Sustainable Transportation Systems
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Lecture 04
Current Scenario of Transportation in India

Hello friends. So, now we are having this lecture number 4 which is about Current Scenario of Transportation in India. So, in this we will discuss about different kind of modes of transportation which are popular in India and various problems related to different transportation modes and then strategies or policy measures which are being implemented in India to address those issues.

And what is the share of non-motorized transport in India or motorized transportation in India and then also we would like to discuss how behaviour of public has changed from pre to post COVID in terms of choosing public or private transportation.

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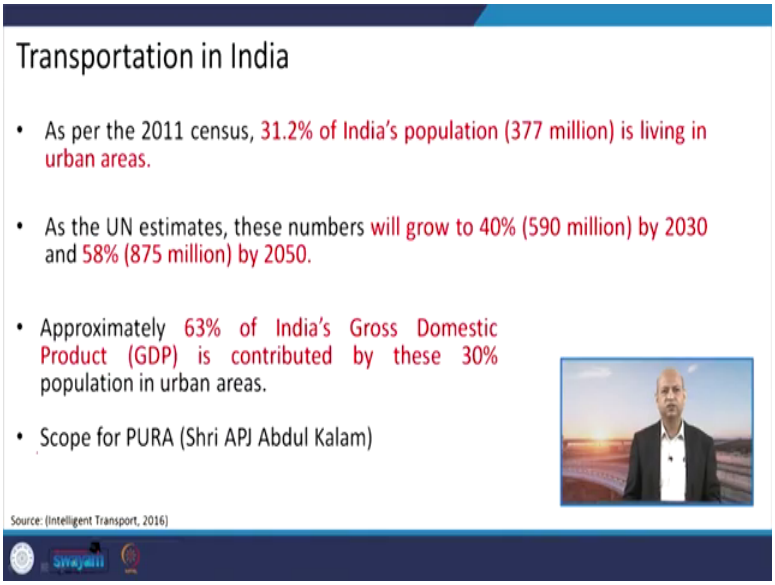

So, you can see like this data says that as per 2011 census around 31 % of India's population was living in urban areas and the estimated population for by 2050 it may increase up to 40 %, but still means larger population segment of India lives in country side or rural areas but because the population is huge, even this 31 % is also around 377 million people who are living in cities and then we have mega cities also like Delhi, Mumbai, Kolkata, and mega cities means the population more than 10 million.

So, some cities have around 20 million of people living in a particular city so you can visualize the situation how difficult situation is there or how challenging situation is there. And this 63 % of India's GDP is contributed by cities only. So, that means this 30 % population who is living in India they are contributing the major part of economy and that is why it is said that 'cities are economic engines of modern age habitat or urban areas or nations'.

This is why our late president Mr. APJ Abdul Kalam he gave the concept if PURA, providing urban amenities in rural areas so that this migration of population from rural areas to urban can be discouraged and people may find better job opportunities, better educational opportunities, better health infrastructure, even in country side. So, this was the concept which was taken quite seriously and now people are working on those issues which can help us to achieve or to meet that dream of PURA.

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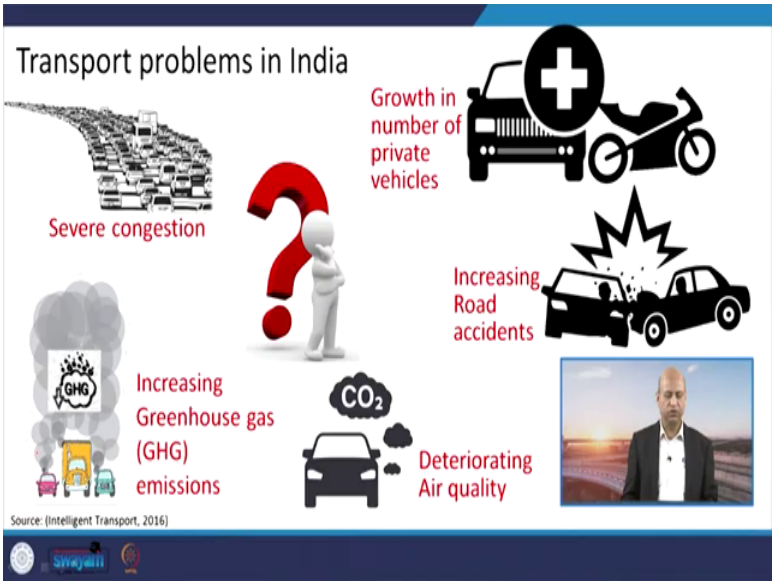

Well, then different problems if we want to discuss related to transportation in Indian context, then we can see that lot of congestion is there in urban areas, and growth of private vehicles have been tremendous and that shows that maybe we have not been successful to motivate people to shift from private vehicles to public transportation system or in other view point, people may also argue that maybe our public transportation system is not so good that people feel motivated to discard the private vehicles and use the public transportation system.

Then there are road accidents, you will see some figures, we will give you this information, some data, and that is very serious situations, so many people die because of road accidents.

Then there are increasing issues of this greenhouse gases, emissions, so climate change related issues are there, which are also emitted by transportation sector and deteriorating environmental aspects like air quality and forest areas or other, seriously air quality is the most important issue because at local level these tail pipe emission also contributes significantly in deteriorating urban air quality.

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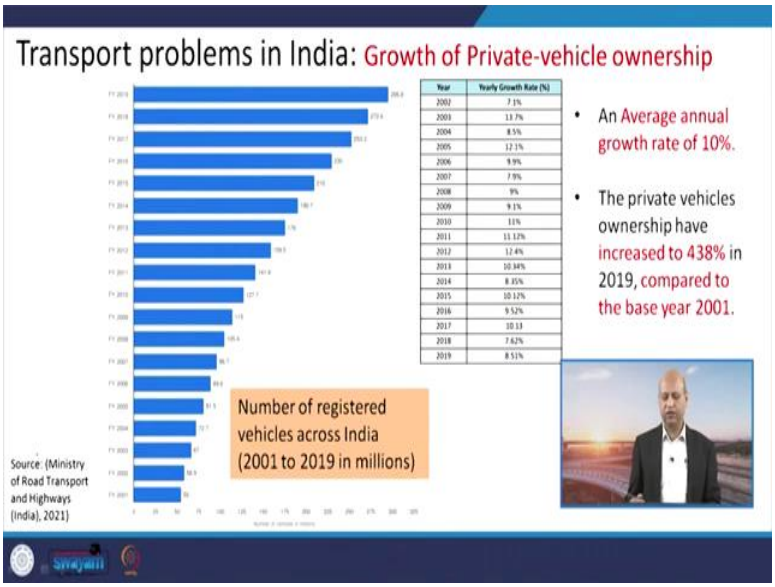

Well, if you want to see these like growth in privately owned vehicles, so you can see like around 10 % annually, private ownership of vehicle increased and if we compare from 2001 to 2019 data then around 438 % increase has been noticed in privately owned vehicles, so that shows that the demand of mobility of the public was not met properly by public transportation and people had to go for their own vehicles. So, these are the vehicles which are shown in millions from 2001 to 2019.

