

Introduction to Multimodal Urban Transportation Systems (MUTS)
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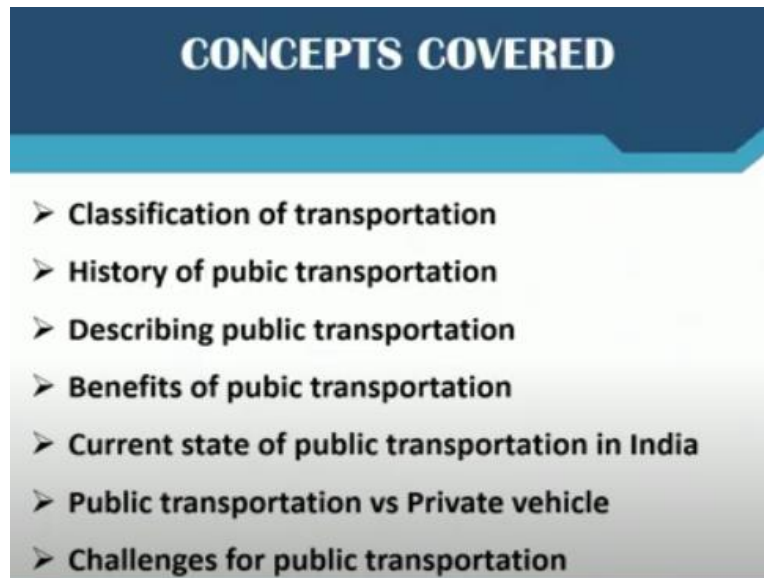
Module No # 02

Lecture No # 06

Public Transportation: Introduction to public transportation

Hello friends, welcome to the introduction of multimodal urban transportation systems, module 2 which is on public transportation and lecture 1, where we will be introducing public transportation.

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The concepts that will be covered during this lecture include classification of transportation. We will look at some history of public transportation, describe what you mean by public transportation, what are its benefits? What is the current state of public transportation in India and look at the differences or the similarities between the public transportation and private vehicle transportation. And then finally look at challenges of how to improve public transportation in India.

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Introduction to Public Transportation (PT)

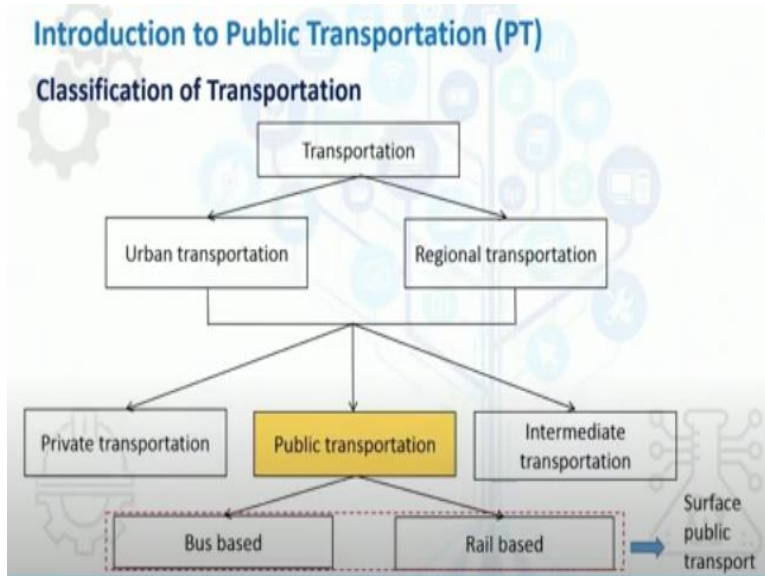
Classification of Transportation

- The scope of transportation may be broadly classified with reference to the area of operation as
 - Urban and regional
- Urban transportation concentrates on planning and operation of transportation in an urban area
 - Intra-city and short trips.
- Regional transportation deals with inter-city and long distance trips.
- Transportation can be further classified into three categories
 - Private, public and intermediate.

So when we talk about public transportation we can classify transportation broadly into 2 groups; one as urban transportation and one is regional transportation. So when we talk about urban transportation, we are essentially talking about trips within the city or short trips, i.e. intra-city trips or short trips, whereas when we talk about regional trips or regional transportation we mean trips taken on rail transportation system or air transportation systems, which are mostly inter-city trips.

