Sustainable Transportation Systems
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Lecture 25
TOD Implementation

Hello, friends. You may recall during last lecture, we discussed about various principles, factors and other aspects of TOD, that is Transit Oriented Development, what are the factors which influence, which motivate us to opt for the Transit-Oriented Development.

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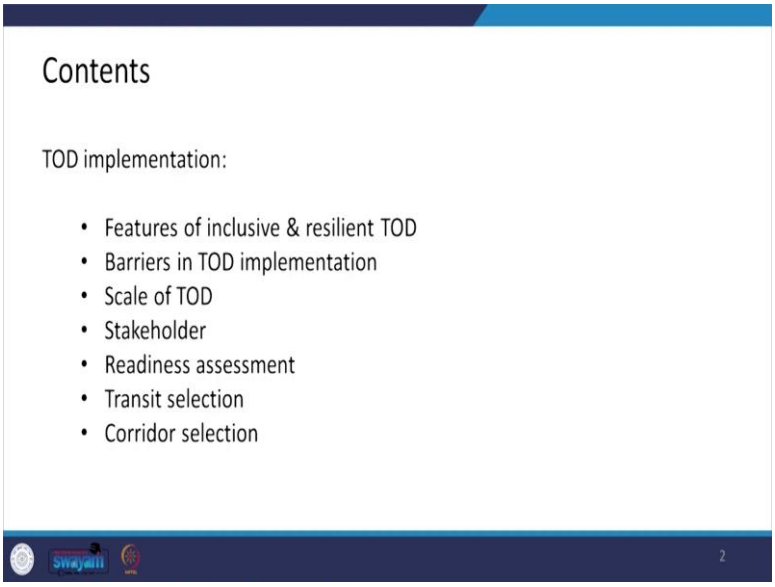

Now, today we will discuss about how to implement it, means how to implement on the ground the transit-oriented development. To discuss about various aspects of ground level implementation of transit-oriented development, we will see like features which are important for making the TOD inclusive and resilient, and what are different barriers which we have to overcome when we are talking about implementation of TOD.

And then different scales of TOD from city to urban areas, suburban areas, those kinds of things, and the role of stakeholders which we have of course, discussed but when we implement them, what is their postures, their roles, and then the readiness assessment when it is means completely ready from different angles, aspects to implement the TOD.

And then how to select the transit, particular transit whether BRTS, MRTS what are those basic parameters which help us to go for a certain type of TOD. And then how to select the corridor whether to go to through the A corridor or B corridor or C corridor. So, what are those factors, all these things we will discuss in today's lecture, so, that we can be prepared to implement the TOD.

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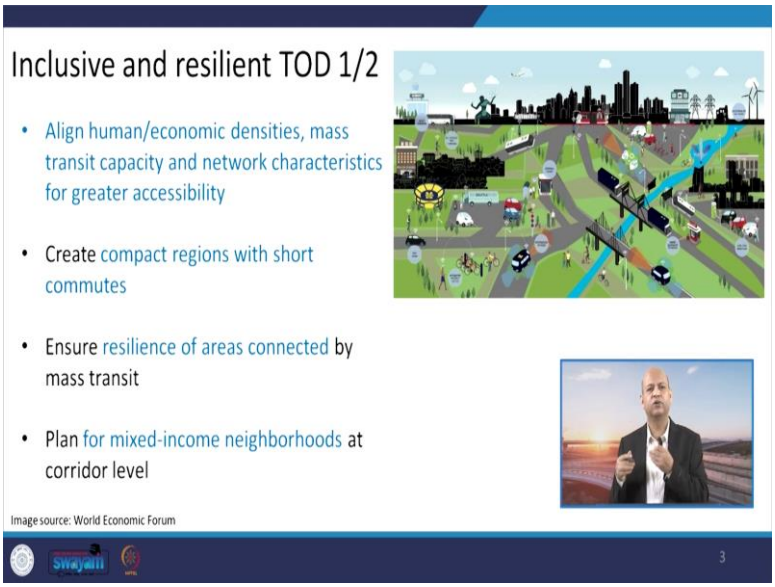

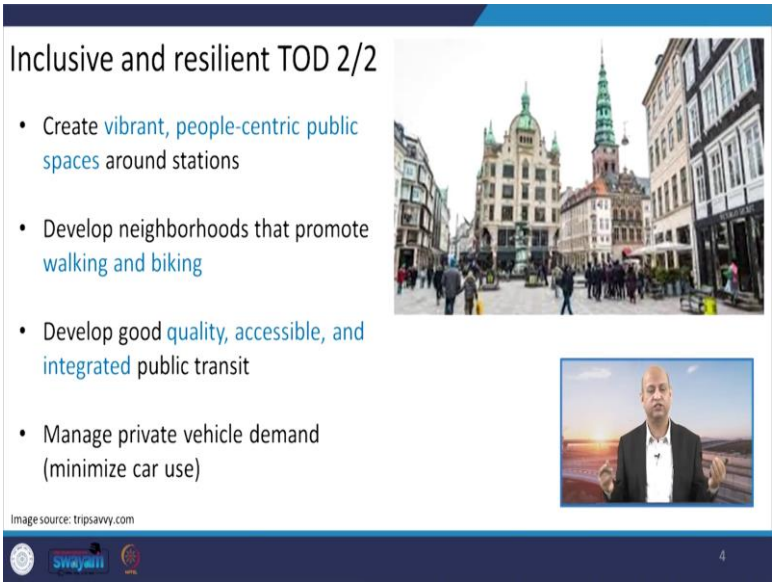

Well, when we talk about inclusive and resilient TOD, then basically we try to include all those things which are important from different strata of the population that no segment of the society is left out, we include everyone, means the transit-oriented development should be of such a nature that it includes all the segments of the society, whether poor, middle class, upper class means, it should be accessible by all. It should not favour or disfavour a particular part of the society.

And then when we talk about resilience, then we talk about different kinds of crisis or very emergency situation when something occurs like earthquake or accidents or terrorist attack, then how to deal with that, so, that the system again comes to the operational phase, without losing much time and losses.

So, that is the part of resilience, which is also shown in terms of like, inclusiveness like the vibrant and the people centric kind of public places has to be connected with each other this TOD should help in that direction and the neighbourhoods, which promotes walking and bicycling those kinds of things should be there, that integration has to have happen. And it should develop, it should enhance the quality of life in terms of accessibility as well as integration of different public modes of transportation. And then it should also manage to shift the population from privately owned vehicle to the public this transit system.

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And when we talk about inclusive infrastructure, then also we talk about within population of every kind of people means, we are not only talking from monetary point of view, whether poor or middle class or upper class, not only that, but we should also talk about different kind of physical challenges or physical limitations of people.

So, if the young people are there, those are physically challenged people are there or differently abled people are there, so, they should also be able to access that transit-oriented development or the system. So, ramps and for those who cannot see, then those kind of, footpath should be there so that they can feel it. So, all means any kind of physical limitation should not hinder the people to access the transit system, that is very important part of this publicly owned systems, because it helps everyone to participate in the social and economic and cultural activities.

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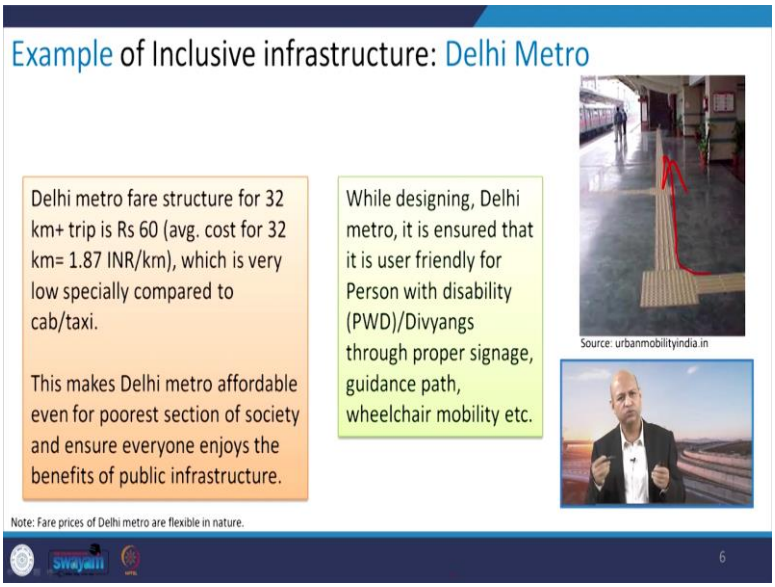

So, when we want to give some practical example of inclusive infrastructure, Delhi metro is a very good example. Because you see this kind of footpaths or those kind of structures which can be felt by anybody, even those who cannot see so, they can use this for the directions also, they can sense the direction, where to go when even going from one platform to another one or from one direction to another one.