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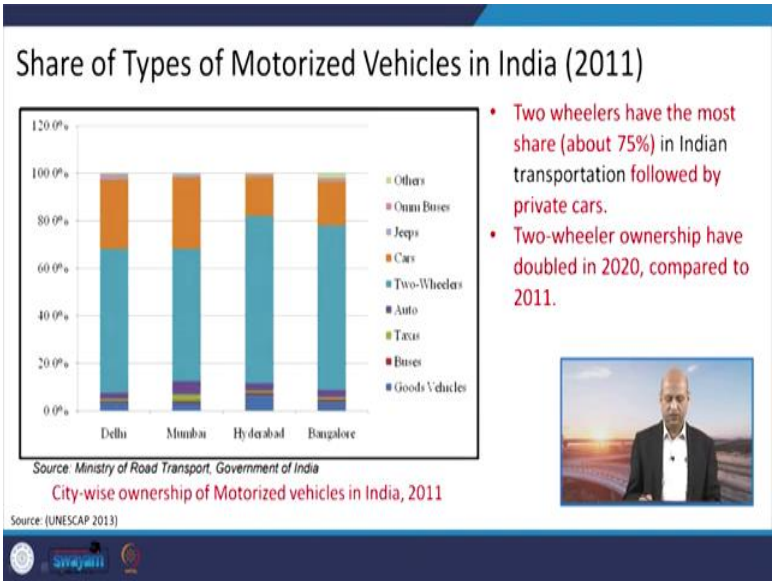

And if you want to see this composition of like different types of vehicle like jeeps, cars or 2-wheeler, so the 2-wheeler, in different cities you will find that 2-wheelers are the majority of the vehicle fleet. So around 75 % increase in Indian transportation system was observed for 2-wheelers and from 2011 to 2020 this doubled basically.

So, again because air pollution emissions, so air pollutants, emissions which come out of tail pipes, they also depend upon types of vehicles. So, if there are 2-wheelers more then like NOx emissions are quite high from 2-wheelers.

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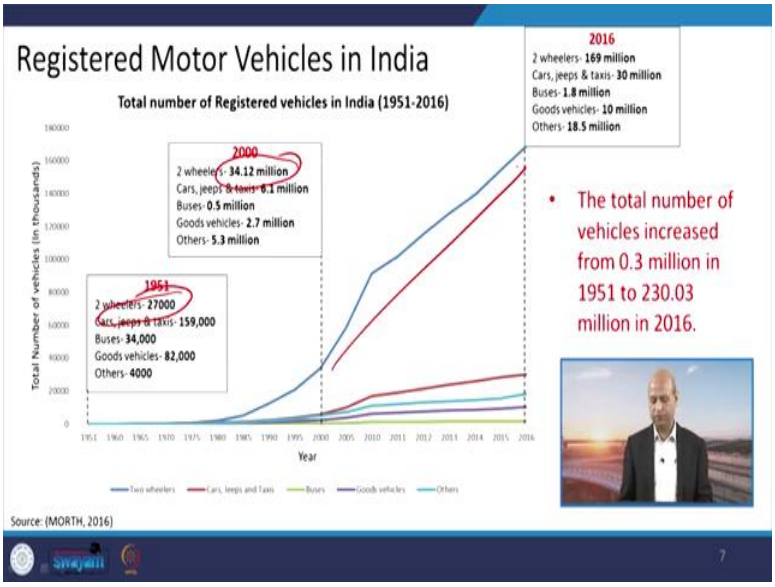

Well, if you want to see again this data of registered motor vehicles in India, so like in 1951 the number was quite less, only 27,000 2-wheelers, but in 2000 it became 34 million, so you can see the huge growth and after opening up of our economy from '92 onwards, you can see the tremendous growth in all types of vehicle categories but 2-wheelers observed the largest of highest growth in terms of privately owned vehicles.

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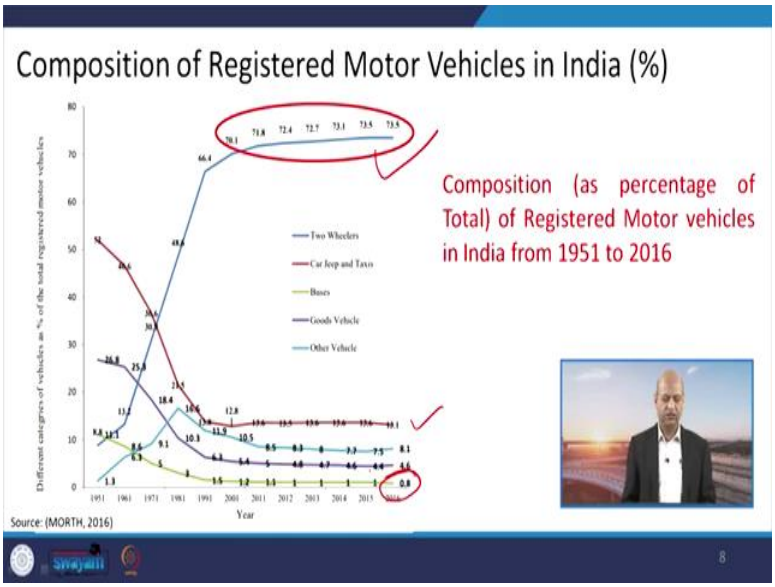

Well, if you see the composition, so again because of those increased numbers, this composition of 2-wheelers is much more than other categories of vehicles whether it is cars or buses, buses have very less numbers although because buses have higher capacity to cater passengers, so they can be used by more number of people, but if you see the numbers, then the huge number is of 2-wheelers and they have their own implications.

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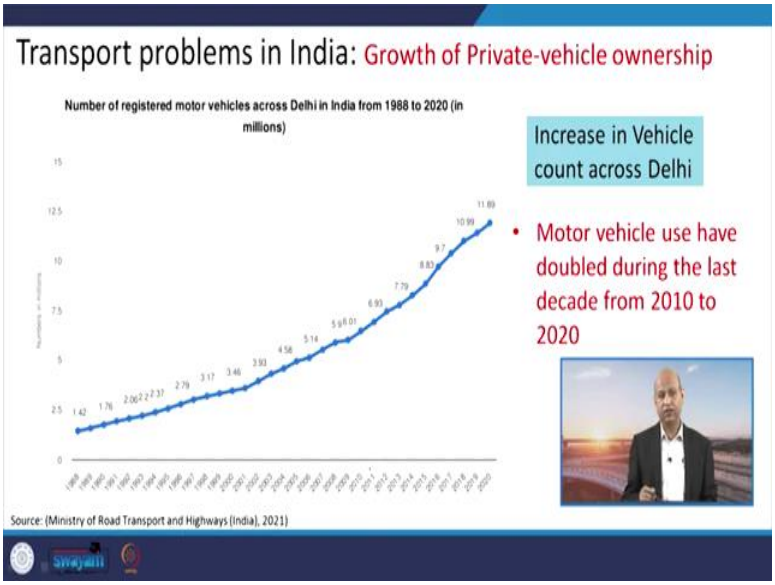

Then if we focus on Delhi, so again in Delhi from 1988 to 2020, this continuous increase in vehicle ownership has been there and vehicle ownership has increased tremendously but the infrastructure that is like road length has not increased so much, and that is the reason why we have the congestion, very slow speed, and because of congestion and slow speed lot of emission of air pollution is there and that is why we have very low air quality in urban areas.

