**INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

**NPTEL**
**NPTEL ONLINE CERTIFICATION COURSE**

**Housing Policy & Planning**

**Lecture – 12**
**Technology Systems in Housing Delivery**

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Hello, today we will discuss the very important part of housing policy and planning which is the technology system, which enables developer or which ultimately deliver housing to the user groups. So before we come to the technology systems let us have quick recap of the last discussion. In the last discussion we discussed about the housing finance and affordability. In the affordability session we discussed two elements what is which influence the relative affordability of a product.

One is the supply side, which reduces the price of the product or cost of the product and the demand side intervention, which basically enhances the capacity of the people to purchase a house. Then we discuss the housing finance the some concept of the housing finance how it is operated, what is major processes and the major problem and issues. We have seen that major problems was the access by the common people, poor people to the housing finance, it is flexibility and the formal mechanism, which create some barrier and also we have seen that the NPS nonperforming as it is which is major concern from the major bank and based on that discussion, we will come to the next part of the discussion today, which is called as the technology systems.

In the initial lecture when we discuss the problems of housing delivery, we identified several elements, which is basically barriers or creating the barriers in effective housing delivery and within that we identified two to three major barriers, one major barrier was housing affordability, which we discussed last day and later on we will come as when required. Another major barrier was that the project construction, project delivery of the housing because housing such subject, such matter, which need to be constructed on ground really, and deliver to the people and it depends on many factors land, availability of the material,

availability of the labour, the technology system or technology, which is actually creating the housing, how it is delivering and the administrative in the office institutional mechanism, which also influences the speed of the housing.

So within that we have seen that in the current practice the one housing, bigger housing project like say 500 or 1000 unit, housing project which takes 4 years or 5 years from the inception to the completion or this for other and sometimes it takes more it is delayed. One of the major problem of this delay and the durational, long duration is the conversational technology system and conversational construction system, which used and this construction system by enlarge is onsite.

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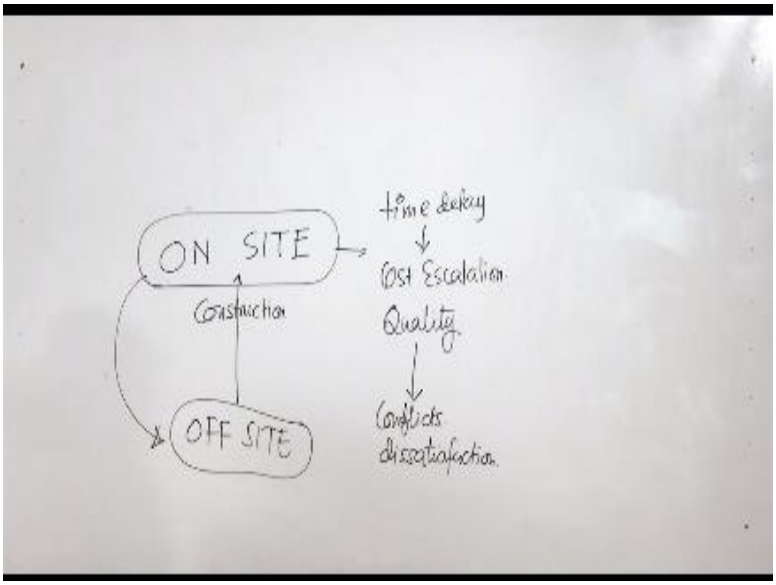


And since it is onsite construction that means starting from the foundation to the super structure to the everything finishing, infrastructure everything is done on site and because of the onsite it takes long-time and not only time the onsite activity of the construction, onsite 100% onsite construction it leads to time delay and since there is time delay it leads to cost escalation, another very important but it is related with that since it is a site based construction the quality also compromised.

Quality of the product, quality of the housing also compromised because it is onsite construction based on the actual availability of the labour and it is skill level. So, these are

the issues and also sometimes it leads to the conflicts between the inducers and developer and dissatisfaction. As response to this problem one of the solution is that to construct the onsite activity to a outside model where offsite model where the major construction take place in a factory in terms of building compounds.

Every compound of a house, which is manufactured at the factory under given design prescription and then transported to the site and assembled on the site and the major differences in the onsite construction, some of the activities are not possible during the rainy season and it is prom weather. You cannot construct a house in a rainy season or a in very extreme weather, but if it is offsite construction then you do the construction or the manufacturing at the factory and then you come to the site and assemble in a given period, in suitable time in convenient time.