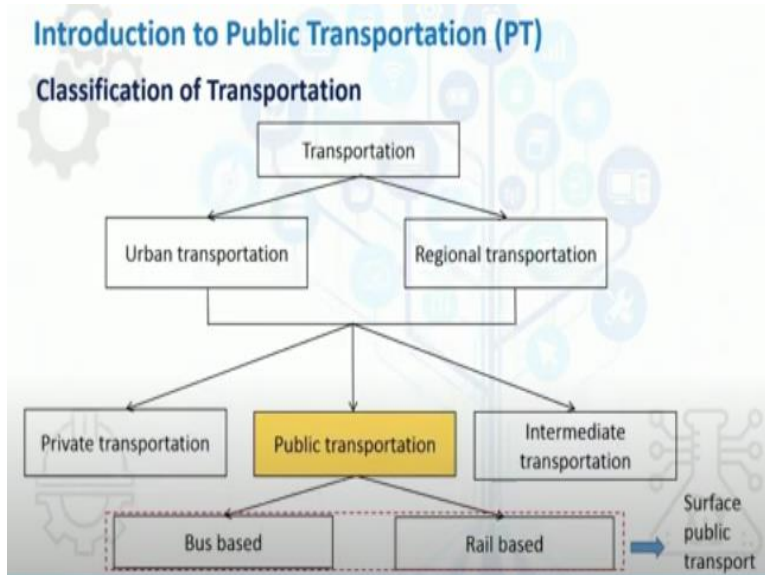
Furthermore you can break down transportation into 3 different categories, which is private transportation, public transportation and intermediate transportation. So this module is mostly based on public transportation system.

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So if you look at this chart, this is what we are talking about, urban and regional, and they can be further classified into public, private and intermediate and we are looking at public transportation which are usually bus based, and rail based, and when you combine those 2 you can say that you are talking mostly about surface public transportation. So in these lectures we will be mostly looking at rail based and bus based transportation systems. We are not getting into water based public transportation or air public transportation systems.

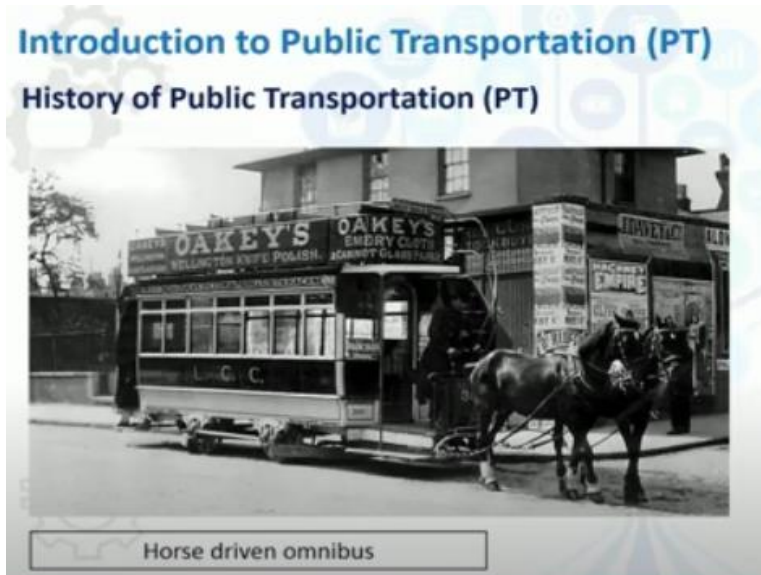
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So when we look at the history of public transportation, cars came in very late into the transportation system domain. We usually used to walk to different kinds of places, goods were then transported either by horse driven carts or even through water ways before cars came. So

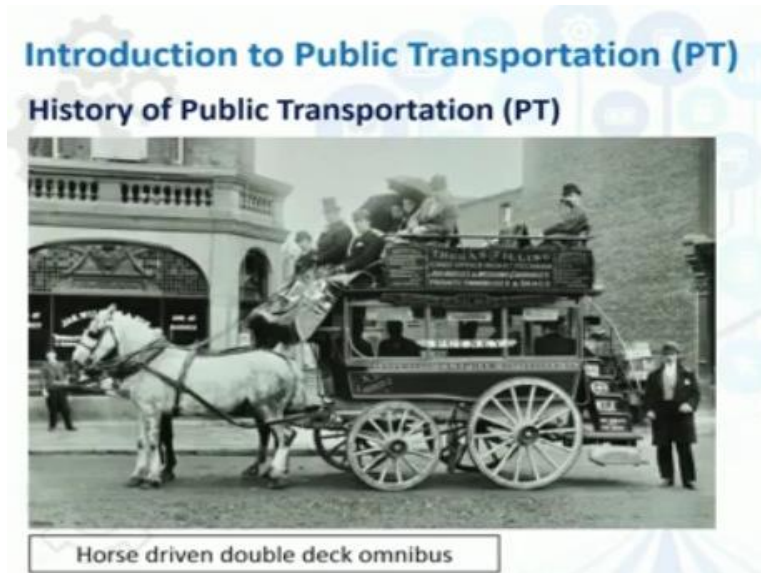
there were animals driven carts, there were even electric coaches that were there in earlier public transportation systems whereas motorized fuel based transportation came in much later.

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So these are some of the old pictures where you will see the horse driven omnibus.

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You will see the double Decker horse omnibus.

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Introduction to Public Transportation (PT)

History of Public Transportation (PT)



Cable car in San Francisco, USA

Then came the cable cars in San Francisco United States.