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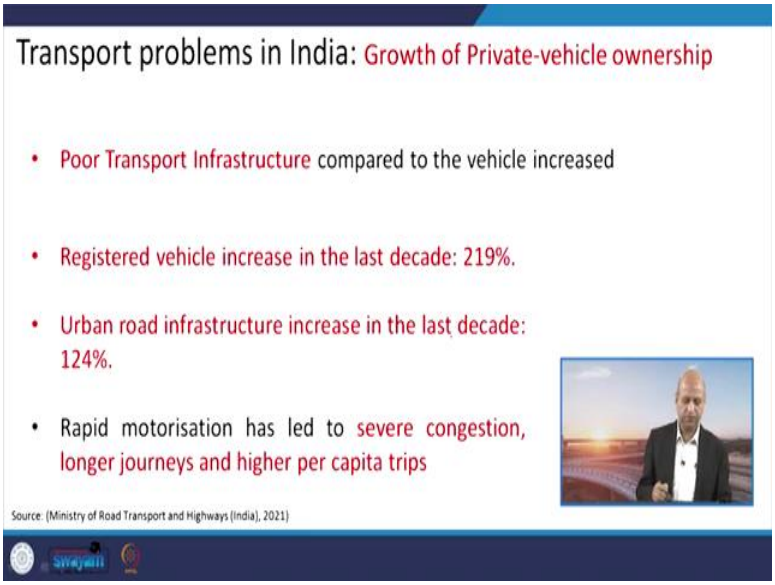

Now, if we want to relate these growth of privately owned vehicles, so it gives some indicators like poor transport infrastructure compared to vehicle increased. So, vehicle ownership has increased but the transportation infrastructure has not kept paced with the

increase in the vehicle ownership. Then the huge growth to 119 % growth in registered in last decade and 124 % increase in the road infrastructure.

So, 219 % and 124 %, so around double is gap is there in the growth in infrastructure and the vehicle ownership, so that is why the congestion is there, the direct result of these kind of developments.

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See the congestion situation in different cities, these are pictorial representation of Delhi, Mumbai and then Kolkata. So, means the data says that around 3 Indian cities are in top 10 world congested cities according to the survey. And. it is known that Mumbai is ranked second in the world and Bengaluru sixth, Delhi eighth and Pune the sixteenth among 416 cities which are listed in terms of congested cities across the 56 countries. So, this is the situation which is directly outcome of higher number of privately owned vehicles, means very less amount of population using public transportation system you can say.

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And again the very negative aspect of this huge growth in privately owned vehicles and very less development of the needed infrastructure like road, etc., is the accidents. So, road accidents from 2005 to 2019 if you see, around 151,000 fatalities occur annually. It is huge, huge number that is around 414 people die each day due to road accident, so this is a very-very grim situation, very serious situation and we need to pay attention on this.

Well, around 6 % of global road accidents, traffic accidents or incidents they are in India alone, and almost 70 % of those accidents involve young Indians. So, you can imagine the situation, it is a kind of pandemic you can say, we need to address it very urgently.

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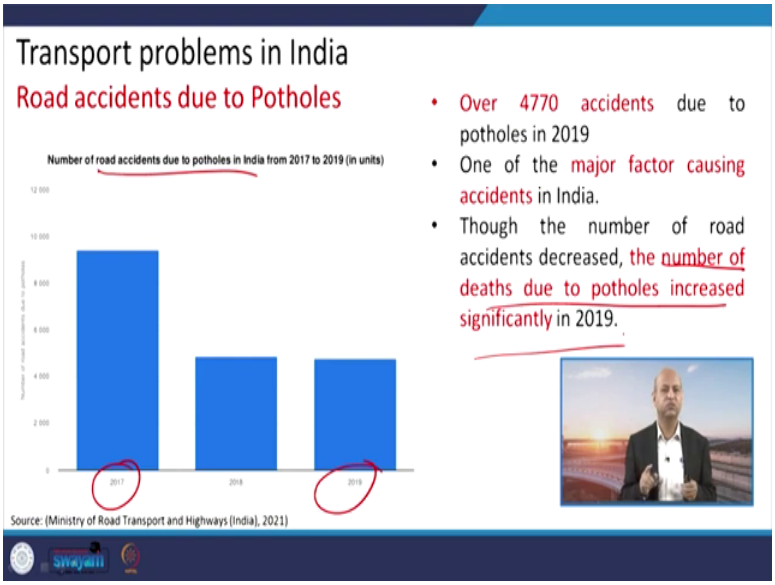

Well, the good aspect is that the potholes, the accidents of potholes on the roads have decreased from 2017 to 2019, but the very negative aspect of very bad aspect of this is that the number of deaths due to potholes has increased in 2019, means maybe those small potholes were repaired so accidents related to those have decreased, but the accidents which have happened are so serious that the number of deaths due to potholes have increased over the years, again this is very serious issue and we need to address it urgently.

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Then air pollution related problem is very serious because around 4.2 million deaths every year worldwide are due to ambient, ambient means outdoor air pollution, exhaust emissions

and air quality, deteriorated air quality, so this is the estimated figure in fact. And in India also the situation is not so good because around 1.1 million people prematurely die because of poor air quality.

So, these are the figures which directly or indirectly motivates us that we should put lot of investment to improve the transportation systems and transportation related infrastructure.

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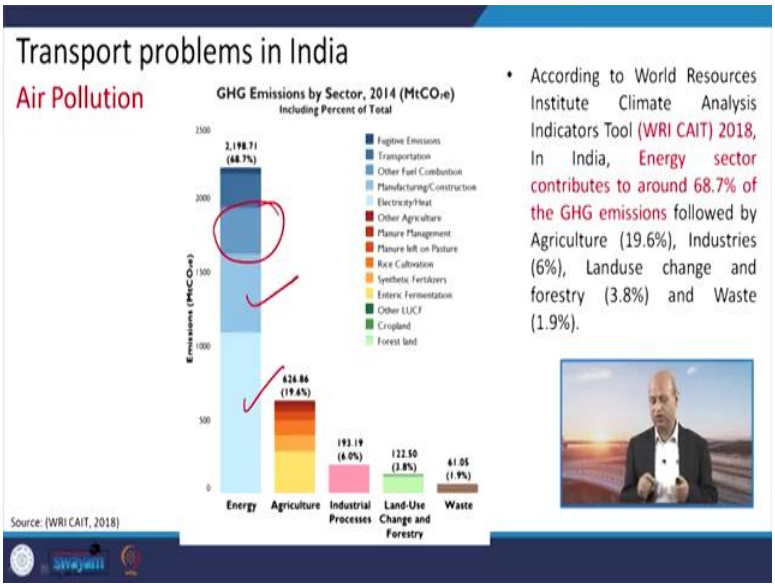

Well, if you see the air pollution emissions or greenhouse gas emission from energy sector is the highest but energy sector itself is composed of like electricity, heat, and then manufacturing sector but this is the transportation sector which is also significant. It is not something which we can ignore.