So in a short you achieve the time and if you achieve the time, the cost and quality, why quality because if it is done at the factory it is the quality it is standardise product, it is done in a standardise and more monitor process. So it is ensure the quality as well and as result the more satisfaction will be there and dissatisfaction will be result.

Some of the countries they have gone through this process of the onsite construction to the offsite construction to get the benefit of this trying effectiveness, cost effectiveness, quality everything. Some of the country they call it as modular construction, some of the country they call it as manufacture construction or some of the country they call it as a industrialised building system or building technology for the faster housing. So the major advantage of this construction is basically time saving.

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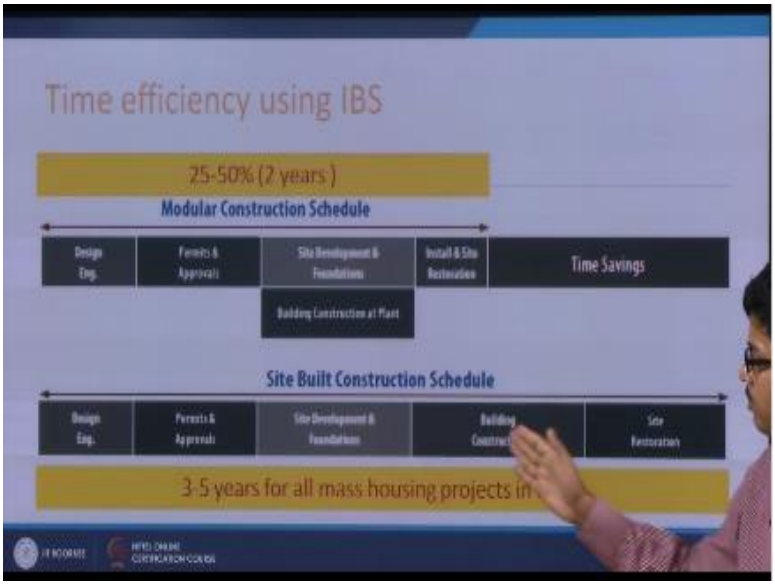


So in a typical modular construction schedule and this is a site build constructions schedule where you have the permit and approvals then site development, then building construction and site restoration. So building construction and site restoration basically takes long-time, which takes basically 3 to 5 years for India. Whereas in a modular construction or offsite construction you just need little time to install and site restoration.

So this is the time savings for typical offsite construction, which we are calling at a industrialised building system, which is nothing, but incorporate the industrialized system at the outside of the factory then bringing the product or the compound in the site and assembling for the faster delivery of the housing. So to understand in a better way how it works and how what can be done for India let us understand how it works technically.

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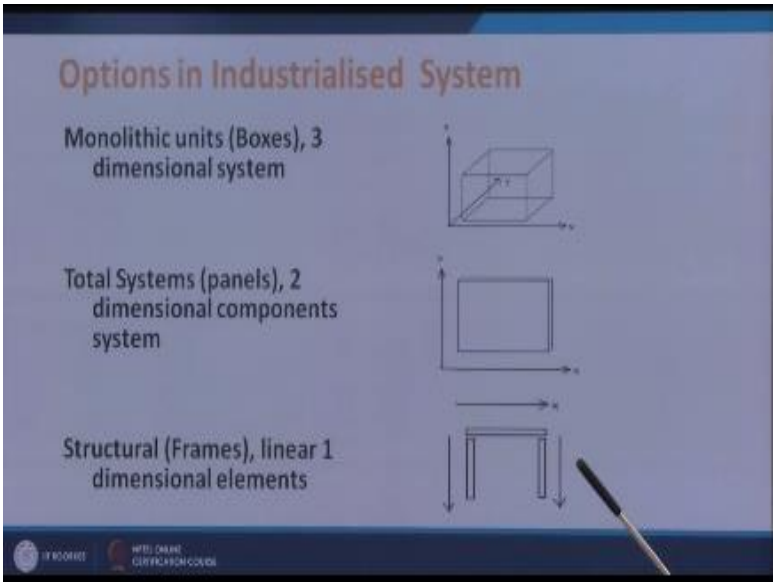


Now ultimately since the housing is building and it is three dimensional object this object can be analyzed in three ways. One could be that we consider each room or each unit as box, which is called monolithic or box system or three dimensional system another approach could be that to make a enclose space to make building we consider each and every was as the panel, which is called as total system and which is basically two dimensional because if we consider, if we ignore the thickness for our convinces of understanding it is basically two dimensional.