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Introduction to Public Transportation (PT)

History of Public Transportation (PT)

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Ford cars replacing horse

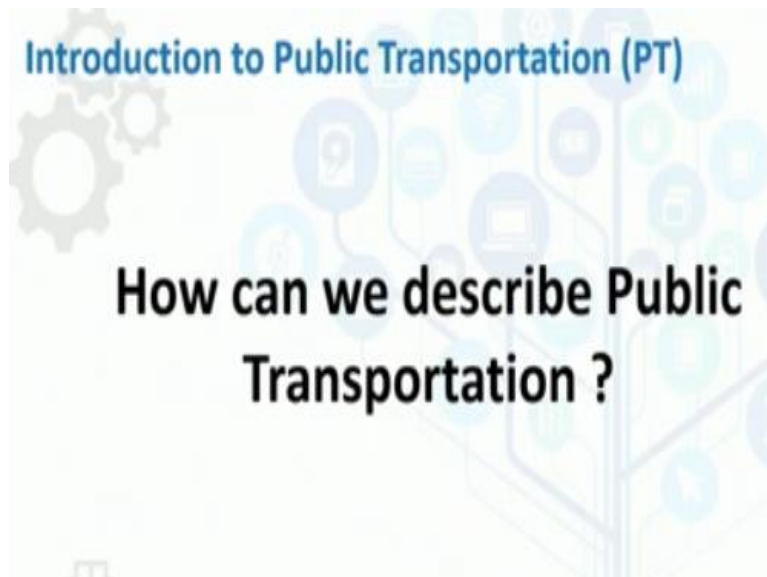
And then slowly the Ford motor company started building the cars, what we have known as the automobile of today. That is where we started building motorized cars.

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And now we are already talking about autonomous vehicle. So we definitely have come a long way but it is always good to know history of transportation before you learn about transportation or public transportation.

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So how can we describe public transportation? What is a definition for public transportation? So you always ,when we start studying a concept, you have to know how you describe it.

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Introduction to Public Transportation (PT)

Describing public transportation

- Common carriers not owned by the passengers.
- Passengers pay the fares for the service.
- The service operates on a fix schedule and route.
- PT includes features like PT stops, time table, ticketing, monthly pass, route numbers, etc.

So when we talk about public transportation, we are talking about common carriers those are not owned by any of the passengers that are riding them and then people pay a fare to get the services of these systems, of public transportation systems, and the service operates on a fixed schedule and a fixed route. So these are some of the characteristics of this, and this is how you describe public transportation systems. It also includes features like stops. So there are certain stops at which you will get on these public transportation systems, there is time table according to which these systems operate or run. So you have to pay a fare, you can pay a fare either every day or monthly pass and there are different route numbers etc., So these are some common characteristics of describing any public transportation to system.

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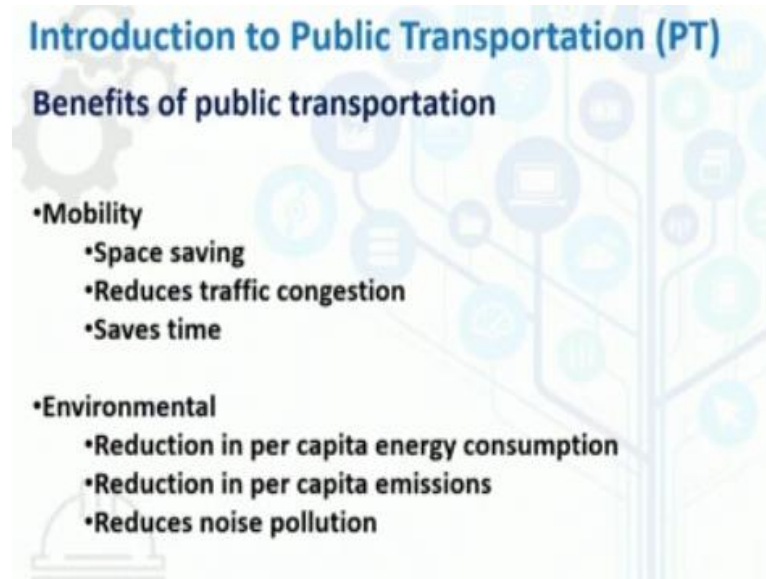
Introduction to Public Transportation (PT)

Benefits of public transportation

- Mobility
- Environmental
- Monetary
- Social
- Safety

Now when we start looking at the benefits of public transportation system, we can broadly say there are benefits under these 5 different domains. There are mobility benefits, there are environmental benefits, there are monetary benefits, social and safety benefits.