So, those kind of things plus from cost point of view also like the 1 kilometre like 32-kilometre one trip is 60 rupees only. So, that is around Rs. 1.87 or around Rs. 2 per kilometre you can say. So, that is affordable by everyone, whether it is low income group or middle class or anyone.

So, those kinds of things, I mean to say whether it is materialistic kind of limitations, monetary limitations or physical dimensions related limitations of people, population or the social segments, those should not be acting as a kind of barrier. And the Delhi metro's example is there that every kind of person can access that facility of Delhi Metro.

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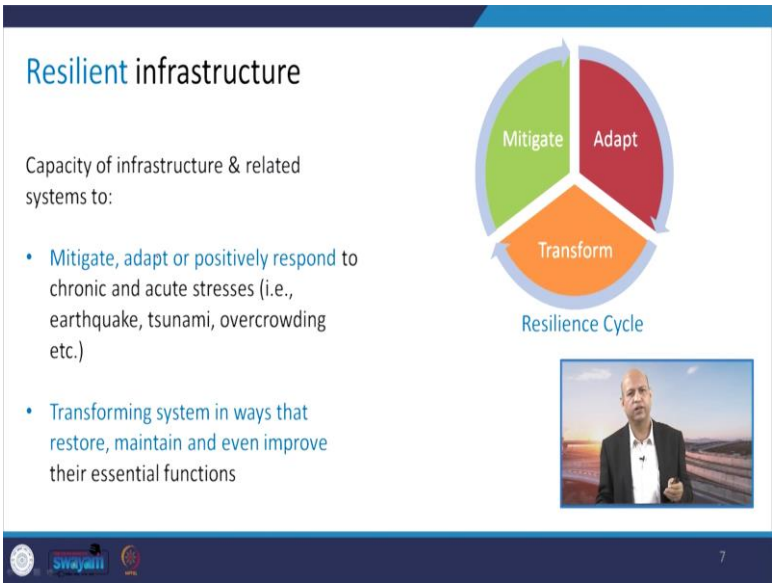

Resilience we were talking so, it should be in such a way the design, the operation should be in such a way that even if some emergency occurs, let us say some tsunami, earthquake overcrowding, we are talking about any kind of this TOD around the world. So, like in Japan, when tsunami occurred, it was a big accident, but they were able to start every kind of system after a few days, that means, they are resilient, those systems are resilient and their complete operation system, management system, administration system is so much integrated, that they can take action timely and very effectively. So, the system must be in a way that it can be adapted to the situation and the mitigation can be taken very quickly.

And then it can transform from one stage like the stage when some accident occurred, and that normal condition was disrupted so, it can transform from abnormal condition to the normal condition very quickly. So, maintenance related issues or the way it is, restored from those kind of issues when accident occurs to the normalcy adaptation and transformation that should be there very quickly and very efficiently.

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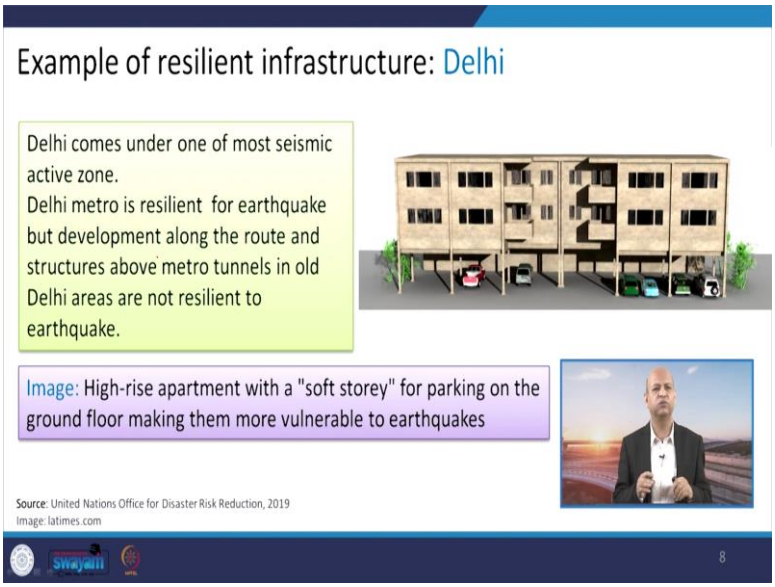

When we talk about examples so, like in Delhi, some pockets have been identified that those high-rise buildings and the parking lots are not in a particular harmony and those parking lots, make them kind of vulnerable from, if some something occurs like earthquake etcetera. Similarly, for example, there were limitations, when the routes were designed. So, those limitations were also taken into account to make it better or resilient.

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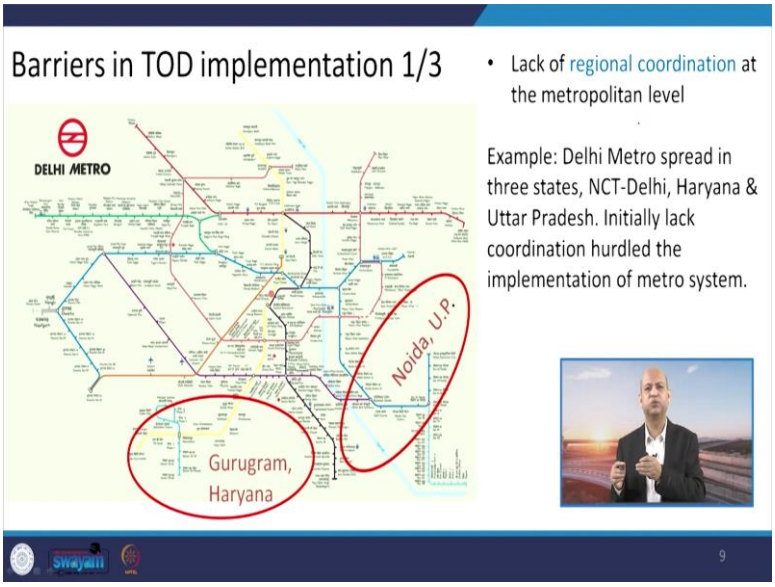

When we see these barriers like when it was regional coordination related, example if you want to see, so, this particular Delhi metro has been integrated with other transportation systems of the region, like UP and Haryana. So, Gurugram is in Haryana, Faridabad is Haryana, Noida is in UP so, how to coordinate, how to integrate them.

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So, one example is like, this Gurugram or rapid metro, which was developed in Haryana that is the Gurugram so, it was separately developed basically, initially, it was not connected with the Delhi metro, but later on, it was given that it should also be run by this DMR. So, this Delhi Metro Rail Corporation, DMRC took it into its own hands.

And the stations and all those things were designed and integrated, connected in such a way that seamlessly the passengers can transfer from one kind of transit to another one, from rapid to metro, Delhi metro from Delhi metro to Gurugram rapid rail. So, those kinds of integrations happens when we talk about regional coordination. That is very important for comfortable journey of people from different parts of that particular region.