It is not enclosing a space fully, but multiple units of panel can encloses space in a better way and also the traditional way of constructing a house like the beam, and the column and the beam, which makes a structure and use of multiple number of columns and beams can create an enclose space, which is called frame system or linear system, which is basically kind of linear one dimensional compound.

So in industrialized system we can use any of the approach based on our situation. Now let us see which of the situation will be suitable or useful for India case. Now based on the system there are two different characteristics, which basically influence of the system. Those are called as close system and open system. In a close system the whole design standardization and construction is done by only one provider or one manufacturer.

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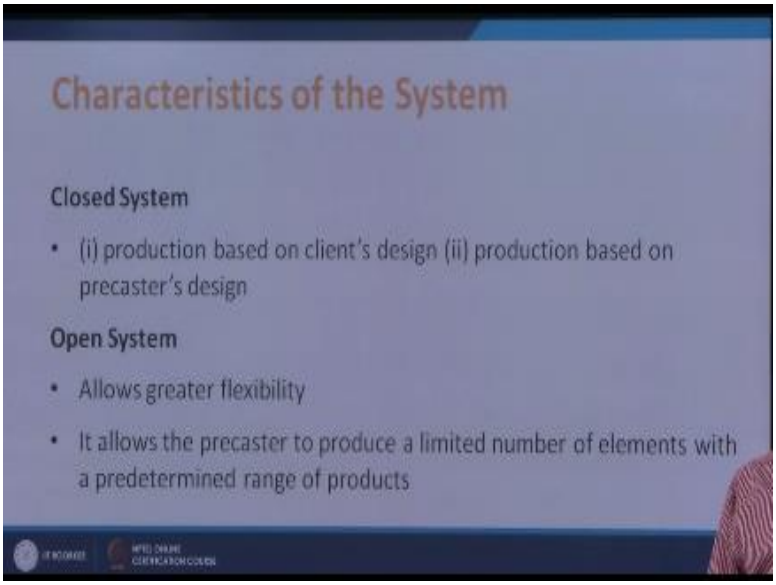


So close system the production can be based on the client design means if plan can provide design to manufacture a manufacture can produce that housing starting from the design to the construction and deliver to the client and it can be based on the per-caster or the producer design sometime the developer or producer or pre-caster they can design a product, they can design construct and manufacture and supply to the market and based on the markets situation people can buy directly from the people so these are close system.

The characteristics of the close system is if I as pre-caster or a producer I develop module I develop a product in that product no other company, no other manufacture will be able to monitor or to modify the product to enhance the product so it is close to the other agency. Whereas in a open system where in a common standardized platform many companies can participate many company can give their product and those product can be assembled.

It is like a assemble computer where in a bases in a common format the compounds from various companies are assembled and integrated to for a particular purpose. So in the open system allows basically greater flexibility and also it allows the pre-caster to produce a limited number of elements with a predetermined range of product. Because in open system it involves integration of multiple number of agency, multiple number of manufactures and the producers.

So many numbers may not be possible, limited number of options are possible, but yes the comfortably is the issue, but the advantage of the open system is that it offers the flexibility and it offers it do not encouraging monopoly, but here in the close system is dependent on either by the producers or by the client it basically encourages monopoly and it is dependent on the very few one or two large developer, large manufacturer, but in open system many manufactures second category, third category, fourth category, small, medium, higher and very large developer or producer they can participate and they can develop housing. Now in a industrial system or outside based system there are several stages, which is required for a country like India.

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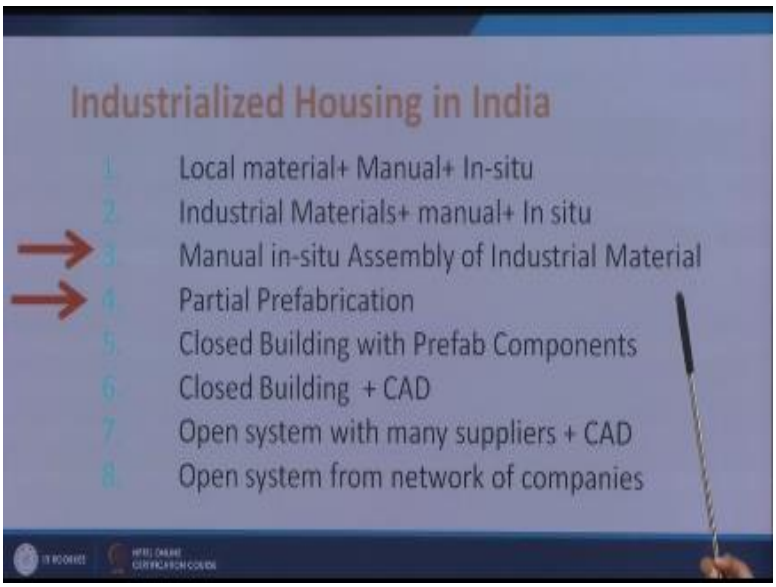