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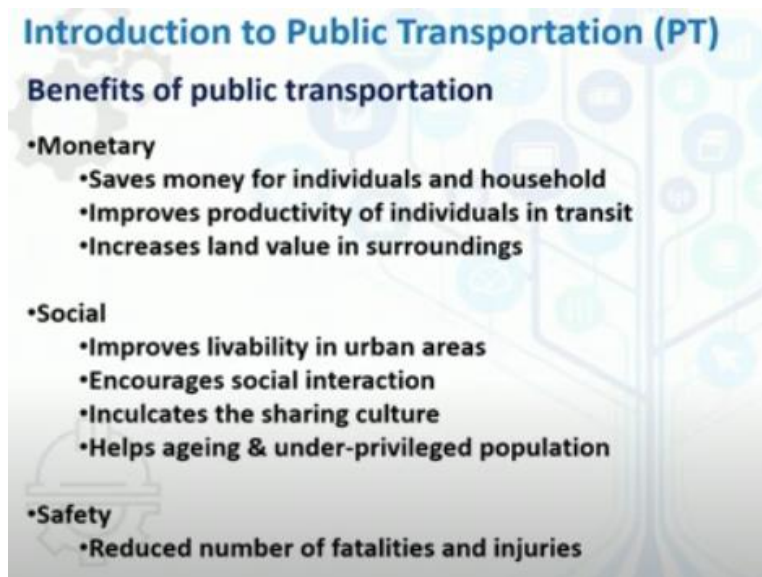
So what do we mean by mobility benefits? Under mobility benefits you would see that if you have an efficient public transportation systems or urban public transportation system in your area it usually takes up less space. So, our cities are congested, and as we grow we have lesser and lesser of space available. When we talk about space for public transportation or space for transportation, in general usually this space, when we provide it in a CBD the price of that area is usually very high. So if, you take it up for public transportation or for transportation we are not utilizing or getting maximum benefits, monetary benefits, from that space. So we always want to minimize the space given to public transportation or given to transportation in general. So you would see that we do not encourage a lot of parking spaces in CBD.

So parking space is part of the transportation facility so, when we talk about public transportation systems we usually need lesser space. Public transportation systems reduce traffic congestion. So if you move a lot of people in a very little space, the congestion usually reduces and it will generally save time. So for example, if you are riding on metro rail usually people want to ride a metro rail because it provides travel time savings, especially during peak hours of travel.

Then when we look at environmental benefits, a public transportation system reduces per capita energy consumption. So how does it do so? Now all of you are travelling in one bus, so the energy consumption is much less when compared to a scenario where you travel on different private vehicles. Energy consumption meaning the amount of fuel that you use up to move that vehicle. There is also reduction in per capita emissions.

Similarly if you are all moving in a bus or a metro rail, emissions are much less as compared to if you move in your private vehicles and of course the noise pollution, the fewer vehicles on the road the noise pollution is much less. Metro rails are also taking precautions in the city where noise pollution is a problem when there elevated metro rail systems but there are noise dampening measures that are taken in that case as well.

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Monetary benefits of public transportation are sometimes direct and many times indirect. Direct benefits are especially in the case of fares, i.e. that you pay on public transportation systems. So usually bus transportation systems are much cheaper than rail transportation or metro transportation. But both of them are much cheaper than the prices that you pay for your fuel at petrol pump for your private mode of transportation.

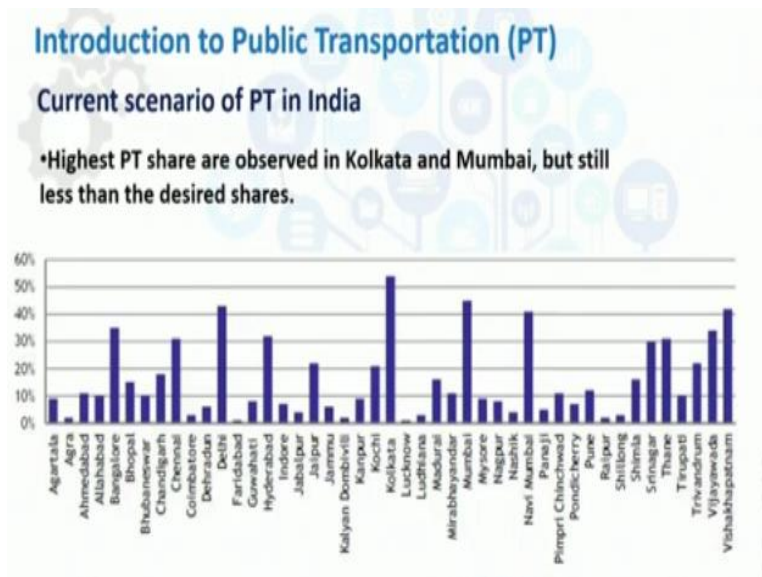
Secondary benefits, in terms of monetary benefits, are that it improves, public transportation usually is seen that it improves productivity of the people. There are many public transportation systems that now have Wi-Fi systems in them that allow you to work while you are commuting.

So it makes people, who live far away, while they are commuting to work. They start working on the public transportation system that helps them improve the productivity.

Also it has been seen that the land values around the public transportation system, especially the public transportation stations, their value of those lands are very high. The concept is called Transit Oriented Developments. So it helps in increasing the land value around these public transportation systems. By introducing public transportation systems, when it comes to social benefits, we have seen that public transportation usually encourages social interaction. It inculcates the behavior of sharing, it helps improve the livability of urban areas. So more and more, these concepts of transit oriented development, that I was talking about, are being encouraged. What it says is, if it live closer to your public transportation, you would use more non motorized modes of transport, hence the air quality would be better and so you will be living in healthier environment and livability usually goes up.