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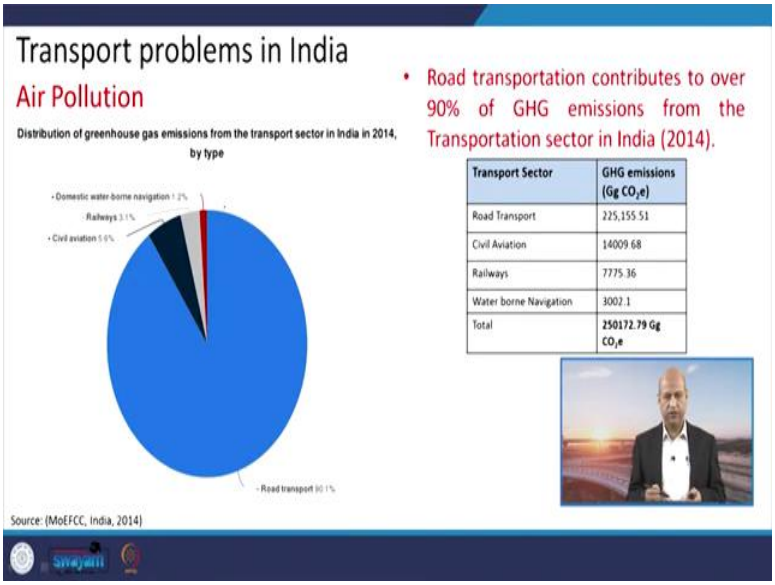

Now, if we want to look at air pollution related problem, if you want to distribute how much air pollution is coming out of different types of transportation systems like road transport or civil aviation, so the road transport is the main culprit of air pollution emissions, this is more than 90 % emissions are coming out of road transportation only.

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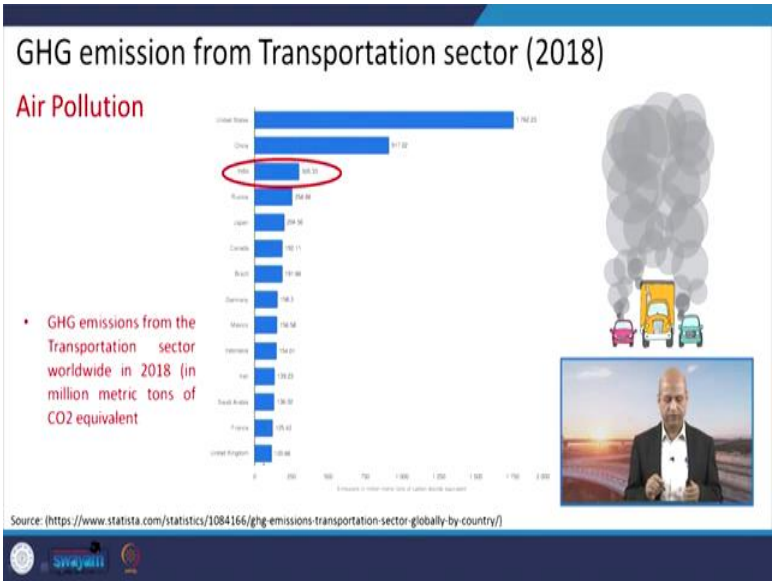

Well, if you see the greenhouse gas emissions in terms of million metric tons, so around 305 million metric tons of CO2 equivalent greenhouse gases are emitted in India alone and the United States is the highest, then China and then we are the third largest GHG emitters, but of course, we have more population so per capita emission is still less than many more countries

because we do not have access to that kind of energy level or energy uses as developed countries citizens have.

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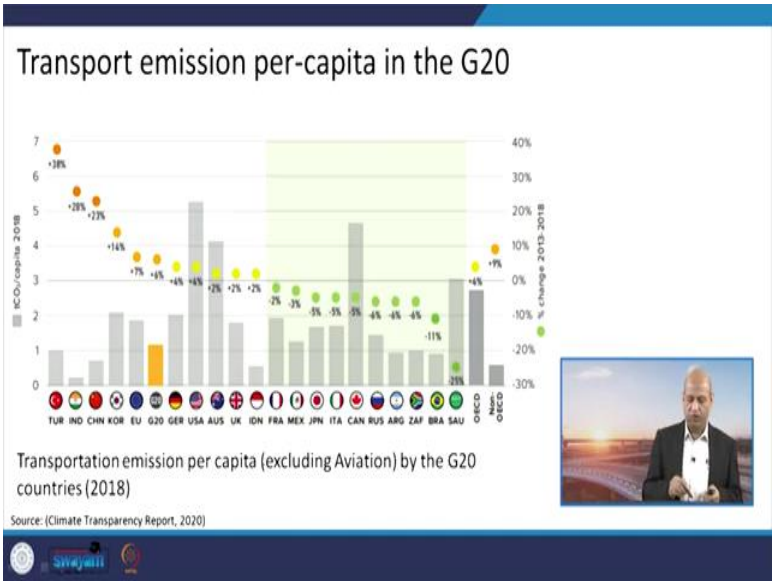

If we go for this per capita emission in G20 countries, so we are the ones we are lowest in emissions, because of huge population and still we need to address or cater the needs of the population, we have huge energy demand, so the emissions maybe grow if we do not go for energy efficient technologies whether it is transportation sector or the industrial sector.

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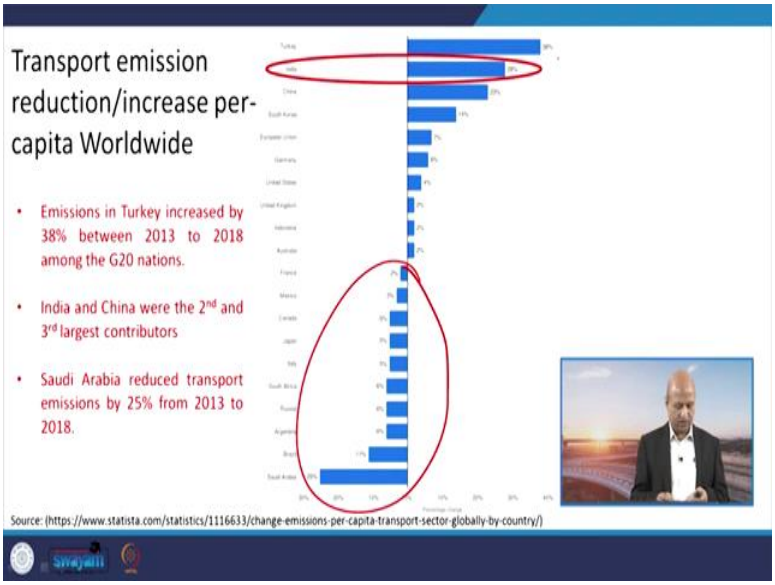

Well, again if you want to see the transport related emissions reduction or increase per capita worldwide, so between 2013 to 2018 these are the countries which observed reduction in

emissions related to transportation sector but in these countries emissions have increased, so India it was 28 % increased, but Turkey around 38 %, China around 23 %. So, and like Saudi Arabia, they observed highest reduction in emissions in comparison to 2013 and up to 2018 and that is 25 %.

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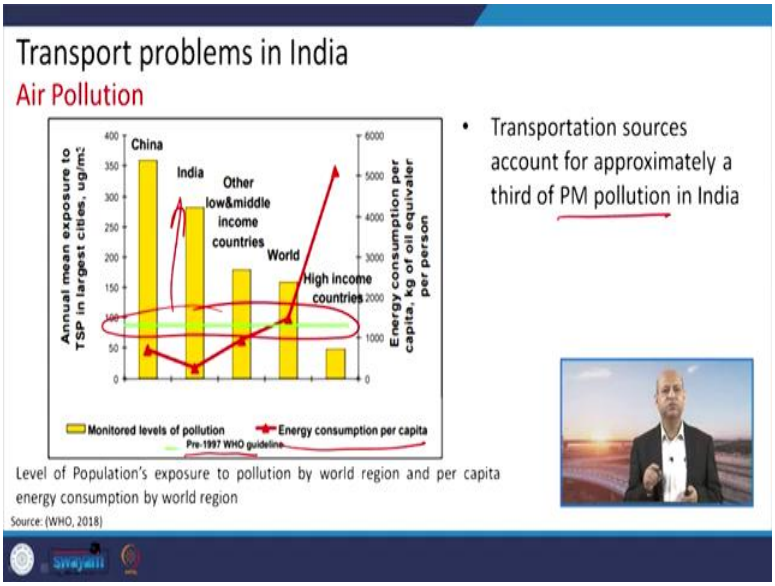

Well, if you want to see particulate matter pollution then, if we want to compare with China, we are lower than the Chinese emissions of particulate matter and energy consumption per capita is also lower, so that way we can be happy but this is not the situation of becoming happy because this much, this average pre-1997 WHO guidelines related to particulate matter, still so much accidents is there.

