Sustainable Architecture
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Lecture - 46
Vernacular Architecture – I

Good morning, welcome to the 10th week of lectures for this ongoing online course on Sustainable Architecture. We have already discussed about the introduction to sustainable architecture, sustainability at large. And then we have discussed about the various components, various parameters of sustainability and we gradually moved on to sustainable architecture. And then we saw different components for example; energy, water, IEQ, materials, and resources site.

So, we saw all these components and we also looked at each of these components in utmost detail. We discussed about the different technologies which are available, what are the different design strategies, what are the different passive strategies which can be incorporated in sustainable architecture. So, on the whole we now know how to create sustainable architecture in today's times.

However, if you look at some of the examples of historic buildings or traditional buildings the very initial few lectures with which we started, we see that those structures were also very sustainable. So, do we think that traditional architecture is sustainable and if yes then what is it that makes vernacular architecture or traditional architecture sustainable?

So, what are the common traits or what are the traits which make traditional architecture as sustainable? So, let us quickly look at this vernacular architecture and gradually look at some of the case study some of the examples of vernacular architecture and then see, examine them for their sustainability.

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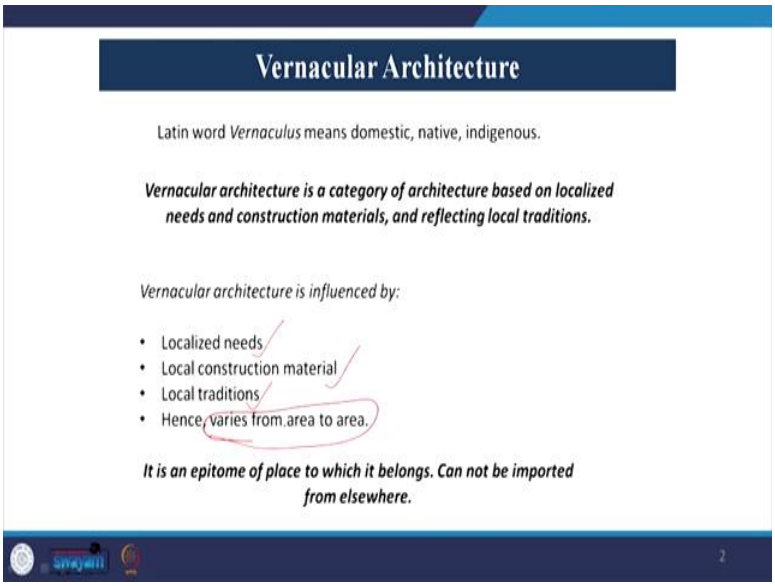

So, when we talk about vernacular architecture; vernacular as a term is coined from the Latin word called vernaculus which means domestic or native indigenous. So, vernacular architecture is essentially indigenous architecture. And that is the architecture which has evolved out of the local resources. These resources may be physical resources, tangible resources, and also intangible resources for example, the society and the culture is an intangible resource.

So, vernacular architecture evolves out of the available local resources and are in response to the local needs of people. So, vernacular architecture out and out is an indigenous architecture, so it is influenced by the localized needs. So, vernacular architecture if I have to summarize it responds to the local needs.

It use as the local construction material or the tangible resources, physical resources; it respects the local traditions, society, and culture. And hence vernacular architecture varies from area to area; we would not find vernacular architecture of one place exactly the same as that of another place.

Because whether it be resources, or society, culture, traditions, or the needs, at least some of it is bound to change from place to place. And hence vernacular architecture is unique to each place it bears the identity of that place. So, it is absolutely local and hence since it is so unique it cannot be imported from one place to the other place which is where the

main difference between the contemporary modern sustainable architecture and vernacular architecture lies.

Vernacular architecture belongs the identity, it has the identity of that place while sustainable architecture contemporary has no identity of a place. We use the same technology which we may be using in other places, we may be using the same kind of design principles. And hence the resultant architecture is also the same wherever we go even when it is sustainable.