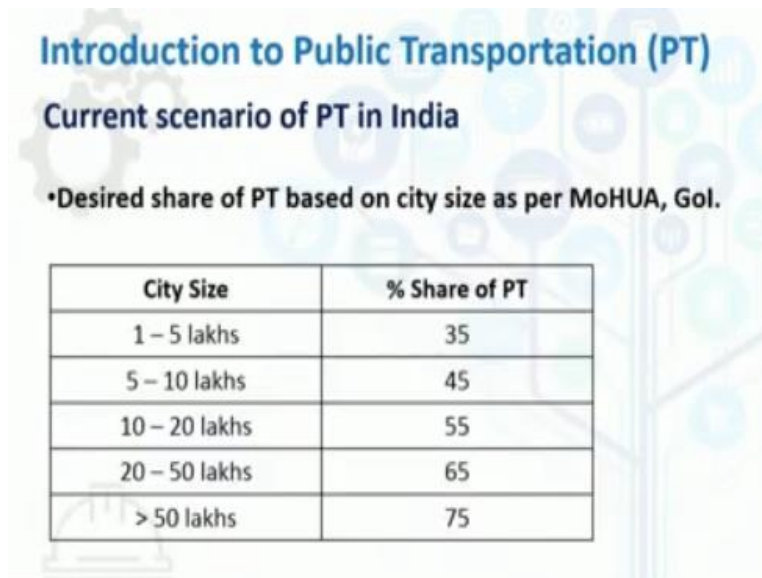
The other is also that the public transportation helps the ageing and under privileged population. People who cannot drive or they do not have driver license, they can use public transportation to still go to their offices and earn a livelihood. Lastly they have tremendous safety benefits; there are reduced number of fatality and injuries when there are people travelling on public transportation modes as compared or opposed to private automobile modes.

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When you look at the current scenario of public transportation in India, you would see that our large metropolitan cities do have a good, a high share of public transportation modes, with Kolkata and Mumbai being the highest. But at the same time these percentages are not the desired percentages. So if you look at Kolkata it is about just over 50 and Mumbai and Navi Mumbai put together is just above 40.

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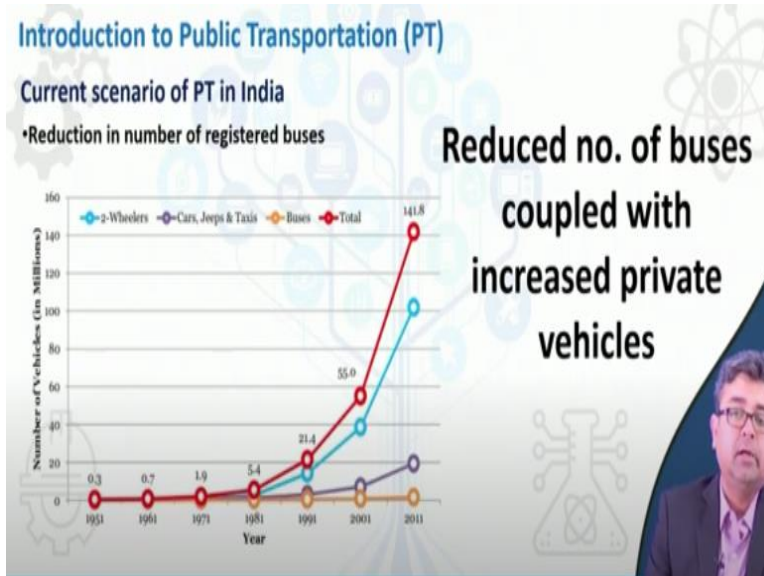
Introduction to Public Transportation (PT)
Current scenario of PT in India

•Desired share of PT based on city size as per MoHUA, Gol.

City Size	% Share of PT
1 – 5 lakhs	35
5 – 10 lakhs	45
10 – 20 lakhs	55
20 – 50 lakhs	65
> 50 lakhs	75

But what is the desired or what is the goal of the government of India is to have a 75% share of public transportation in cities that are over 50 lakhs in population. So although our large metropolitan cities are doing good in public transportation share but we still have to do a lot to improve the share of public transportation in those cities and when it comes to tier 2 or tier 3 cities you really have to do a good job in improving the share of public transportation modes.