So, we should try to lower the emissions of particulate matter because particulate matter is something which is directly affecting our respiratory system and we are if exposed to particulate matter then several kind of problems maybe there related to respiratory system.

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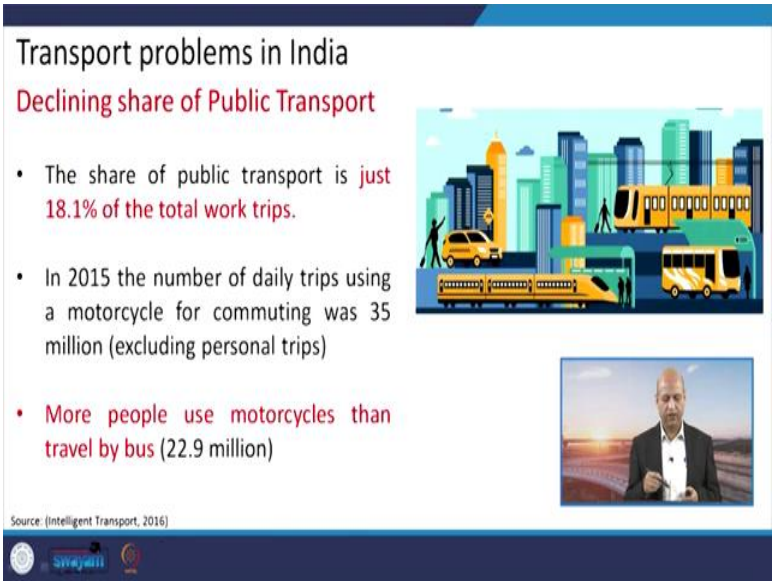

Well, you know if we want to see the declining share of the public transport in comparison to the privately owned vehicles, so more people use motorcycles than they travel by bus, around 22.9 million people. So, I mean the scenario is that public transportation is being used by less number of people and more people are using their own privately owned vehicles.

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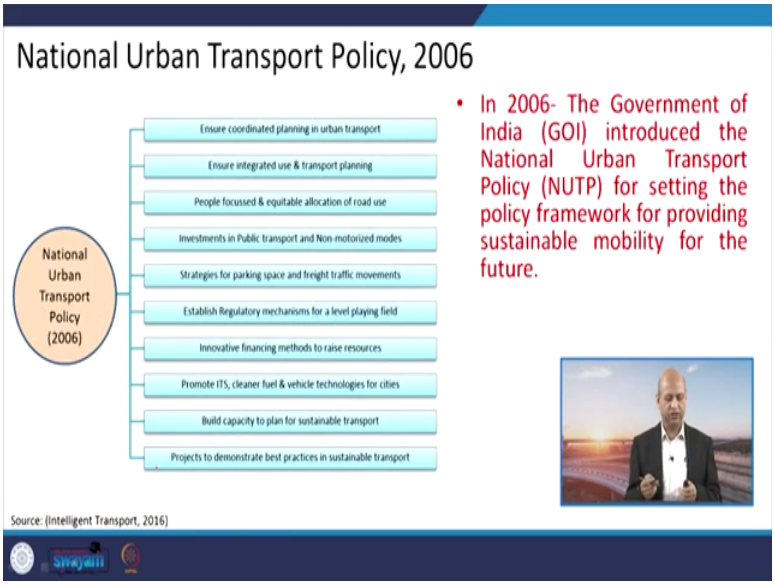

To address these issues several policy measures were adopted and in 2006 National Urban Transport Policy was implemented and it is very ambitious and very good policy which was implemented by government of India to give impetus to infrastructure facilities, to also adopt intelligent transportation systems and to integrate different modes of the transportation

systems and that has given good result in the sense that people are finding now better connectivity to the bus stations or train etc., in larger cities.

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Well, then there was this policy of smart cities, so when we talk about smart cities, we talk about all kind of infrastructure they are using in this digital age, so that we can integrate different kind of transportation modes as well as other facilities to reduce air pollution emissions, etc.

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So, here you see air pollution index or there are sensors which can give you idea about crowd, so if centrally controlled mechanism is there, we can increase the frequency of public

transportation systems so that people can be transported during these crowd situation and that way if we deal with the intelligent transportation systems, we can also reduce the congestion scenario and when we reduce the congestion scenario that means we are emitting less air pollutants and we are helping to improve the air quality.

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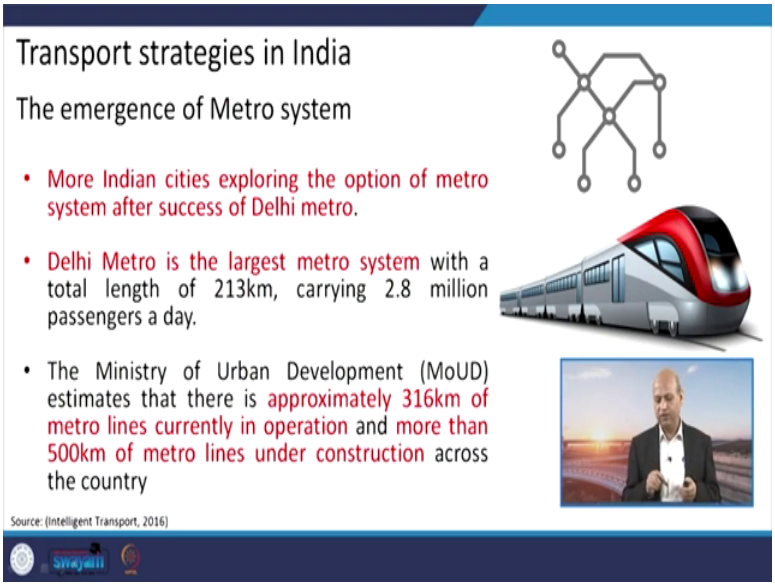

In Delhi there is a success story of metro, Delhi metro, you know about this case study and now many cities are using or they are trying to have metros in their own cities because of the success story of Delhi metro. But again there are different schools of thoughts, some people argue that it may not be successful everywhere, it depends on many other factors like how many people are there to access metro.

And then what is their per capita income or it is better that we should go bus rapid transportation system rather than metro, so there are many arguments or many policy issues regarding this but still it is a good success story which we can talk about because it is one of the very well-known system which is having carbon credits and because it is saving the emissions, it is reducing the emissions of the greenhouse gases.