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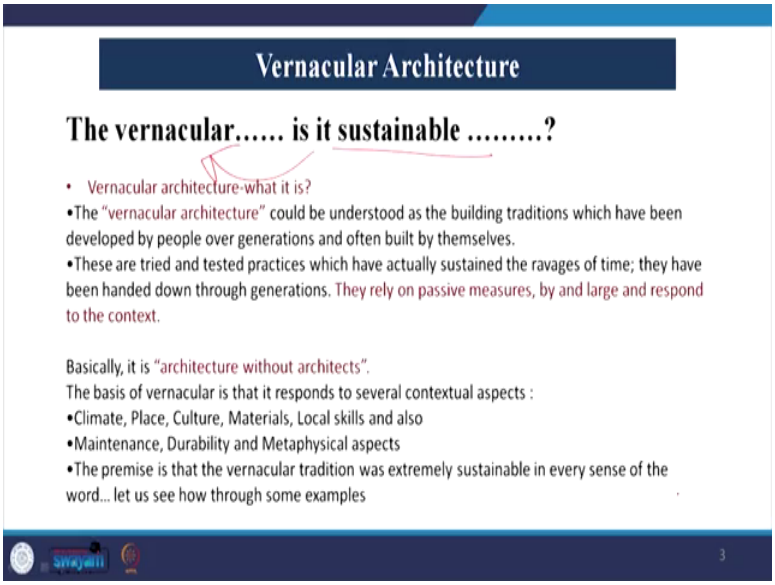

So, when we are saying whether vernacular is sustainable or not we are looking at all the aspects of sustainable architecture. And then, checking whether it is found in vernacular architecture and that we will do through the case studies. But, basically vernacular architecture is architecture without architects because it has grown organically over a period of time.

But, since it is a long time that we are talking about people have perfected their own architecture. So, it is an architecture without architects and it not only responds to the tangible aspects which can be seen, but it also responds to the intangible aspects and also the metaphysical aspects beyond that. So, there are issues which are taken into account for example, maintenance, durability, the lifestyle, the culture of people.

And there are metaphysical aspects which are expressed in terms of religious beliefs and a couple of others. So, if you remember the slide we have used this characteristics of sustainable architecture to define what sustainable architecture should be. So, if you remember we will quickly take a recap.

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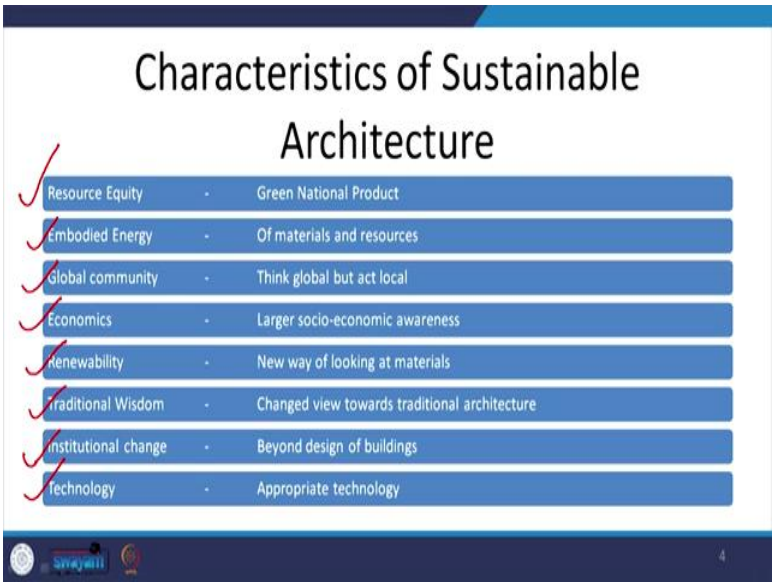

So, sustainable architecture has resource equity, it has low embodied energy, it responds to the global community. So, we think globally, but yet we act locally. It talks about the economics having a larger socio economic awareness, the materials used are largely renewable. There is traditional wisdom, and it institutionalizes the change, and it uses the appropriate technology.