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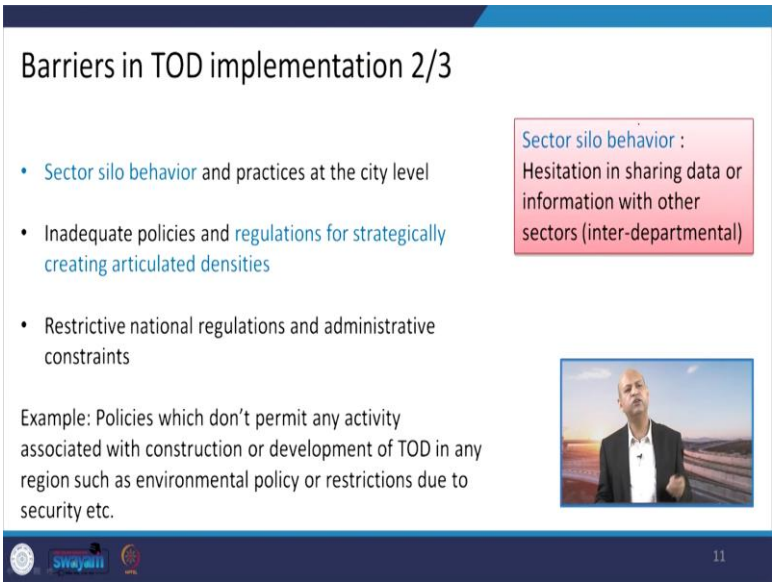

When we talk about different barriers, so, like, sometimes some particular hesitation happens whether data collection related to a particular kind of transportation system and some restrictions related to policies or regulations. So, those things have to be addressed properly. Otherwise, what happens that suppose, a particular stretch is there and because of certain policy that stretch is you cannot disturb that stretch, then you have to completely reroute the that the, the transit system. So, all those things have to be seen earlier in an advanced situation, otherwise that can be a bottleneck in future. So, those barriers should be properly taken into account.

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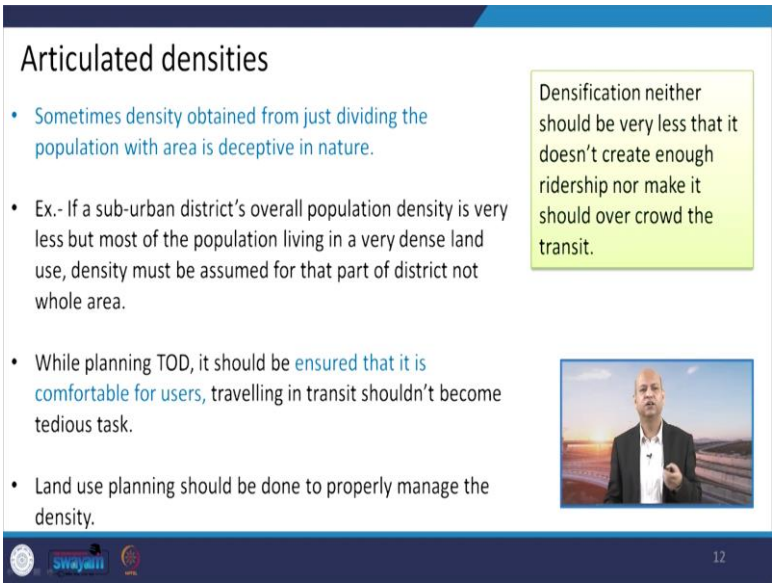

When we talk about articulating densities so, that means, as per densified population or the dense population areas, where this transit is going so, it should serve the purpose means, they should be in a location where nearby they can reach the station by walking or some other last mile connectivity kind of systems etc.

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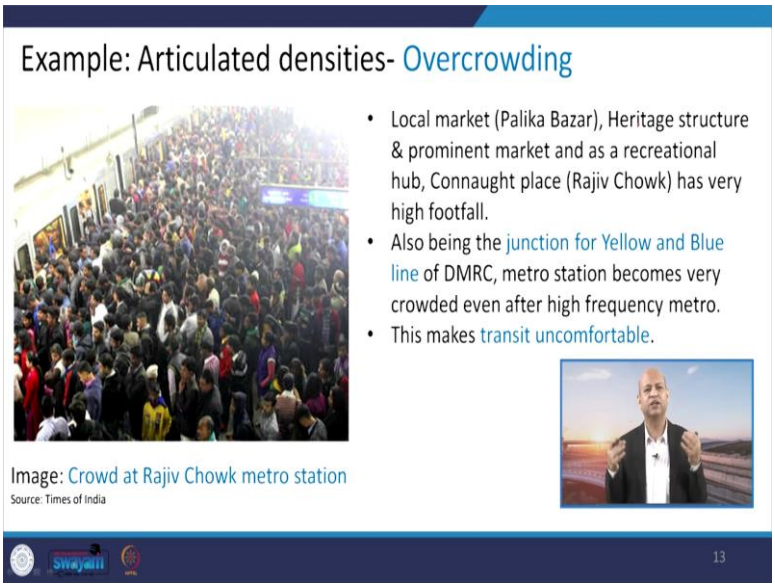

And then it should not also be so much densely populated area and so, limited facility of the station that it becomes overcrowded. So, those kinds of things you have to make very good balance otherwise, what happens like you might be knowing that like at Connaught place this two lines are meeting there and it becomes at times very crowded, lot of people are there and it is not comfortable means, that means the population flow has not been taken into account or they were not able to estimate that this much load will be there.

So, otherwise the seamless flow should be there and it should be comfortable without any kind of struggling to go to the, coaches and getting out these kind of situation is not good for a good transit system. So, those things have to be taken into account that means the densities articulation should we as per the population density. You have to take care whether it is the lien population, then you can have a small station or so, and if it is a densely populated area, you have to have that kind of area where the people can walk and they can have different platforms like that.

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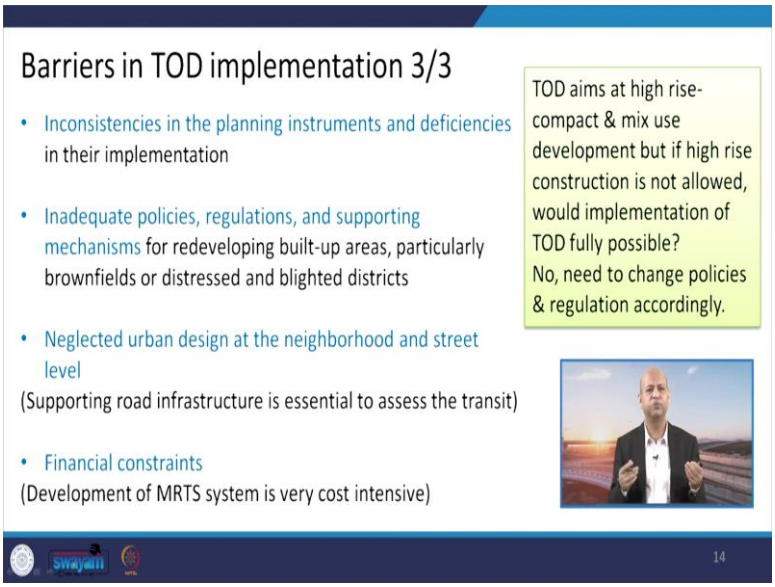

Similarly, when we talk about like road infrastructure or the policies related so, there should not be inconsistency in planning. And inadequate policies or regulations, which are supporting different mechanisms. So, there must be very good, I mean combination and coordination otherwise, problem arises in the future.

Similarly, like the finance related issues, so, the cost intensive facilities are not welcomed by people. So, proper calculations, proper estimations, where to get the money, where to generate the revenue from, all those things have to be seen in advance and in a right way. So, that implementation becomes very smooth, it is not that you have started to build one phase and you do not have money then a lot of wastage of time and resources occur.