Like initially, we start from local material and construction on site and then slowly we go to the using industrial material and then manual process in situ then we conquer the manual assembly in industrial material that means we are going to manual process, but we are assembling the industrial material like right now in the projects the overall process since manual and site based, but we are using some of the industrial material, finishing like say still or the fixture like say plumbing fixtures, flooring element, windows, doors those are manufactured in the industry.

So we are assembling that we are using that, but in a manual method then after the next stage there will be a partial pre-fabrication, partial means some of the compounds like wall, or the

columns or the beams or slap compounds will be pre-fabricated and after that some of the part will be onsite may be fixture and finishing will be done at the onsite. So this is called partial, so right now we are in this position in India, which is basically is combination of the manual labour, manual and onsite construction and also some amount of partial people pre-fabrication we are using.

We will show the example next day, so the next stage the close building concept or code system with compounds may be one or two or few developers can or procedure they can come forward and they can develop the whole package of the housing in industrialized mode that mean the whole houses will be developed constructed manufactured in the factory and will supply to the site on the given time and may be assembled and that is possible in the desired quality if it is done in a close building system.

Now the close building system needs integration with the computer, either drafting and design and this will lead to a greater flexibility of the compound, which is integrated in a given flat form, given formatting of the dimensions so after that producer the open system with many suppliers with application of the CAD and open system from various network on companies can achieve, but these are the future stages with some of the countries they have achieved this stages.

In this stages they have achieved like many suppliers, many pre-casters their working in the market and various options, various type of housing, typologies their available in the market and which does not need more than two to three months to execute in the site and it is cheaper, it is affordable, it is very quickly constructed options of the housing typology, but what you need to have this industrialized building system.

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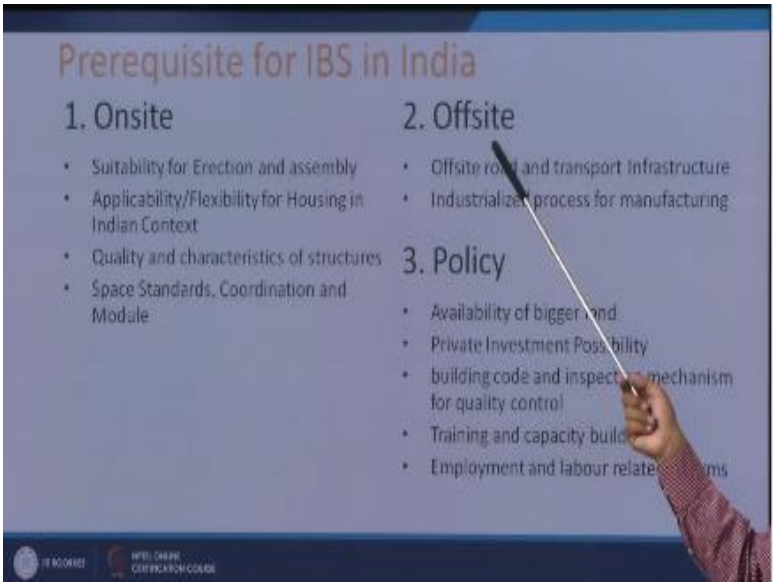


There are various pre-request like some of the pre-request on site, some of the conditions required which is outside, which is required beyond the boundary and some of the pre-request the policy. I start with the policy parameter like two enable this kind of construction, we need availability of the bigger land sometimes we are talking about the basically the large housing, mass housing and for mass housing, bigger lands is required so if we change technology from the conversational technology to the new technology, the land is the very important input.

Then the private investment possibility. There are very few developers who will be very much interested to invest the pre-fabricated or the industrialized technology. So private investment is required and for that we need a policy parameter by the government right now the present government they are encouraging the industrialized building system and pre-fabricated system will largely.

There are various developers who are coming forward to invest in this sector. I will give the example later on and whenever there is change of technology, there is need for the quality control, so for this quality control we need building code and the inspection mechanism to ensure the quality. So new set of building roles, building codes, new set of control mechanism is required to be developed and not only that to execute this in the ground level we need training and capacity building for the people who will be working in the factory,

who will be work in the site, who will be working in the authorities to sanction the building plans so every level there will be training and capacity building because there is a change of whole delivery system of the housing. Then the employment and labour related reforms not only the training and capacity building some reforms required in the level loss that is the part of the policy frame work done by the government of India. So apart from the micro level changes in the policy we need some amount of reforms or change at the outside parameters like if we want to construct the building compounds in factory and want to transport them in a area we another area which distant we need a better transport trade work very robust kind of very strong kind of transport network consist in the offsite road and wider the road, strong road.