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Let us quickly go over couple of these vernacular architecture examples from all over the world and see whether these qualify to be called as sustainable or not. So, this particular example the first one is a traditional Thai house. So, if you look at the design of this Thai house which is a typical design in the villages of Thailand.

So, the material which is used for construction is bamboo and locally available weed which is used for thatching the roof. The bamboo stilts the bamboo poles are used to create these stilts and then this design of the hut is such that it has steep slope and the portion beneath these stilts is kept open it is kept free. And in addition to this we would find a lot of trees around the huts usually.

Now, why is it being done and how are they doing it? First of all raising it over stilts. Because most of these were like constructed in coastal areas and these villages would be inundated with water the tidal waves and also because this region receives heavy rains that is why the slope of the roof is so steep.

And also the raised stilt allows for the water to come in during early mornings and late evenings that is during the high tide time. Rest of the day during the day this space remains cool, because it receives very good breeze and it remains shaded. So, this area is used for daytime activities; the skin of the building which is these walls are very thin and they will allow for ventilation through the skin.

So, when this thatch becomes wet or even when it is not wet it allows for ventilation through it. And also the design is such that there are large openings in these houses which also allow for a lot of air movement which is what is the requirement of a warm humid climate like this. The material which is used for construction is all locally available, it is it can be replenished it is rapidly renewable. So, not just renewable, but it is also rapidly renewable material.

So, bamboo is a very fast growing plant to all of us know that the weeds that they use for thatch are commonly available and they grow very fast, so all the materials are locally available and then on top of that there is this uniqueness of design. So, anybody who looks at these huts looks at the shape of these huts can out rightly tell that this is from Thailand.

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So, on the whole not just that it serves the functional purpose but it optimizes the use of materials, it optimizes the use of site and it serves the people local needs. So, it is not just environmentally sustainable, but it is socially sustainable it is economically sustainable. Alongside the huts that we just saw were for the common man. If we look at the palace the Thai lord's house, we can see slight change from the common mans hut house to the traditional lord's house.

Now, the shape of the hut remains the same shape of the roof remains the same thereby providing it the same identity of belonging to the same place. So, whether it be common mans house or it be the lords house the roof profile is the same which serves the

physiological requirement of running off the rain water, number one. But at the same time it provides the same identity.

Other than that instead of using bamboo the lord's house uses the commonly available wood for the construction of this house. So, instead of a material like bamboo which is so commonly available here wood has been used which is renewable, but not rapidly renewable. So, the using renewable material also the size of the house is not extraordinarily large it is well within the equitable resources limit yet to maintain that hierarchy.

The house looks different it looks better which was also the need of the society. So, we see that vernacular architecture of Thailand has very well responded to all the environmental needs, the economic needs and also the social needs of the people. And hence it can be called as a good example of sustainable architecture.

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Also because almost all the houses in Thailand are along the waterways the traditional settlements thus the stilts not only served as the purpose of for allowing the water to drain off to these water bodies. But, since these waterways were used as a means of transportation these stilts also allowed the lower portion to be used as a make shift place for transporting people. So, the boats would ply near the houses and people can conveniently get into their boats and get down. So, that is how the design overall served the purpose, the social purpose.

