wood, mud and stone are considered as primary construction materials here. Amongst all the variety of trees

available here, Kali and Deodar are most befitting for construction.

1.6.1 Deodar Wood

It is one of the sturdiest Indian conifers and is effortlessly available. It provides stability to tall structures when being used as beams, posts, door frames and other things. Considering it is a type of soft wood, very high tech tools are not required by the artisans. Even when deodar is untreated, it is termite and insect resistant. Moreover it can survive long phases of weathering.

1.6.2 Mud

Mud is quite easily available almost everywhere. It provides good insulation and has great binding properties. Mud is used in two ways in traditional construction style of Himachal. One way is by filling it into wooden forms and then ramming it into the place, eventually leading to a wall and the other one is by making sun dried blocks of mud.

1.6.3 Stone

Stones used in traditional construction here are of two types.

- Hardstone: It is generally used in walls and foundations of the building. Main sources of these stones are local quarries.
- Slate tiles: These are a type of metamorphic rock and are used in roof of the building. It is frost resistant and provided moisture barrier.

1.7 Settlement Pattern

Typical villages in the state are along the stepped contours. The heart of maximum settlements is at temple which is usually located at the highest spot of the village.

Houses are typically located on the southern slope because of cold climate. This way houses maximize the penetration of sun light, while being in this orientation.

Height of the buildings is controlled by the path of sun, as sunlight needed for every dwelling unit. If height of the room is kept low (2.1-2.4 meters), that results in little surface to volume ratio dropping heat loss from the surfaces.

2. TRADITIONAL CONSTRUCTION TECHNIQUES OF HIMACHAL PRADESH

- Mud construction in Alpine zone
- Kath Khuni construction in Inner Himalayas
- Dry stone masonry construction in Shiwaliks

2.1 Mud Construction

These houses can be seen in abundant in alpine region of Kinnaur, Chamba and Lahaul & Spiti, that too at those sites, where water is promptly available.

Walls of these houses are up to one foot thick and in severe winters, they provide great insulation. Most of the houses typically are double-storeyed with flat roof. As during the winters the winters there is snow up to 5-6 feet, hence second storey for access the outside world. Generally, the mud houses have up to 8 to 10 rooms.

Fig - 5 Mud Construction in Alpine Zone
(Source:https://db.worldhousing.net/list/?submit=Search&q=Mud+wall+construction+in+Spiti+Valley)

2.2 Kath-Khuni Construction

This construction technique is most predominant in the isolated hilly villages in of the Himachal Pradesh majorly in Sirmour, Mandi, Kullu and Chamba. In the Uttarakhand region, this same technique is known as Koti Banal.

This construction technique principally uses stone and wood as they are easily available. Therefore, it is a result of use of all the resources at hand instead of getting or importing anything from outside.

Plinth in Kath Khuni is filled with stone almost up to one meter above ground. While constructing the walls, alternate courses of wood and dry masonry is done without use of any mortar for cementing. In the wall, two timber joists are laid corresponding to each other and space in between them is filled with rubble stone while a wooden nail (Kadil) is used to secure the edge.

However, while proving windows in the walls, it's done with the help of solid plank shutters. As in these walls, in-built storage is considered their integral part.

Fig 6 Kath Khuni Construction

(Source: https://www.sahapedia.org/the-himalayan-vernacular-kath-khuni-architecture)

2.3 Dry Stone Construction

This type of construction style is more prevalent in the villages of Kinnaur, Kullu, Shimla, Chamba and Kangra. Because of rivers in these regions, there is availability of river stone and then there is scarcity of good wood, which leads to this kind of construction technique.

It is a variant of kath khuni, with no use of wood. General term for these types of houses is "pathar ke makan" which literally translates to houses of stones. Plan of the house is generally L-shaped or rectangular, with typically two to three floors.

As cupboards are also required in houses, in that case niches are left in the wall. And then later on bricks are used to create space within wall because of their much smaller thickness. Furthermore, RC or wooden staircase is generally provided in case of more than one floor that that outside the building.

Fig- 7 Dry Stone Construction

3. CONCLUSIONS

In the end, it's fair to conclude that, all these traditional building techniques are result of availability of material in specific region and the ecological sensitivity. Most commonly used materials are wood, stone and mud. All three of these are used in different manners depending upon their availability.

Usage of nearby accessible resources, joinery sections and dovetailing of linkages with the nails is characteristics of these indigenous architecture styles. As of now, as far off places are getting connected to near-by towns and cities, these construction techniques are evolving with new materials suitable for the local climatic conditions. With the continuous change, the future might be uncertain, but people locally are trying their best to keep it alive.

This study has been carried out to capture the essence of local architectural building practice that is worth saving and appreciating.

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