The better payment design so that large size vehicle can carry all those building material to the one place to another place. Another very important point I would you like discuss is that even after the any natural these are studies happen. We need large infrastructure, road infra structure to carry the transits houses from one place to another place to elect and do an assemble, and the road infra structure is not sufficient we need the intellectual process of the manufacturing for that the eco system of the individualized system of the manufacturing along with labor input, material input the institutional input is required.

All are input is required and it is possible with policy framework of the Government as well as with help of the private investigator and then we come to the onsite requirement. The suitability for the election and the assembly place like in hill legion like in Uttarakhand and place like in plain legion of slice a MP or UP may be different geographically and topographically. So the type of housing typology or the technology but the particular typology or technology may not suitable in plain land which suitable in hilly land.

So, based on the type of the plot and the type of the contest the section of the technologies very crucial which is depended on site. Second is the applicability and flexibility for the housing in India contest. In India the major housing construction is incremental because incremental housing is more popular because of the nature of the family structure the social structure how people grow economically over the period of time. So if it is possible with in the construction system that there is some scope of incremental construction some amount of scope to make further addition in the house that kind of flexibility required in the new technology system also.

Then quality and characteristic of the structure quality should be durable against all the weather effect the hot session, winter session an also rainy session it should be able to its stand all the weather effective including the natural diastral life flood and cyclone on the seismic effects so it should durable considerating all the major effects. And also space standards and the dimensional and modular coordination and the developed module will be contextual for the particular city or particular zone or particular target group.

So it is basically the area specific geographically on site specific requirement like the specific disbanded for example, the dimension of the room or dimension of the any module for any area in plain land may not be equal with other land. The dimension of a house in a tribal land may not be equal of a dimension of a house which is than at the city code area. So depending on the contest depending on the target group depending on the geographical location we may have to very this space standards the coordination between the space standards and it is the module.

So in hard the onsite to offsite and policy parameter are very much require to bring or to change technology from one system to another system. So the progress in India till the last decade there has been lot of experimentation of the products like say building products in the flooding in the walling and roofing element, but in spite all these experiment and attempts we could not achieve the total technology transport total technology change in the India in the mass housing sector.

It was limited to the laboratory experiment which some pilot experiment and pilot demonstration project, but right now there is a big stars by the Government of India after the national housing and habitat policy and read the current pradhan mantri awas yojana there is a sub mission which is called to technology submission under the technology submission Government of identified many technologies which will transfer the technologies from on site to offsite.

And this technologies these are indentified technology like using monolithic construction technology, monolithic concrete construction expanded polystyrene panel system, 3-S system, precast for system GFRG panel system then modular building system and Light Gauge Steel Frame Structure. Next day when we will show some of the case studies in Indian situation where will see that the large scale construction mass housing construction is

possible using some of the technologies like that, but most of the technologies are under develop in most of the research laboratories including ITS and this central research laboratories so upper some time may be upper five years or ten years this technologies will be able to deliver housing in a faster way in a speeder way and as a result of that it will reduce the cost of the building in a great extend.

So with these two days discussion today we discussed the technology system which is basically are supply side intervention because two change technology from onside to offside technology can reduced the cost of the housing project substantially because if change from onside to offside we get the advantage on the time, advantage of the cost, advantage of the quality and advantage of the user satisfaction, but it needs several prerequisite one side prerequisite off side prerequisite policy prerequisite and as a system it has three different kind of system one is a box system, panel system and linear system.

It has two different corrected sties one is a open system and other is a close system. Close system is depending on the provider supplier who is basically developing whole package, whole housing as pro package where other provides other supplies not allowed or permitted to intervened where as in open system many suppliers and many providers, many producers they are work in a common plat form like assemble computer and cross system is a open system follow is the close system in India right now we are going to a combination of a onside and off side construction using manual labor mostly.

But next stage provably with the close system and with the Government policy we can have better system to deliver housing using the new technologies in India after the pradhan mantri awas yojana and technologies submission. We have shown that videos technologies are identified next day will show you some of the guess study some of the examples how to the technology can be used to reduce the time and cost and what are the future prospect in regards, so thank you.

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