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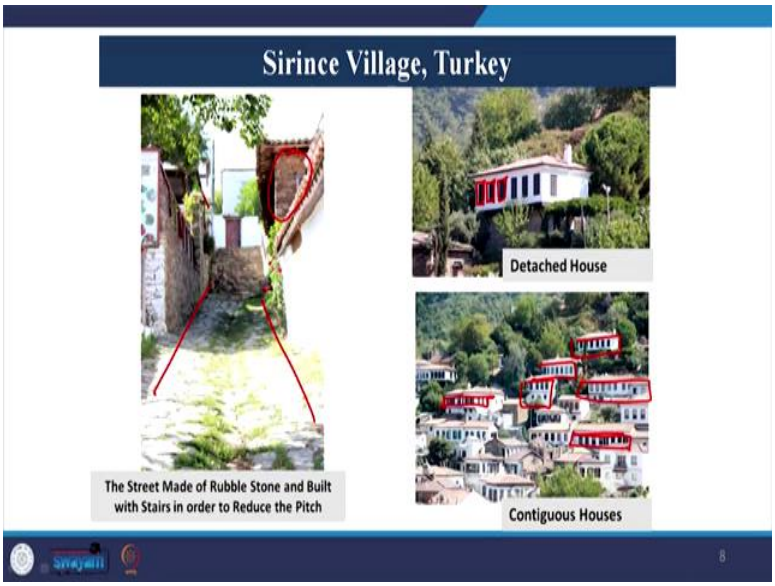

The next example we take this is a village, Sirince village from Turkey. Now, if we look at the geographic location of this village and also the resources which are available we can see that a lot of stone is available from the mountains nearby and wood. So, the most commonly available material is stone and wood which is what we see here being used.

Now this is a mountainous terrain, a hilly terrain, second the local materials which are available stone and wood. And then the climate of this place which is largely cold for most part of the year. So, to respond to that we can very clearly see the response in terms of vernacular architecture; the houses are made up of stone largely part of it for example, the wood frames, and the beams inside the houses are all made of wood.

So, all these frames and the beams in the roof are made out of wood which is locally available again. Even the streets are lined using this stone which is commonly available that is the resource which has been used in these buildings, in these houses.

Now, as far as this design is concerned all the buildings are oriented to face the sun facing side on the hill. So, all the buildings if you can see they face the sun they have been oriented in such a manner that they face the sun and they have huge windows. So, these windows if we look at these and compare it with the other examples from hot dry climates which we subsequently will. Almost the entire façade is full of windows, huge windows and these

windows are usually the glass windows which allow for lot of sun to be penetrated inside these residential buildings.

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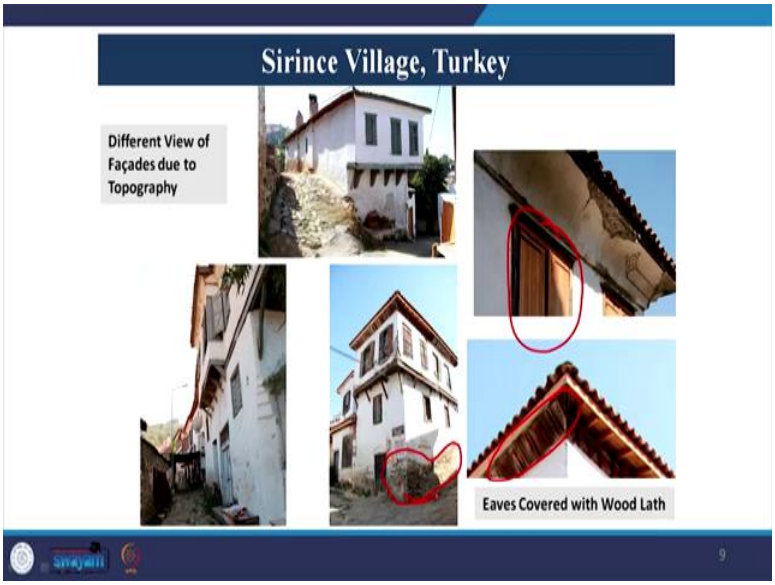

Thus it responds to the environmental domain, environmental dimension of sustainability. However, because of this topography there is a slight variation in the look of the building the facades that is because of this topography yet each building which is different still look similar very similar to each other because of this unique identity.