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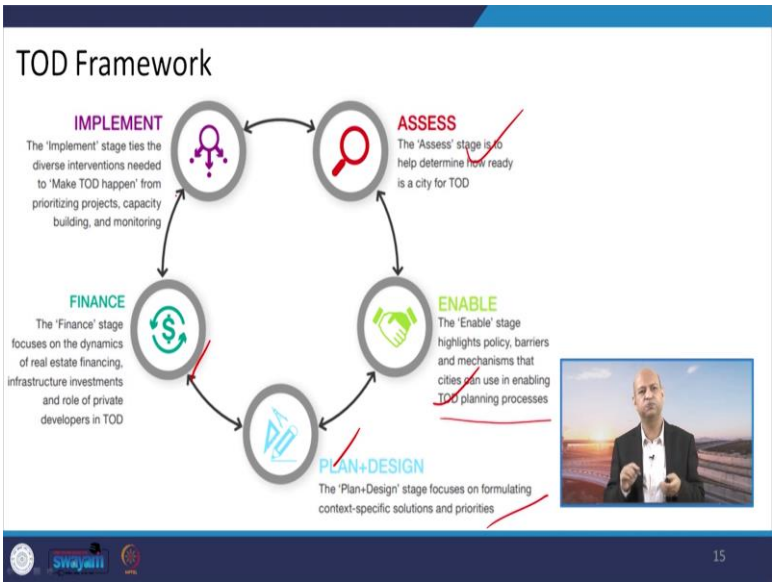

Well, the framework, the framework is strategy when we talk to implement, so, first of all, we assess. So, the assessment stage is like to determine whether the city is ready for TOD, if you are just implementing TOD and city is not ready in terms of financial resources or proper routes, etcetera, and proper coordination between different departments, then it becomes very tidy and very difficult.

Then enable, to enable like, those policies and barriers, barriers should be removed, the policies must be in a favour of enabling this TOD planning processes. So, means, if you want to start some venture, some public, private partnership, all those things have to be explored an enabling process must be enhanced.

Well, then plan and design means you have got the data and assessment has been done properly. So, you can plan and design at this stage, you have to formulate the context, particular context, where you have to provide the facility and the problems which may arise and before like a proactive approach, so that you can deal with the problems which may arise, means you can have certain kinds of modelling efforts.

Then financial resources where to bring those resources, whether from private sector, whether from some lending agency like World Bank or other agencies. And then implement means, having better coordination, better partnership, then you go for implementation, and if you have done all these stages properly, then implementation becomes very easy and smooth otherwise, if something gap remains then it becomes bottleneck or problem in the future.

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Different kinds of scales of TOD so, it depends on like areas and location like city region, that is different issue, different problems may be there. Then how to determine the corridor, planning and orientation, station area, how to design what are the important features, which will be taken into account when we design the station area.

As I have just given you an example that at Connaught place at certain times lot of crowd is there, it is unmanageable kind of thing, it does not give good feeling when you walk from one platform to another or when we go from one line to another one. Then site level related issues and the development context like whether it is greenfield, means completely new project in terms of TOD or you are developing something in suburban area or urban area like urban means like fully developed like Delhi.

So, Delhi metro was in an urban area. So, those kind of brownfield we call it that there are situations, there are development activities, everything is going on and you have to add the TOD there to adjust or accommodate in or adapt in the situation, given situation.

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So, those kinds of things we can see like at the city region, when we talk about the TOD then there are issues like the integration between different land uses and the transit system. Already some transit system will be there so, how to integrate those transit system with the TOD.

And it should provide certain points of intervention where policies or statutory related requirements like master plans or development plans, so, they are also integrated properly. It

is not like out of blue, you just give a plan and you have to go for that, no, the existing plans should be smoothly adjusted according to the TOD.

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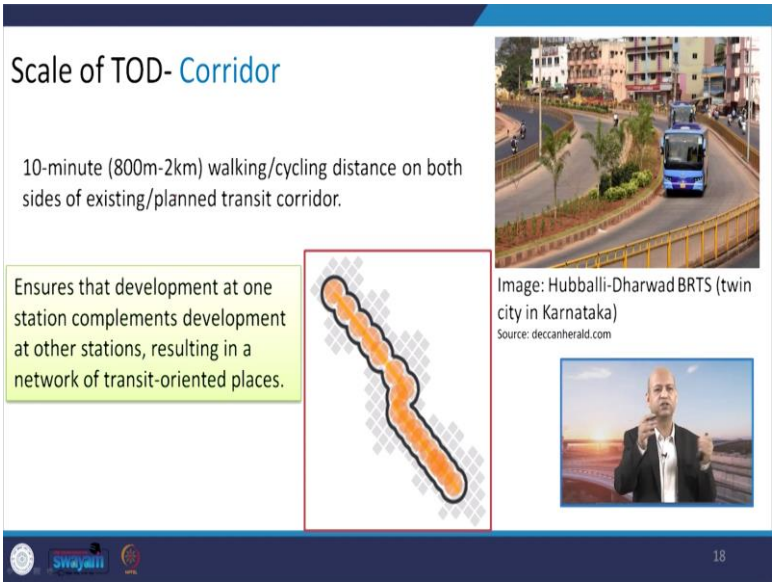

Then when we talk about the corridors, so, this should ensure the development as per requirement of the network and places. So, again you have to see whether, those corridors pass through those locations where around 10 minutes or 800 metre distances to 2-kilometre distances and walking, cycling and like three wheelers etcetera, those kind of things can take to the transit corridor. So, the route should be in such a way otherwise, if you are, taking the route in such a way that you do not find any kind of connectivity, then it becomes a problem.

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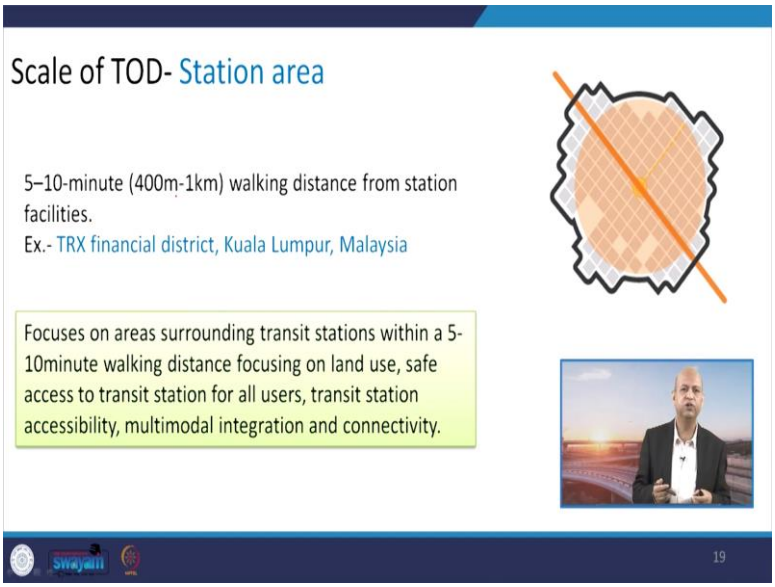

When we talk about each station area so, you have to see like, the 5 to 10 minutes walking distances must, should be there means beyond that people will not like to walk in the area, the developed area around the station. So, that kind of things you have to take into account otherwise, if you spread it like facilities beyond 400-500 metre that people will not like to walk there, they, they will go to another station, where things are in a close proximity and where they can access from one kind of service to another kind of like shopping or other kinds of uses, if they see.

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When we talk about the site level related scaling, then again, this 5 to 10 minutes kind of walking, and these like stations and other facilities at the site means for example, there is a station and the adjoining site, how it is being developed. So, those kind of scale of walking and distances has to be kept in mind when you are designing whether station or the corridor or a particular city region integration. So, how many minutes are taken by walking or by some particular mode of transport and the distances which are covered, all these things really influence the design of those particular segments of the TOD.