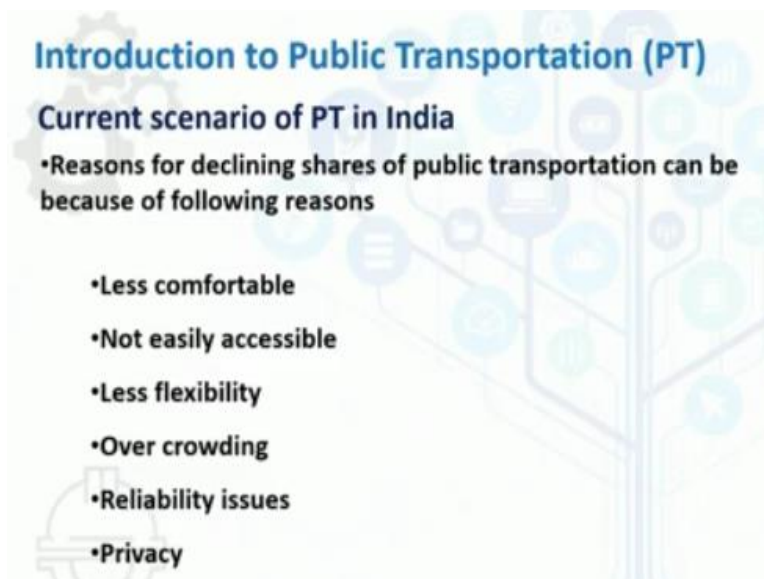
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Coupled with the reducing share of public transportation modes is the fact that there are reduced numbers of buses, so if there is no buses available then people would not take the buses. So what this chart shows is that the total number of buses have almost remained constant in the last 20, 30, 40 years. The number of buses just not increasing whereas, the total number 2 wheeler and the total number of cars are rapidly increasing.

So what is happening is the supply or number of buses on the street are constant, whereas the 2 wheelers and the 4 wheelers are increasing, so more and more people are using their private automobiles.

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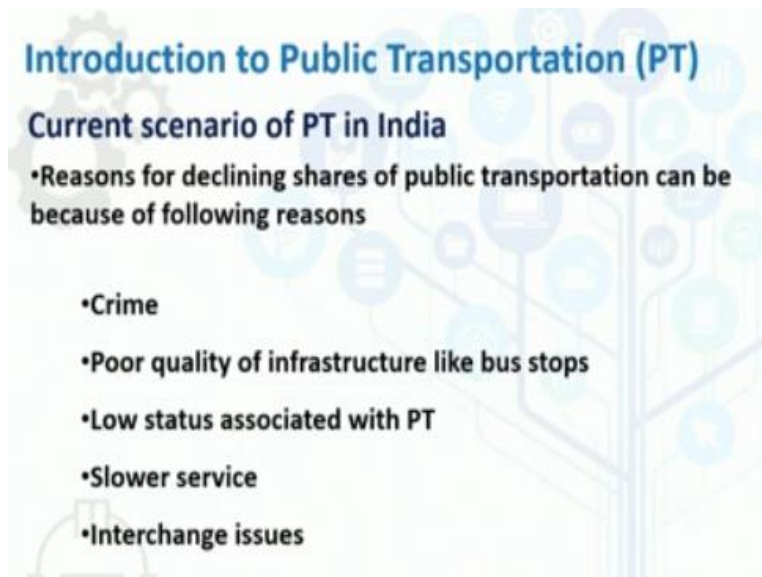


Now when we start looking at the reasons for declining share of public transportation we see that several research shows us some of the primary reasons of reducing declining shares is people often complain that they are less comfortable. They do not get a seat, it is overcrowding in the bus or in the metro systems, sometimes they are less accessible. So maybe the metro station is 2 kilometers or 3 kilometers away from you, and there is just no way to access the metro station.

You do not want to go 2 kilometers out of your way to access the metro system. So accessibility is an issue. People complain about less flexibility. So what happens is when you want to travel there is not a metro system or a bus available; you have to wait 15 minutes or 20 minutes. Usually people, who are currently mostly in a hurry or their lives are mostly busy, do not want to wait and hence you do not end up taking any public transportation system.

There are also reliability issue due to congestion on the streets. Buses do not run on their scheduled time tables. So you do not your reach your destination on time. Also sometimes people feel that there is no privacy on the public on public transportation systems due to overcrowding or any other such issues.

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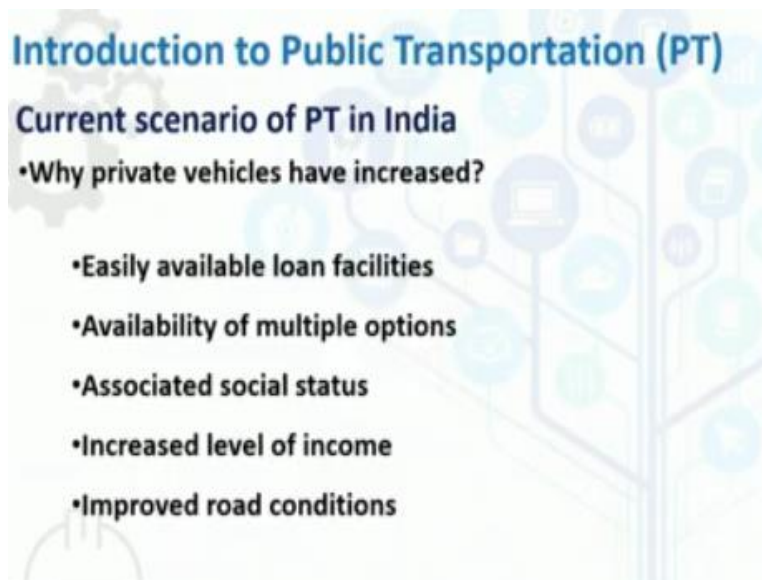