So, these are the wooden beams that I was talking about in the roof, in the windows. So, windows not only just have glass in them, but they also have wooden shutters because it becomes extremely cold. And in extreme cold the wooden shutters would be drawn to keep the cold out and the rest of the building is constructed out of these stones. So, here when it is revealed we can very clearly see that the walls are made out of stones largely because mud is not available, earth is not available. So, this is also a classic example of sustainable architecture.

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Next we have this example of Bhoonga of Rajasthan; I am sure most of you have already heard of how Bhoongas are designed. So, Bhoonga of Rajasthan are kutcha construction they are not permanent houses yet majority of the Bhoongas have survived for centuries continuously that is by virtue of its design and the optimized amount of resource that it consumes.

First of all the requirement for a hot dry climate is to reduce the surface area to volume ratio. And all of us know that the minimum surface area for if different shapes are compared is that of a circle. That is why the Bhoonga takes a circular shape. So, all the Bhoongas are circular in plan that reduces the amount of surface area for this building.

Next the amount of openings, so the Bhoongas have very small openings which is a response to the physiological conditions of this place. So, this is in desert extremely high solar radiation very hot temperatures. So, we have to minimize the air ventilation during the daytime and also there is no need to have huge windows because it will only add to the glare and only small windows are sufficient enough to permit sufficient amount of daylight inside.

In addition to this compact shape and small windows the material which has been used in these Bhoongas is mud it is earth and it is often mixed with cow dung. So, every year subsequently the top layer is recoated it is maintained by recoating the top layer mixing mud with cow dung which not only provide it its durability.

But it also protects it from the rain, because it is like applying a coat of plaster on top and this plaster is renewed refreshed every year. On top of this plaster the mud and cow dung plaster which is applied every subsequent year to impart the unique identity to the Bhoongas they are often decorated both from inside and outside. So, inside if you would see the traditional Bhoongas you would find the ornamentation which uses a lot of these mirrors, small mirrors and it is fully decorated from inside and also from outside.

So, these are the typical patterns of which are found in Bhoongas; Bhoongas are there in Rajasthan as well as in Kutch. And we can distinguish between the Bhoongas of Rajasthan and Kutch simply by looking at the designs which are painted on these walls that is providing the identity. Also another very interesting unique feature is that it has a roof thatch made out of thatch which extends much beyond the walls.

Now, there is anyways very little rain in this region where Bhoongas are, but whatever minimal amount of rain is there the mud wall is prone to be damaged if the walls if the rain splashes on the wall. So, if there is driving rain this extended roof protects the mud wall from getting wet by the rain.

And hence most of these Bhoongas they have survived for almost centuries and they just keep getting maintained year after year. There was an interesting study that after the earthquake of very high severity in Bhuj, almost none of the Bhoongas faced a severe damage almost all the Bhoongas survived that was by virtue of the design, so, not just this individual building, but also the boundary around it.

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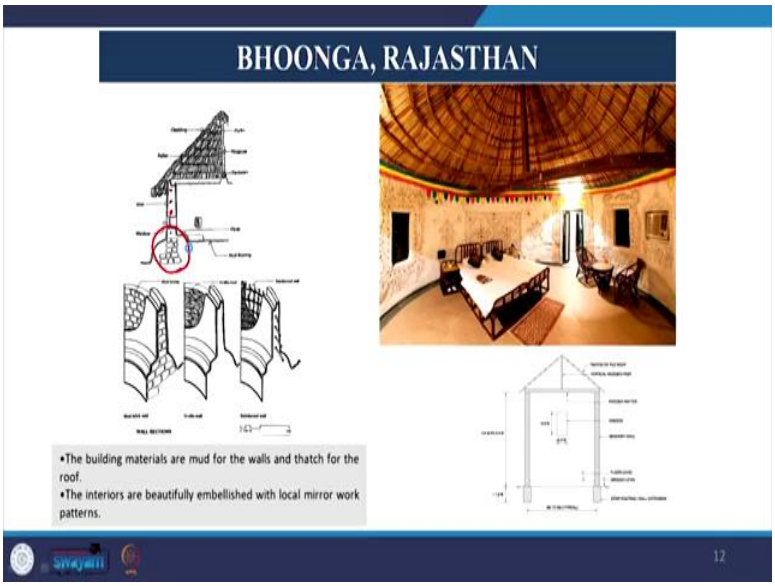