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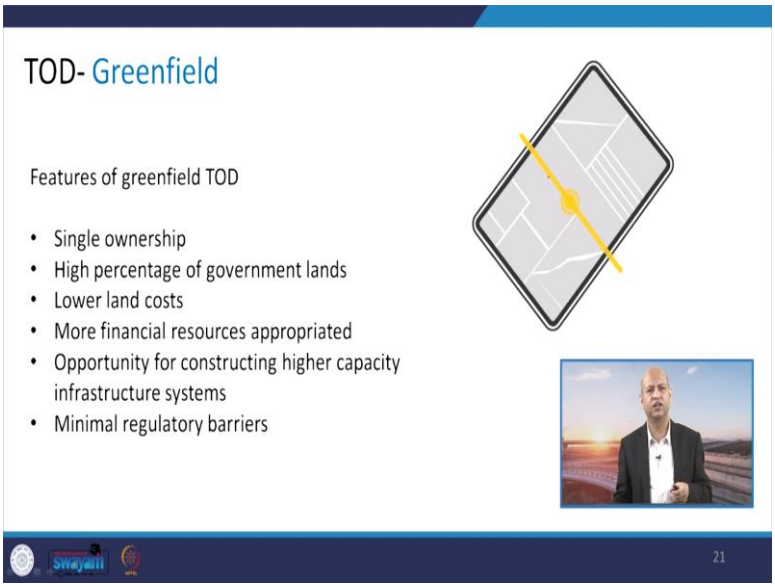

When we talk about greenfield development of transit-oriented development, then you it is kind of free thing means, no development is there, you have to organise everything new. So, lot of freedom is there means you can go for single ownership by creating a public limited company or totally public kind of governance or you can also go for public private partnership or you can give to being operated by a private party, depending upon situation means, you are free to decide, there is a lot of freedom is there.

Similarly, like high percentage of government lands is there. So, lot of planning freedom is there because there is no hindrance, you can take permissions and there are no different conflict of interest when it occurs, when privately owned lands are there. So, people have their own priorities and sometimes they take time to sell it or it becomes difficult or time consuming.

And it also helps in lowering the land cost because of this greenfield development is there so you do not need to demolish or you do not have limitations. For example, if highly, developed area is there and there is no place then you have to go to underground. So, cost escalates like anything.

Similarly, financial resources can be available from different agencies because it is a new project and you can sell the idea that this is the way we are going to develop and these are the ways of revenues which will come from. So, the lending agency may also be interested. There may be opportunities for constructing higher capacity of infrastructure systems like high rise buildings or any way you want to orient that system you can do.

Similarly, like regulatory barriers are minimal, because again the new project is there, unless in between some lands are there which are disputable or something with which kind of things you can easily avoid. So, greenfield projects are easy to implement, when you see the TOD related issues.

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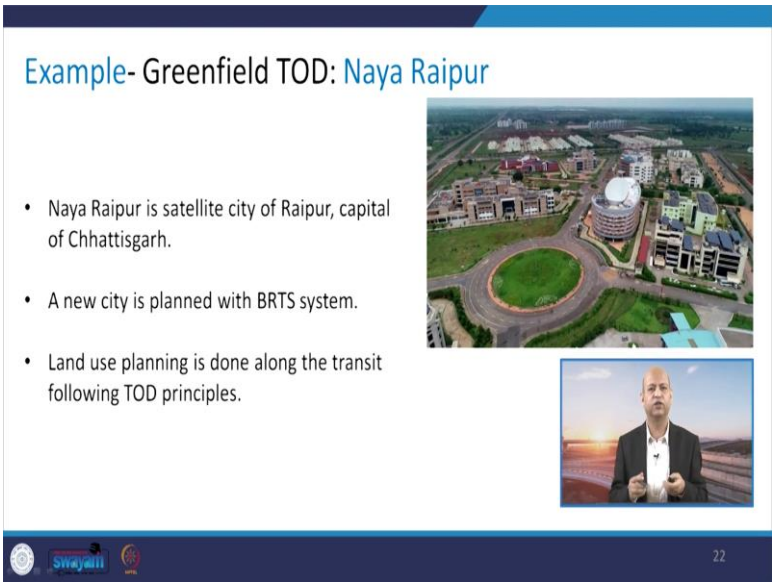

So, this one example is Naya Raipur in Chhattisgarh, so, they are developing the new capital city of the Chhattisgarh. So, new BRTS system is coming up as a TOD and that is why you know, this will be cost effective, because they can do many experiments according to their aspiration, according to their goals, aims and objectives. So, all the principles of TOD can be easily followed.

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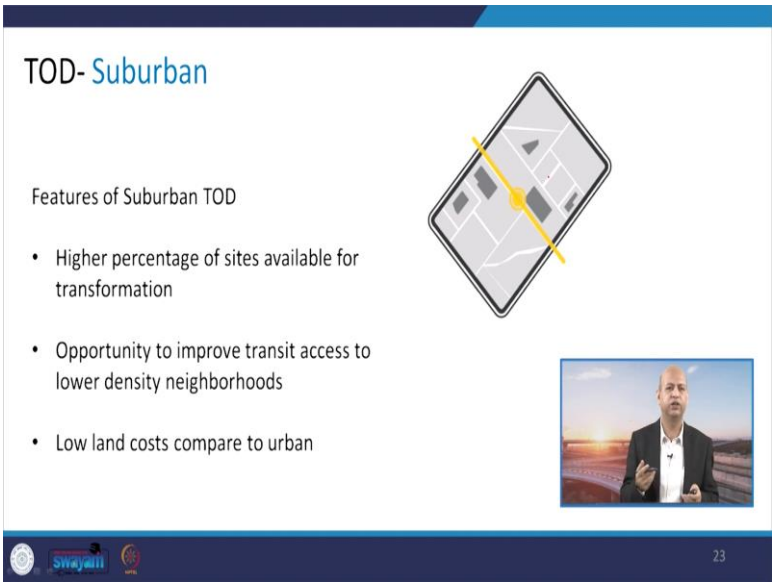

When we talk about suburban then there are certain issues like higher percentage of sites available for transformation, because in suburban people are thinly populated, lot of countryside area is also there. Then low land cost comparable to the city area or urban area. So, again, it is also advantageous situation in comparison to the city otherwise, from greenfield comparison, this may not be so much freedom, there are certain limitations which you have to follow.

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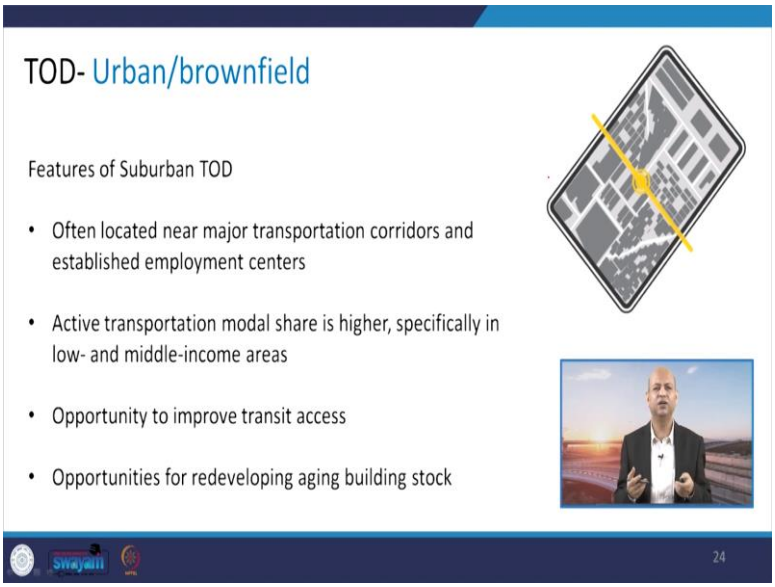

When we talk about the urban law or brownfield where development is already there and you have to adjust your TOD in that developed area, like city area, you can imagine like in old Delhi, such a crowded place it is so, underground metro you have to plan and everything is going on upstairs on the ground level and the high machinery, then precision system. So, a lot of issues are there which occurs in brownfield.