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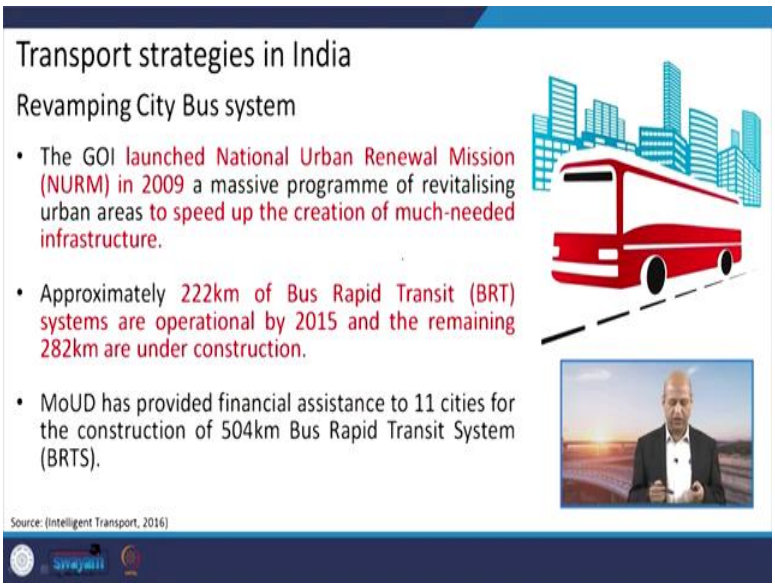

In different cities we are revamping our bus transportation system so lot of investments is there and we are buying new buses but again the cost parameter is very high and that is why this National Urban Renewable Mission was launched in 2009 and special packages were given to different cities to have Bus Rapid Transit System, BRT system and in some cities it is very successful like Ahmedabad, Gandhi Nagar, etc.

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Now, we talk about like future bus technology, means there are hybrid technology based buses which use different kind of fuels which are emitting less amount of air pollutants or greenhouse gases but they are very expensive, so there is a need to have our indigenous technology in terms of having good hybrid buses which can compete with those expensive which we generally import from developed countries.

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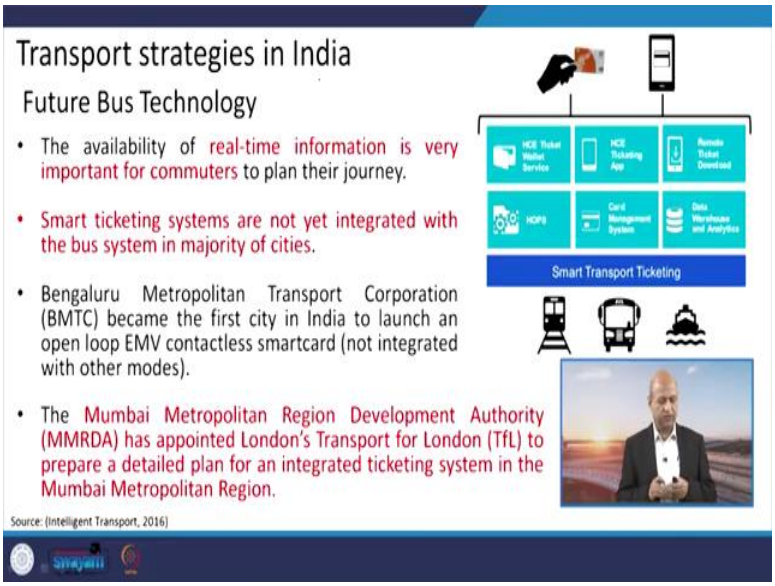

When we talk about these future bus technologies then we also have this digital technology so that real time information can be transferred from buses to centralized location and they can guide to different routes if there is let us say some traffic jam is there, so the driver can

get the information and he can have the different routes, so that way, those kind of developments are taking into picture now-a-days.

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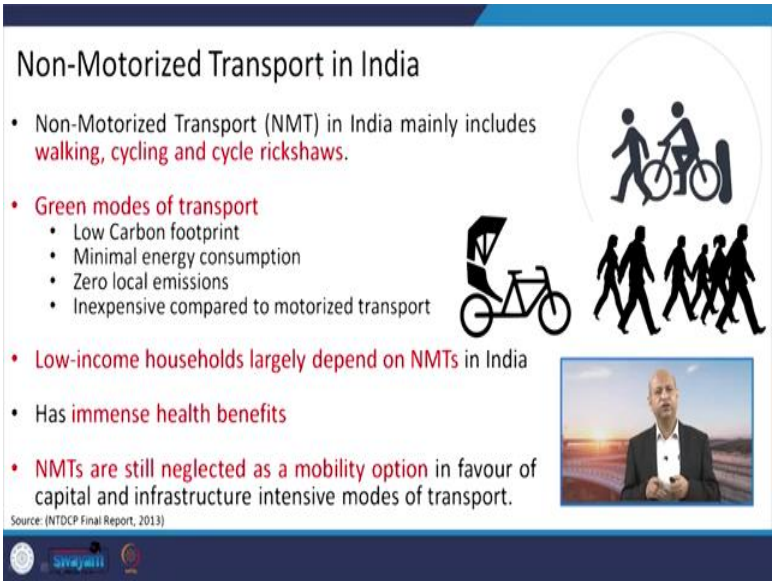

Well, wonderful example is of non-motorized transport, in fact, new urban planning is giving lot of importance to these non-motorized transportation possibilities because these help us to save resources as well as to ensure the improved air quality, so if we can have more walking or cycling tracks then people may feel motivated or they can have incentive to use those tracks.

But unfortunately we do not have those kind of footpaths or I mean, where dedicated footpaths can be there for people to walk and many people walk on the road and that is very dangerous, it is not so good for people. But there are also immense health benefits so people are now-a-days shifting for at least shorter distances, they try to walk to use bicycle or use rickshaw, etcetera.

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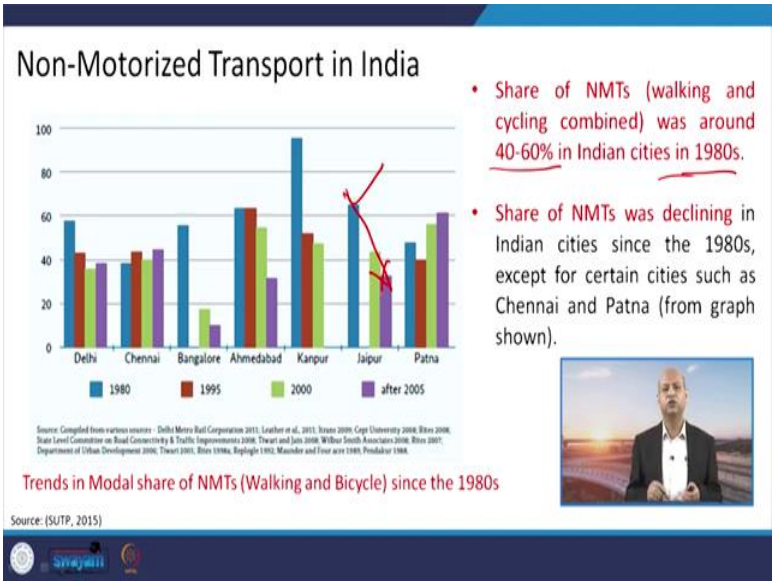

But situation is not so good in terms of these observed data, like in 1980s the share of NMTs – Non-Motorized Transportation was around 40 to 60 % but over the years it has reduced, reasons maybe that there are no proper footpaths or they have been just engulfed by expansion of roads, so you can see one example, in case of Jaipur.

This was the share in 1980 and it has reduced to this much, so in most of the cities, except few exceptions in most of the cities these NMT share has reduced drastically and that is not good for our public health as well as for environment.