So, the boundary around it was made in the form of a fence which was made out of mud again same kind of construction covered with thatch or sometimes made out of thatch. And that prevented the sand to come into the community, the village and most of the sand would just settle outside the boundary of the village. So, this is a renovated, this is a hotel, but this has been constructed using the same materials and same design principles as that of traditional Bhoongas.

So, small windows thatched roof, the circular plan, and originally the Bhoongas for reinforcement they also used the locally available weeds in the center. And on top the mud was applied very rarely would this brick be used or the stone be used and if at all it would be used it would be used only in the foundations. So, we can conclude that Bhoongas again very sustainable example of architecture.

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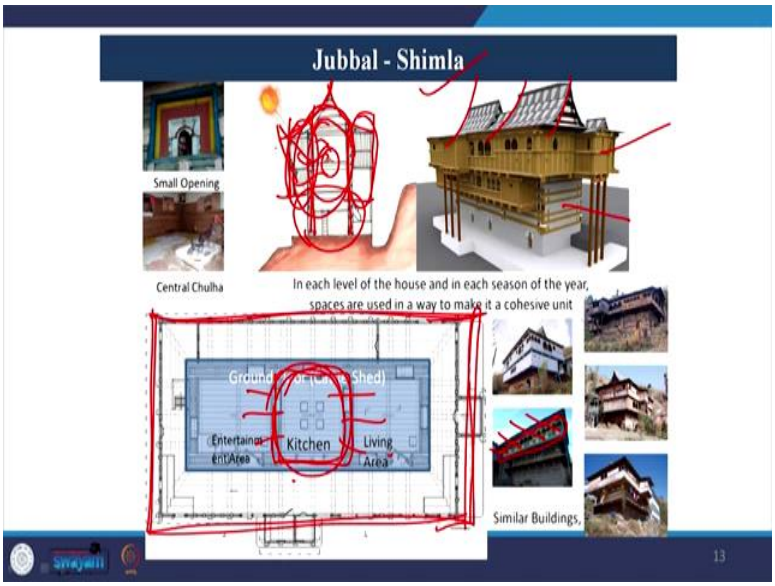

Looking at another case study from Shimla, so this is in Jubbal Shimla, if you look at the design of the houses which are found in Shimla which is on high altitude hills. We can see first of all this slope of these roofs which is to slide off the snow and rain which it receives. Another is the geometric plan of the building, so it is a linear plan. If you look at this ,this is a thin linear plan which responds to the availability of land.

So, the hills do not have a lot of plain land available these are thin patches which are along the contour of the hill. So, these thin patches of the land are used to construct the houses and hence most of the houses are very linear. And this linear arrangement is becomes slightly expanded on top while it is very narrow.

So, the, so there are two skins because it is extremely cold. So, the inner skin is made up of stone which is also commonly available and this is like very thick wall. The second layer which has been added which is an extension on the upper stories is a thin wall which is often made out of an insulating material like wood. So, wood is insulating and what it allows for is? it allows for sun to penetrate in.

So, there are a lot of openings in this outer skin. So, these openings are facing the sun facing site on the hill and these allow a lot of penetration of sun. The heat of the sun is taken in this area which is the peripheral area and it is also transmitted inside in the plan kitchen is the central space. So, whatever cooking it has to happen will be happening here and the heat which is generated due to this cooking activity is contained it is stored within

the building within the residence and it is used to heat up the interiors. So, that is how the environment the climate is responded to by using the materials carefully.