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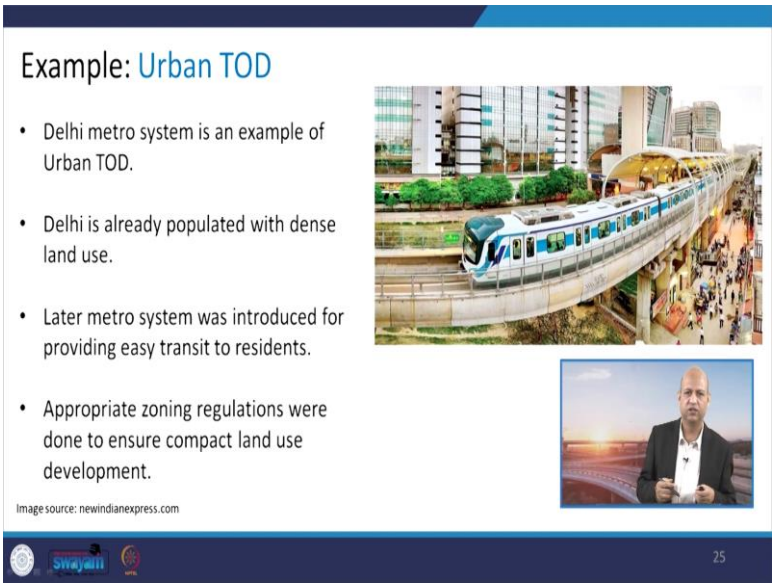

This is the example of the TOD of Delhi metro. So, this was in Delhi and there were a lot of challenges in fact, but DMRC had very good planning and they timely completed different phases. And now, it is one of the very publicly sought system.

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When we talk about like stakeholders in the role of stakeholders in TOD planning. So, you have seen stakeholders' role in several stages. So, here also like in policymaking, political leadership, so, different groups of the stakeholders are there, then economic development related stakeholders may be there who will participate in terms of land, in terms of property, in terms of money etcetera, and transport planners or road safety experts, urban planners,

community people, so, all those kinds of stakeholders have to join hands and their role becomes important if you want to develop an inclusive kind of TOD system.

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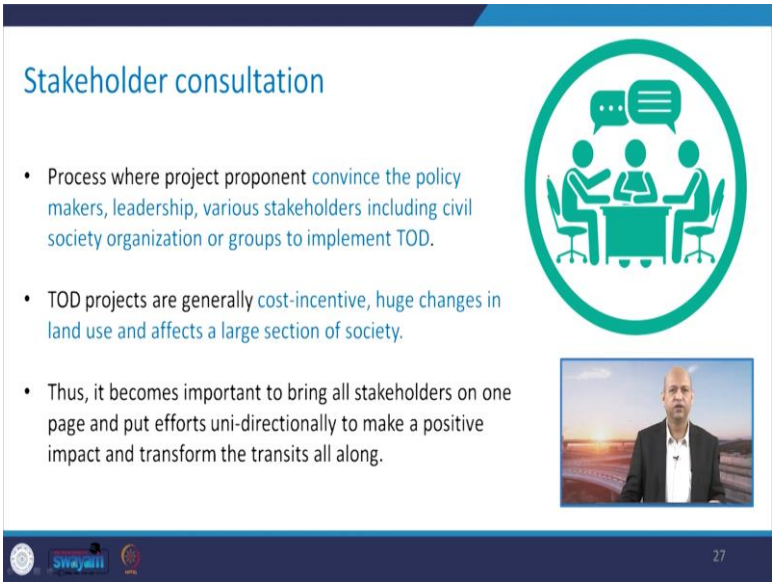

So, the consultation with the stakeholders is very important and that have to be taken into account time to time so that you get timely very good feedback and some incentives are also there because on the basis of stakeholders feedback, you can change your plan otherwise, it becomes very costly afterwards, if you ignore something, which is very important and which information or data can come from stakeholders only in the void of that if you plan the TOD then it may be very problematic in future. So, the stakeholders' participation is very, very important.

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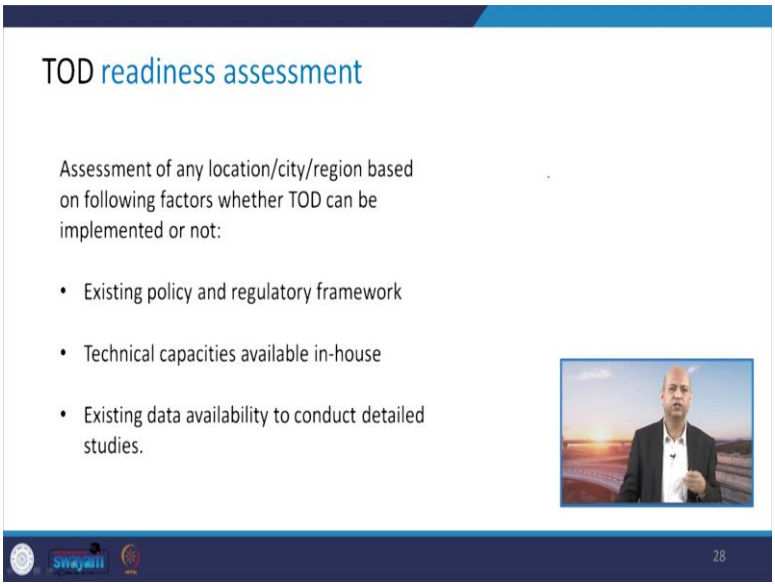

Then we talk about the readiness assessment, whether the project is ready to implement, whether that site is okay. So, so, the existing policies, regulatory framework, you have to study and then technical capacities available in house and you have to hire some experts for that, whether your particular agency which is implementing this is also having in house experts who can loop into that, and then existing data availability or you have to conduct some surveys and studies to get the data, all those gaps you have to build or bridge. So, the readiness will depend upon the minimum gap.

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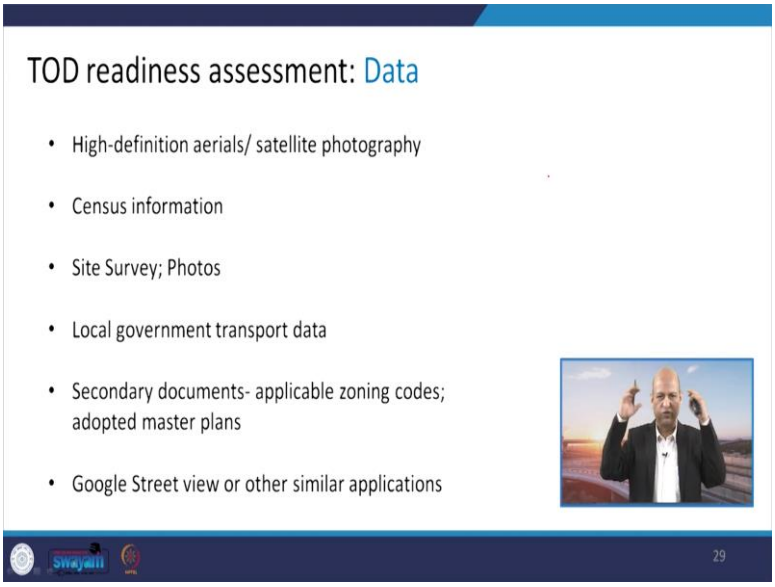

So, the data related issues you can get from census data or some reports which are prepared by different agencies, and then photographs, from satellite photographs, you can get, different kind of densities or different kind of land use and land, land plan is easily seen by high definition, aerial photographs. And then the secondary data from secondary sources related to economic data or social data, those kinds of things, and other like Google Street view all those tools may also help.

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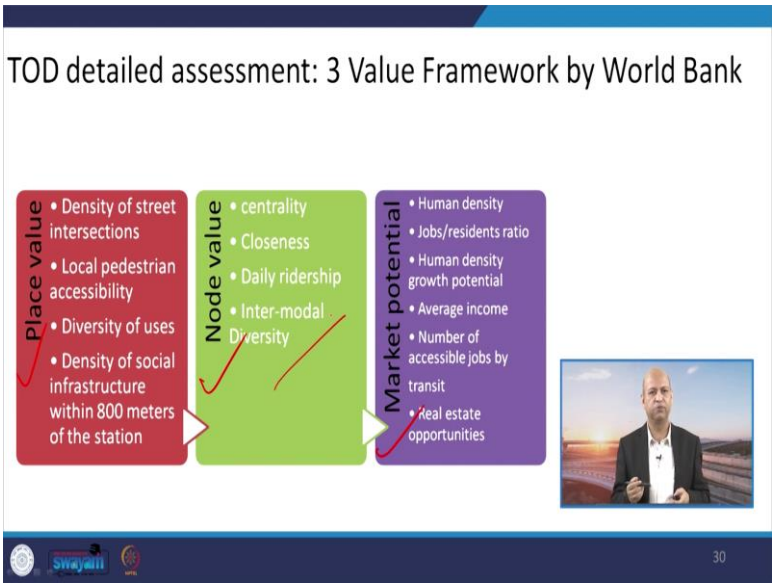

When we talk about detailed assessment so, the three value framework which is very important from the World Bank, these are like place value and node value and the market value. So, the place value, depend upon the density of the street intersections, then local pedestrian accessibility, diversity of the uses, and infrastructures density within the 800 metre around the station.