The other issues with public transportation systems that have come out is that crime related problems at the especially the bus stops, or if the vehicle is crowded in itself, during night times that is a problem. People almost say that public transportation system is not for me, when I am a wealthy person, or when I am a high income group person, it is not for me. So there is a social

status associated with public transportation systems that says that it is probably only for the people who cannot afford private vehicle.

The services, like I said slower or unreliable, and there is always an issue when you are changing between 2 public transportation systems. So for example if you have to reach a destination and you have to change 2 buses or change 2 metros then people usually tend to not take them and choose for a private mode of transportation.

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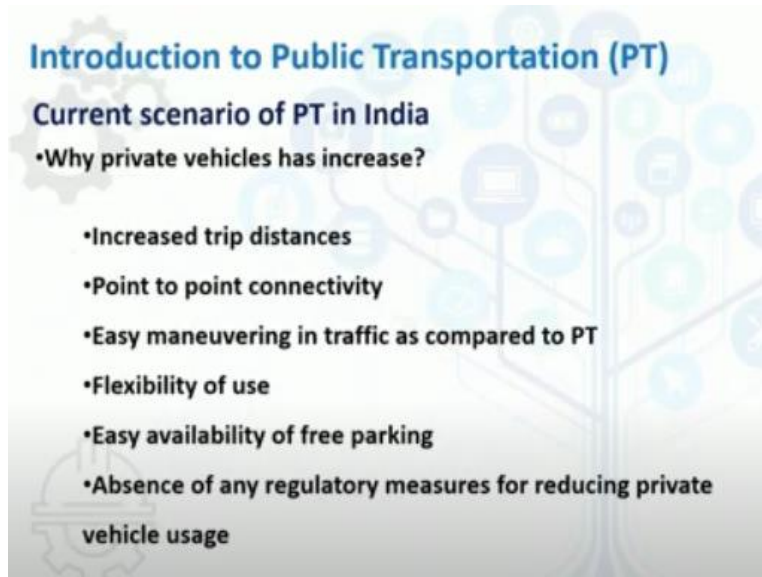


So on the other hand why have private vehicles increased? Now in the last 2 slides we saw that what are the issues with public transportation systems; now let us look at why have private vehicles increased? So one of the foremost reason for this is the easy availability of different types of private vehicles. So you can buy them as there are different types of loan options available to you there are different variants of just one brand of a vehicle.

So if you want to have fully automatic, if you want a manual, so there are the options to you are many to choose from and financing is available at low rates of interest. So it really makes it attractive for you to purchase a vehicle. Again the flip side, just as public transportation had negative connotation when it comes to social status, this has a positive connotation that said that if you are going up the ladder in your social status you have to have a vehicle.

So that is kind of a stigma that is associated with it and also research has shown that improving the roadway conditions or providing better roads in your cities almost leads to people buying more vehicles or more private vehicles. So on the one hand we want to have good roads in our cities we want to have wider roads in our cities. But on the other hand if you have wider roads and good facility usually what happens is public transportation does not increase but the private transportation usually increases.

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Introduction to Public Transportation (PT)

Current scenario of PT in India

- Why private vehicles has increase?
 - Increased trip distances
 - Point to point connectivity
 - Easy maneuvering in traffic as compared to PT
 - Flexibility of use
 - Easy availability of free parking
 - Absence of any regulatory measures for reducing private vehicle usage

Increased trip distances, so this is the one I was talking about if you have a sprawled city, if you have suburban areas growing horizontally, then your trip distances are increasing. So your distance between your home and your office increases, as the distance increases probability of using public transportation modes decreases and the rise and the probability of use of private transportation increases.

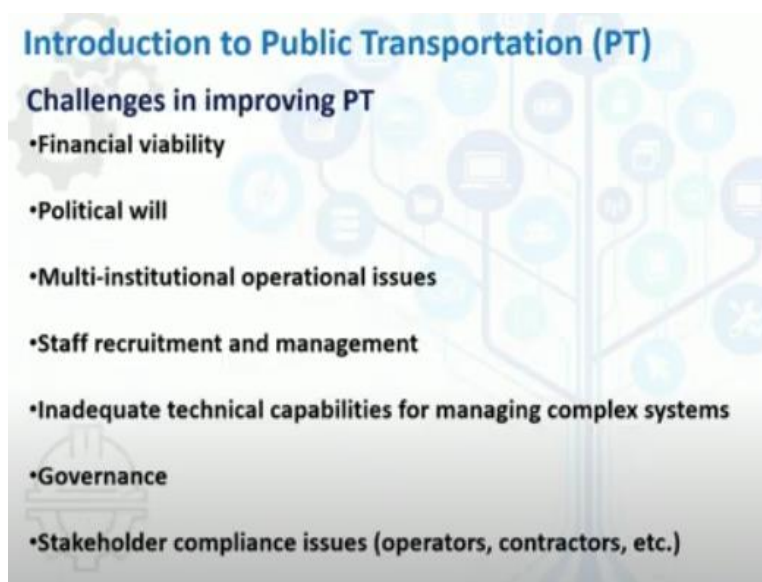
The biggest benefit that people perceive with private transportation is that it provides point to point connectivity whereas to access a public transportation mode will not come to your home whereas your vehicle is at your home. So you can move from your home to your office, where your office will have a parking right below it. So it is almost point to point transportation, whereas for using public transportation you have to either walk to bus stop and walk from the bus stop to office or take some other mode to access the public transportation.