So, stone and wood largely which is also locally available and it can also be replenished it is available in abundance, thus design making it linear the steep slope. And also the needs of people, the social needs, so this ground floor is actually used to keep cattle's and to store hay while people stay on upper floors. And the kitchen is in the center where it is used to heat the entire space.

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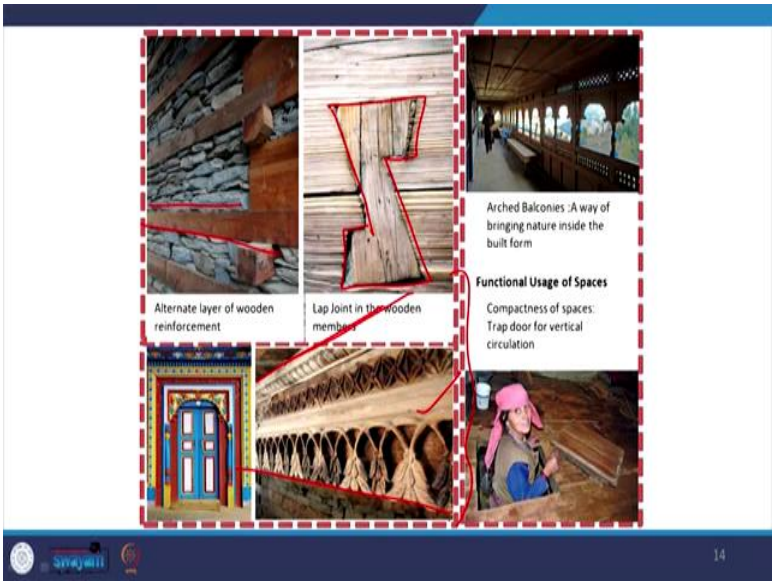

So, it is not just responding to the environmental needs, but it is responding to the social needs. And the moment we use locally available resources it is responding to the economic needs as well. Also another very interesting fact is the type of wood which has been used. So, there are different types of woods which are available, but these woods are carefully selected.

So, for ornamentation the hardwoods are used which can be carved out. For constructing the walls for providing the reinforcement, but because it is also an earthquake prone area even harder woods are used for joints for making the joints for connecting the wooden beams and all. So, very hard wood is used while comparatively softer wood is used for ornamentation and carving. But this is used in very limited proportions very limited amount of this wood is used which is for ornamentation.

So, this ornamentation and this design, the steep slope imparts that identity yet fulfilling the socio cultural needs of the people and also being sensitive towards the environment. So, we can again conclude that this is an interesting example of sustainable architecture. The last case study that we are taking today is that of Kullu.

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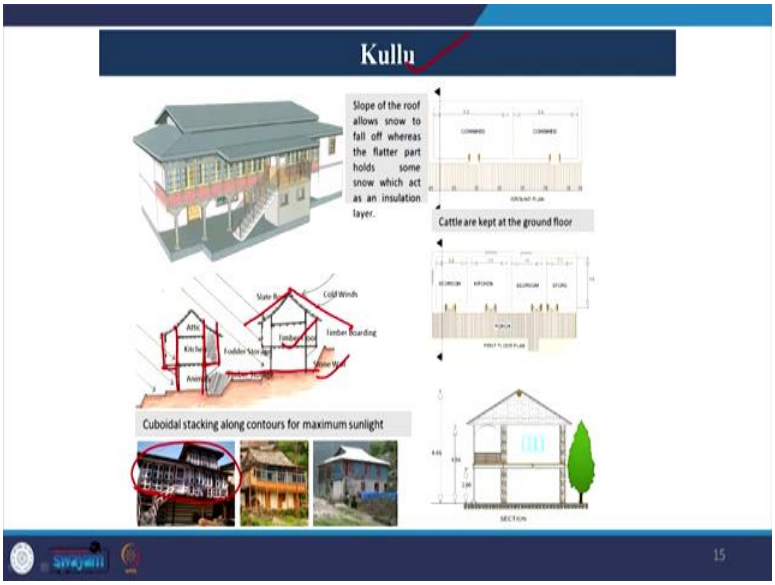