Similarly, the node value is basically defined by the centrality of the location whether it is skewed or the centre, closeness to various the uses or the places, important places where people will travel to. Then daily ridership, how much it will be their intermodal diversity whether it is connecting to other kinds of transportation systems or not.

And also market potential because, the real estate related opportunities if you are developing in a particular way and if you do not find takers, then that system will fail. So, the market potential has to be properly assessed, whether it will be welcomed by the people, whether people will shift to those areas which you are developing to help the transit system or transit-oriented development.

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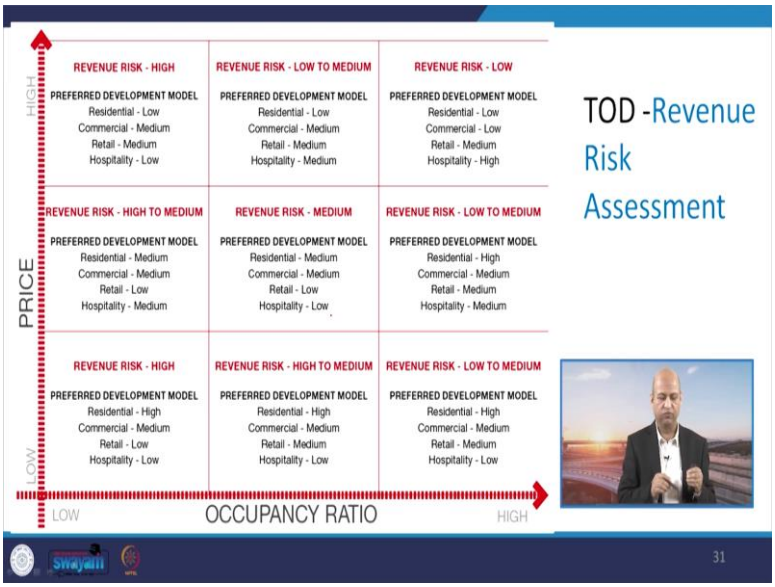

When we talk about the revenue risk assessment because it is very important unless the revenue will be generated to sustain the system it will not go for long. So, you have to design in such a way that whether through the selling of the land for having the high-rise buildings to the developers or real estate developers and builders and also like developing markets and selling shops, to the people who will use them.

So, if those kind of demand related issues have been taken into account and people really access them, go for shopping, etc. So, that way lot of revenue generates, people are now using the parking lot and going from one place to another taking the, this transit system, whether MRTS or BRTS, those kind of things. So, all those things really help you to reduce the risk of the revenue generation.

So, that has to be taken the occupancy ratio and the price which really sometimes compete. So, you can see you different kinds of combinations are there, somewhere it is revenue risk is high, we have to avoid those situation, the revenue risk low that situation should be welcomed. So, those kind of medium and high risk and low risk kind of different situations or combinations have been discussed in this particular chart, you can see.

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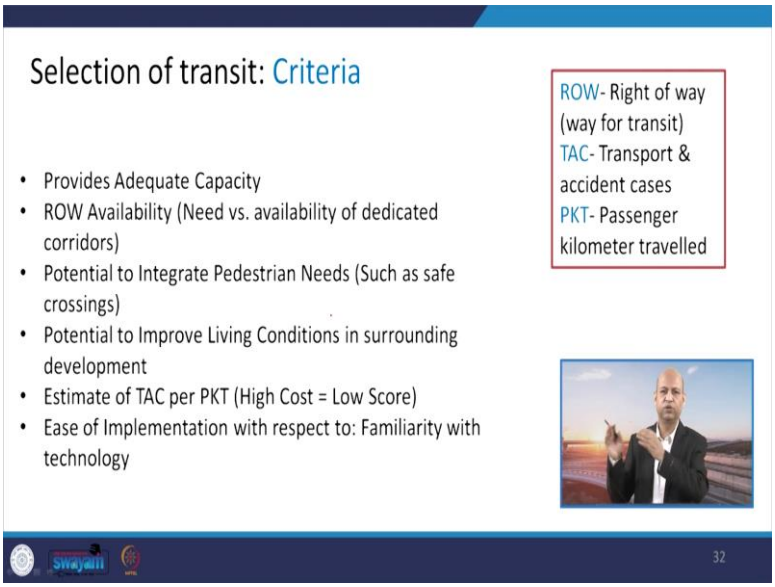

Then the selection criteria depends upon like adequate capacity and then right of the way, way of the transit that means availability of the dedicated corridors or the need that should be in harmony and then the potential to integrate pedestrian needs such as safe crossings etc. Because if the crossings are not safe, people will not feel good to cross those particular locations.

So, those things you have to keep otherwise people will avoid going to say safe pedestrian paths are not provided right. Then the living conditions of the surrounding development that should really add value to the life standards. Then estimating these TAC, that is Transport and Accident Cases. So, the accidents kind of scenarios must have be minimum. So, those things facilities must be there, so, that the chances of accidents are reduced very much.

And then the ease of implementation with respect to the familiarity with the technology, if you bring some very new technology, which people are hesitant to use, then again it becomes long time gap or lag to get adaptation to the local population. So, you, that also you have to keep in mind.

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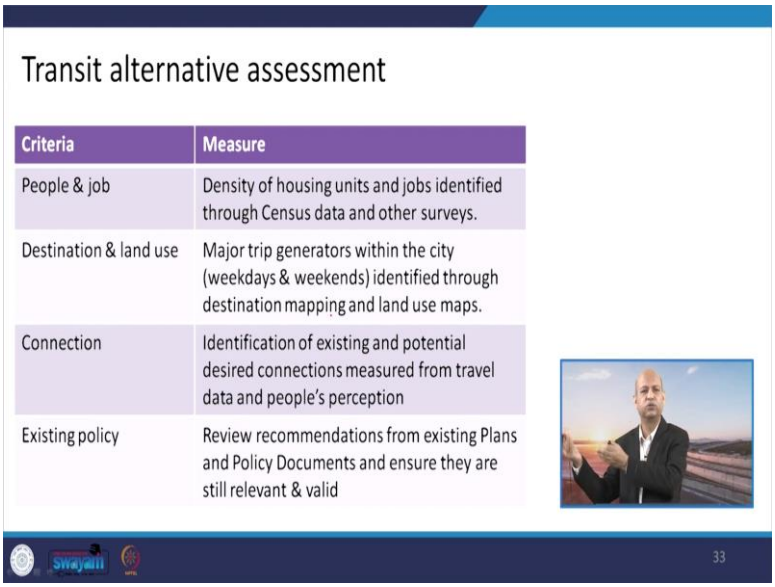

Then the alternative assessments like the people and the job opportunities means the density of the population as well as the opportunities for the economic activities that should be there, then destination and land use kind of things means people should be easily accessible to the stations, the stations should be easily accessible, so, that they can go from their destination one to destination two. The connectivity should be very smooth, and the existing policies should not be against the development of the transit-oriented system.