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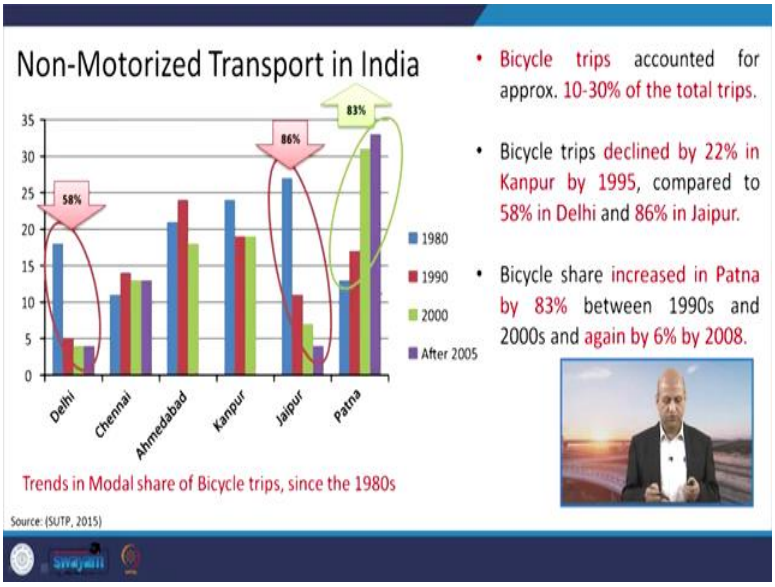

So, the reduction in Jaipur has been observed around 86 % but there are good stories also, like in Patna it has increased around 83 %, in Delhi it has decreased again 58 % because lot of congestion, so many vehicles, how will people walk on those roads which are already taken by traffic jams and those kind of undesirable situations.

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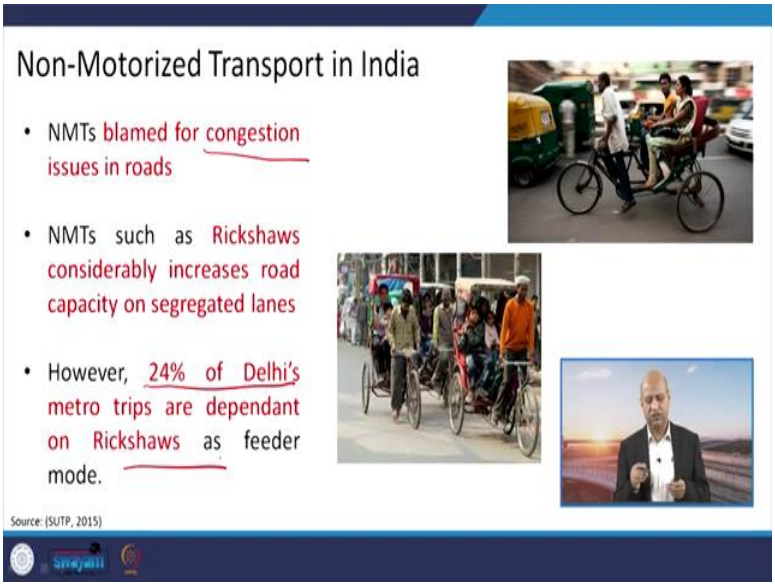

Anyways, but NMTs, people says that NMTs are result of congestion but this is because of mixed kind of population of different vehicle categories, we do not have dedicated lanes for NMTs, etc. And that is why they have to come to the, on the same road where cars, buses, every kind of vehicle category is there and that is also dangerous for them, so if we can have dedicated lanes for NMTs then situation can be improved.

And they are the most important category of vehicle which provides the last minute or last mile connectivity to help you reach to home from the bus station or railway station and like 24 % of Delhi's metro trips are dependent on rickshaws as feeder mode, so we should pay more attention to them. We should provide them good facilities so that they do not feel kind of undesirable population of our transportation.

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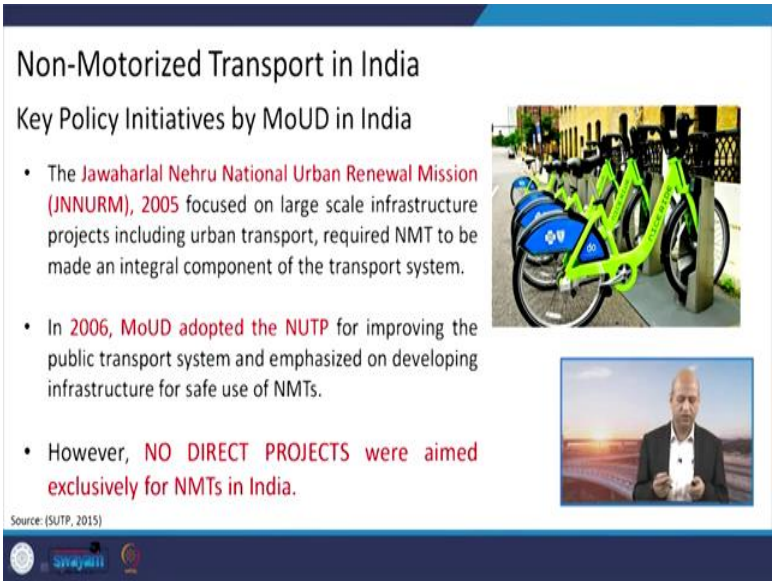

So, to boost this non-motorized transportation in India there have been some key policy measures as listed here by the government and because it also addresses climate change related issues because whenever we walk or we cycle we are not adding to any kind of emissions and it is also good for our health, so that is why these things are being promoted.

And there are several policy initiatives like in case of Jawaharlal Nehru National Urban Renewal Mission, lot of infrastructure was developed to parking lots for cycles or some agencies are also coming which give you to hire or to rent the bicycle from one place to another, some apps are also available in some cities, so these news things are coming up to promote the NMTs.

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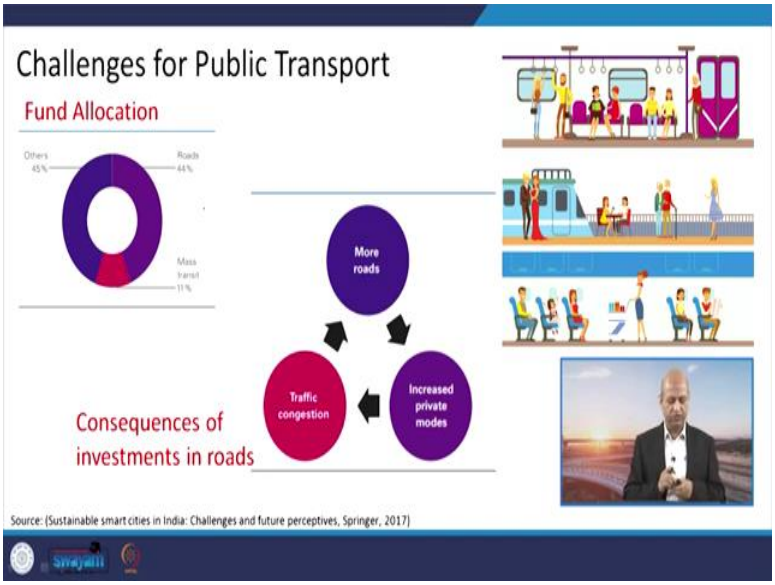

Well, fund allocation if you see, mass transit system has only 11 %, others 45 %, roads for 44 %, so this situation itself says that lot of investment is required in public transportation system or mass rapid transit kind of system, so that we can shift lot of people from privately owned vehicles to public transportation system.