Now, Kullu is slightly lower in altitude as compared to Shimla. Also the hills since they are not that steep they have larger portions of flat lands available as compared to Shimla. So, we can see that the plan of houses in Kullu they become wider as compared to the houses in Shimla also the roof becomes relatively less steep because it does not receive as much of snow

So, we can see these changes in the design coming in; however, the materials have remained the same. So, it still uses stone, it uses stone, it uses timber largely these two because these are again the most commonly available material. We can see the design responses more or less the same. So, thick walls in the center there is a extension on the upper floors in the form of a balcony huge windows which are facing the sun so that the heat during the day from the sun can be trapped inside the building. So, more or less the responses are very similar yet those subtle differences in terms of planning in terms of the design of the house they have set in.

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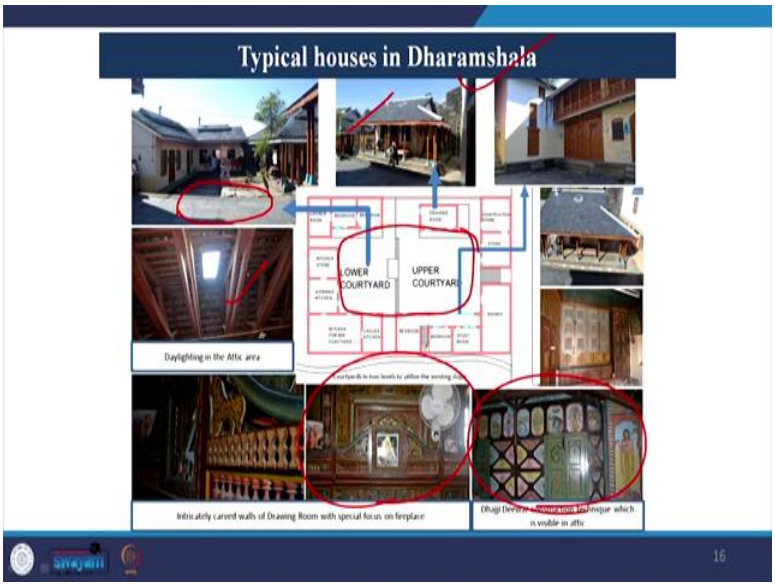

And the third one in this series is the houses in Dharamshala. Now, the Dharamshala is again hill, but it is a valley up in the hill. So, it is cold climate, but yet flat land is available. So, we can quickly look at the plan. There is more area available so, the house becomes much bigger, bigger in size there are no multiple stories. While in Shimla we could see that almost all the houses were g plus 2 where the ground floor is used by cattle for cattle and for storing hay and husk for them. In Kullu they become one storey lower because the coverage on ground is more.

In Dharamshala majority of the houses are only single storied houses because they are quite large. So, there is courtyard, Dharamshala can get quite warm in summers, but in winters it also becomes extremely cold, and its used to snow also. So, the roof is still sloping, but the slope has reduced it is not very steep the courtyard is there. So, to receive the sun during the winters the courtyard is there and it also helps in summers.

The ornamentation has slightly changed, so that reflects the socio cultural context of the buildings and the people. The materials remain the same, so it is largely the stone and wood which is also commonly, abundantly available. Now, through these three examples one from Shimla high altitude, Kullu mid altitudes, mid Himalaya's, and Dharamshala valley which is almost flat.

We can see that the even after the availability of resources is the same types of resources stone and wood is being used. Yet the design response is changed, design response is different, but it responds to the climatic context of the place. Through this we can very clearly establish that is vernacular architecture is of the place and it is for the people and by the people.

So, I will continue this lecture this discussion on vernacular architecture and how we can perceive it to be sustainable? Or what are the traits of sustainability which we can identify in vernacular architecture in the following lecture. Thank you for joining me and see you again in the next lecture on vernacular architecture.

Thank you.