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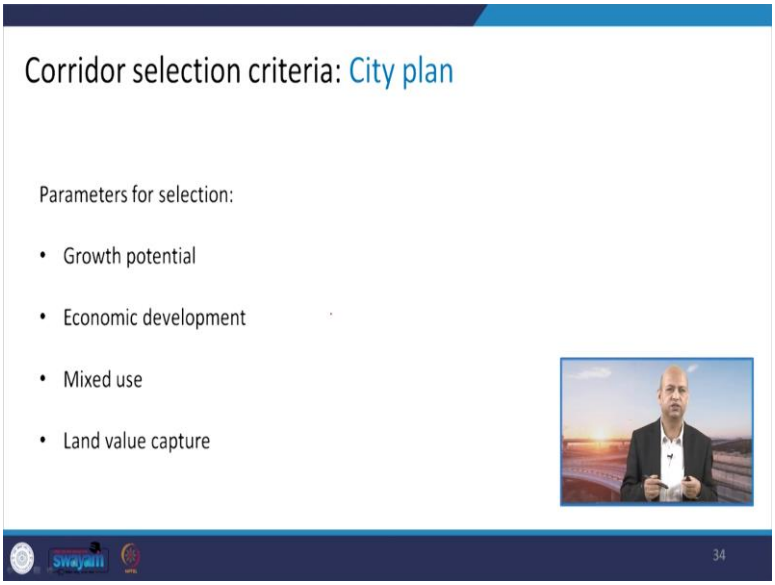

When we talk about the city plan so, the growth potential, economic development, then the mixed uses and the land value capture means, again, related to revenue because if land value is not enhanced, then people will feel discouraged. So, those things you have to do integrate.

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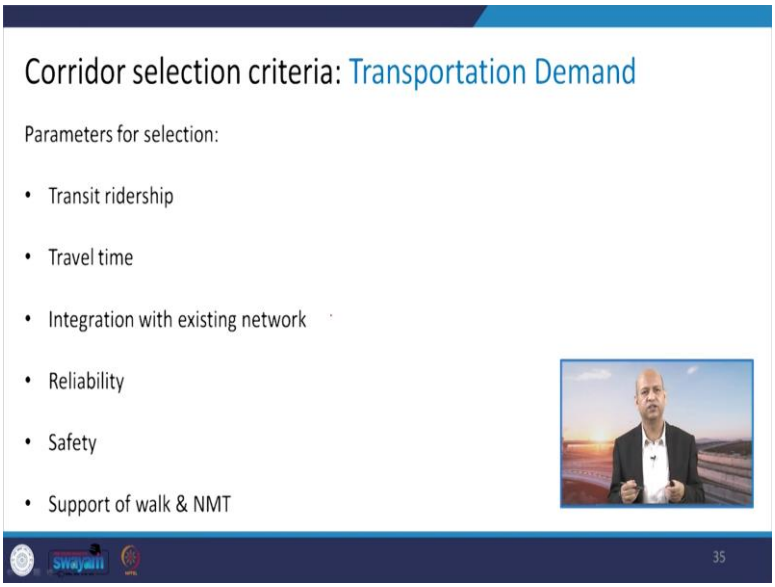

And the transportation demand so, the ridership and the travel time they will really influence the transportation demand, if travel time is more people not will welcome it, travel time is less they will come and access the system, and then existing, with the existing integration with the existing network and the reliability as whether it will come on the time and it will take to the destination on time also. Safety issue means people are very sure that nothing wrong will happen and supporting non-motorised transportation and walking so, that way these are the things which will really enhance the transportation demand.

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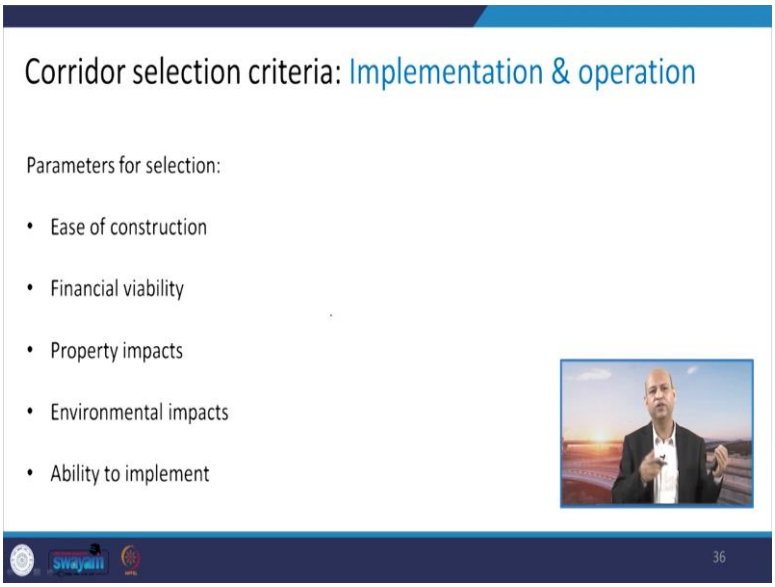

And corridor selection criteria is related to like implementation and operation. So, the construction must be easy in those, in those corridors, if there are, there are some disputed

land areas the construction will be halt and it will be very costly in later on. Financial viability must be there as we have talked several times that the lending must be available and the revenues potential must be good, and the impacts to the property must be positive rather than negative.

So, it should not cross in such a way that it adds to the negative, if it is crossing towards the population, which is densely packed the area, then if noise related issue is there then it is a negative externality. So, that has to be minimised by noise barriers, etc. those things have to be taken into account. Environmental impact must be minimum, ability to implement must be enhanced. So, all those things are related to the corridor selection.

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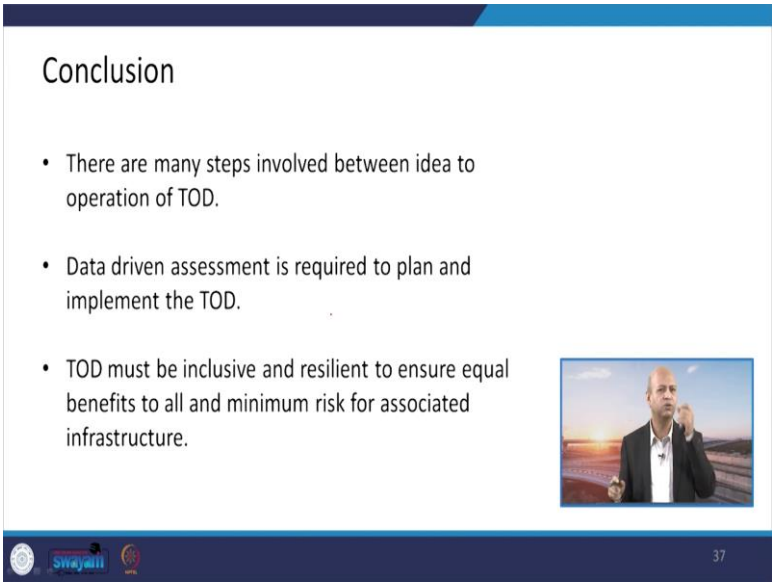

So, in conclusion, we can say that several steps are involved between the idea of the TOD and it is being implemented to a particular city or particular suburban area or to a greenfield. And then data driven assessment is very important, because if you are planning without having solid data, robust data or the objectively survey data, then your planning will not match with the ground reality and that will be problematic in later on.

You will find that your BRTS or MRTS is empty, nobody is taking, because data were not there, you have just planned hypothetically or imaginary, so, that should not occur, that gap should not occur, you must have very good data, reliable data based on first survey or even if you are getting secondary sources data that should be from reliable sources.

Then if we, talk about like inclusiveness, resilience, so, that is also very important. If you are, not taking into account those population, which are like weaker section or marginalised, if

you are not considering their necessities, then that system is not inclusive. So, you have to take into account all kinds of population segments, they can access it.

And resiliency, if something emergency occurs, whether due to earthquake or due to some accident, then the system must come in the operation minimum, within minimum possible time. So, that kind of resilience must be there technologically and from policy point of view. So, this is all for today from the implementation perspective of the TOD.

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And this is one good source, where you can get more idea about how to implement the TOD related systems. Thank you for your kind attention. And now, we will discuss the case studies, which will give you better perspective and better understanding how to design and implement TOD in different settings, whether it is urban, or suburban or greenfield, those kinds of things. Thanks again.