Hence it does not provide point to point accessibility, or connectivity, or easy maneuvering in traffic, or flexibility of use. So you see that these are contrasting to what are the points that we talked about when it comes to the decline in public transportation modes. So flexibility, you have high flexibility whenever you want to go to any place when you have your private transportation with you in your homes, so you can move.

Free parking is a big bonus when it comes to the use of private transportation modes. In Indian cities parking is very rarely priced, even if it is priced, it is very low and hence that attracts a lot of people to use private vehicle transportation. The last point which is slowly coming into effect in some of the Indian cities, it is broadly called congestion pricing, there are no measures to regulate the amount of vehicles that either is purchased or regulate the amount of vehicles that is on the roads. So some of the measures of doing this is toll the entry of vehicles into a CBD. So there are fewer number of vehicles entering into the CBDs.

So these are all the regulation related points which have to be enforced so as to reduce the number of private vehicles, but they are not there in many of our Indian city and hence private vehicle use is still very high.

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Now what are some of the challenges in improving public transportation? Financial viability is one of the biggest challenge in implementing public transportation systems, almost all of the

public transportation modes are subsidized by the government agencies of their state or country. So most of these mode are not sustainable in itself, the fares have to be kept very low so that everybody could use it and as a result the operating and maintenance costs are very high.

This makes it almost financially not viable so when we start to think about implementing metros in some of the cities, some of the tier 2 tier 3 cities they are not financially viable because they just do not have enough demand meaning there are not enough people who would ride it which would account for the cost of construction and operation and maintenance. Often political will is also lacking.

So when we talk about innovative public transportation systems or bringing back some of the old public transportation systems such as trams on the roads you often will see that the government will not be in favor of it. They would rather be in favor of some newer technologies like autonomous vehicles coming into the picture. So public transportation also needs champion, like we said earlier, it needs somebody who will take it forward and implement it and finance it for the city.

Otherwise it becomes very difficult to implement. The other issue is multi-institutionality. So what happens, especially in the case of large metropolitan areas, a single public transportation system may be plying between different municipality or different municipal corporations and then how do you manage the operations between these different organizations becomes an issue. How are the revenues collected? How are they distributed that become a challenge as well

Staff recruitment and management is always a challenge. Public transportation systems are expected to be open late in night as well. So recruiting staff for late night shifts always becomes an issue and paying them a healthy salary is sometimes a challenge as well. We also see that there are human resources problems in operating and managing large public transportation systems. Usually people are not very well versed with how to manage and operating system just because there are not enough institutions that teach them about how to manage public transportation systems.

Now a lot of intelligent transportation is being incorporated in the public transportation arena as well, such as locating where your next bus is, what is the delay on the route? So to understand all

the complexities of each of these public transportation systems, good human resources are required. Qualified technical people are required to run this systems which are often not the case; not found in very many cities in India. Governance, like I said, different boundaries, different municipal boundaries, it means municipal corporation boundaries is an issue.

And finally operators and contractors not talking to each other, not complying with standards is always a problem. There are a lot of public transportation system that are run by private operators and contractors. And to make them comply to, for example emission standards, becomes very difficult when they say that they are running on tight budgets and their revenues are not that high.

But this is one of the very essential systems, running good public transportation system, is to include adherence to environmental regulations, adhere to emission regulations, and this is sometimes found to be challenging.

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So in conclusion what we have read in today's lecture is that -- we have looked at different types of transportation systems. We have looked at different types of public transportation systems where we are mostly focusing on buses and rail based systems in this course. So when they are combined together, they are called surface public transportation systems. Then we have looked at benefits from public transportation systems, different environmental, monetary, safety benefits

and then we have looked at how public transportation systems compare against public transportation systems.

So what are the pros and cons of public transportation systems versus private transportation systems, and finally what are some of the issues that have to be overcome, so that the public transportation systems become successful in your city. So these are the topics that were covered today; the references mostly were taken from these 3 sources and we got some of the images from the given sources as well.

So please go ahead and look at these studies, these 3 references, to know more about what has been taught and I look forward to meeting you in the next lecture, Thank you.