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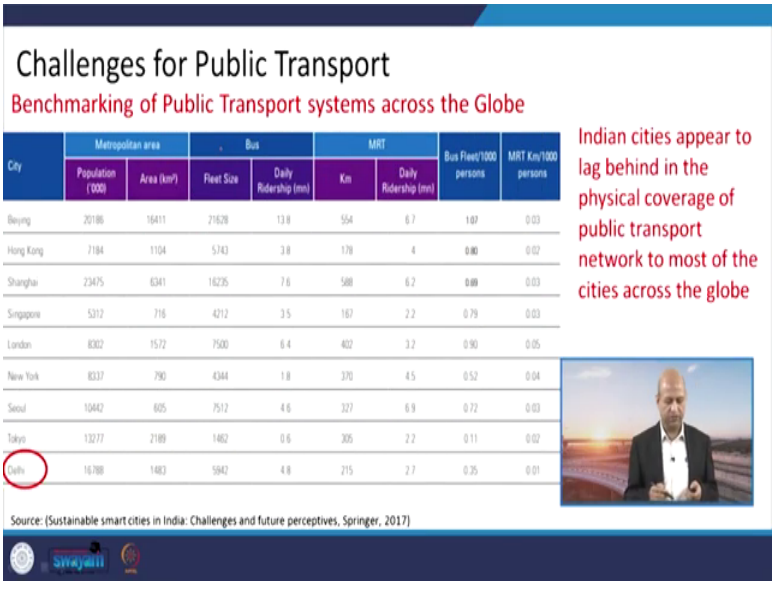

There are lot of challenges like if you want to see in comparison to other cities like Beijing or Hong Kong, so Delhi has at the lowest, at the bottom in terms of daily ridership in the bus or MRT etc., so we are the ones who are using least public transportation system in comparison to other cities, so huge scope is there to improve the public transportation system.

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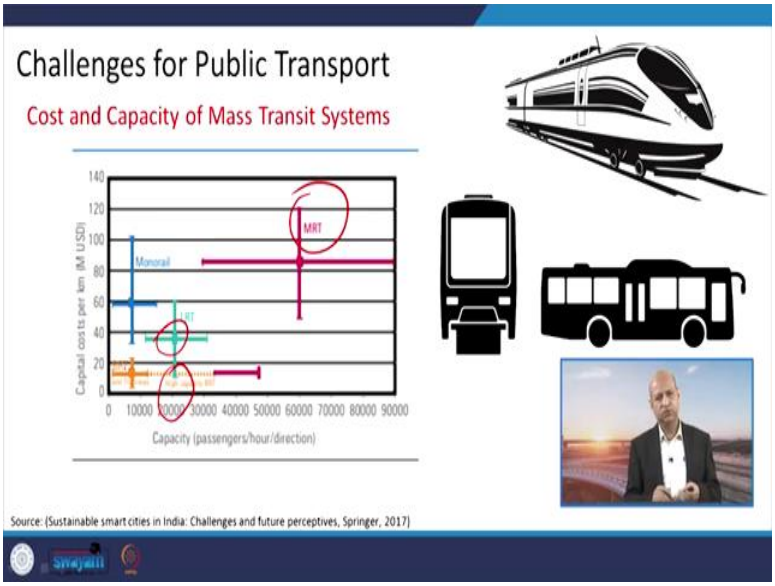

Well, if you see in terms of cost and capacity of different transportation system then this mass rapid, mass transit system (MRT), they have good capacity, they have huge, large capacity but cost is also quite considerable. But in case of light rapid transportation then capacity is very less. Cost is also less, so means depending upon the population, density of different pockets of the city, we can have MRT or LRT. So, we need to analyze the situation and accordingly we should incorporate or implement the system which is desirable there.

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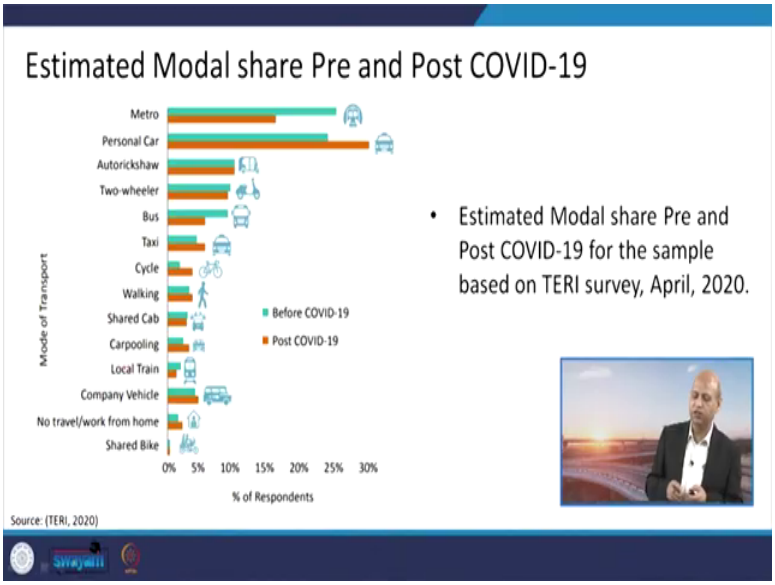

Well, if you want to see this modal share pre or post COVID, how this COVID situation has affected our choice for public or private modes of transportation, then you see like metro, the

uses of metro before COVID-19 was that much, but after COVID-19 it has reduced significantly and personal cars usage has increased. So, because people have this perception and fear that if we come into contact of people COVID, there may be a problem related to COVID-19, so for the safety purpose people have shifted towards more privately owned vehicles.

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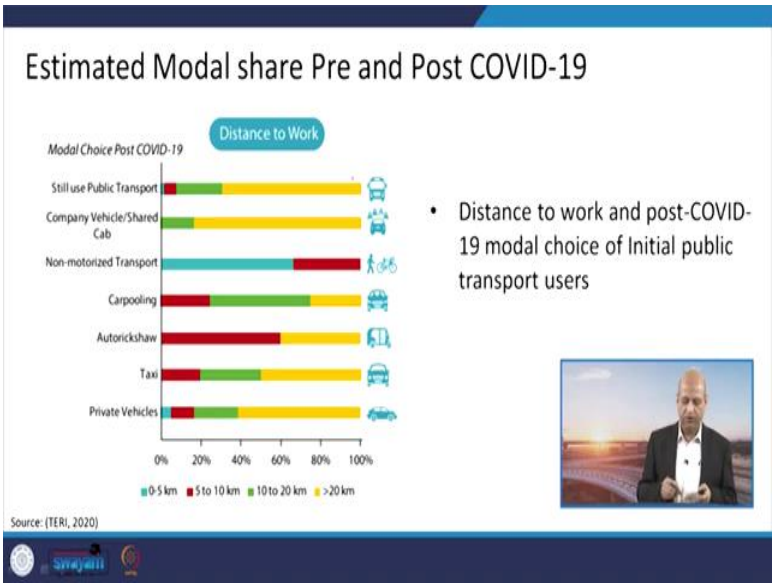

If you want to categorize in terms of distance to work, so these small distances like 0 to 5kms, so non-motorized transportation has catered it and for larger distances still some public transportation systems or company related vehicles they are catering these particular distances.

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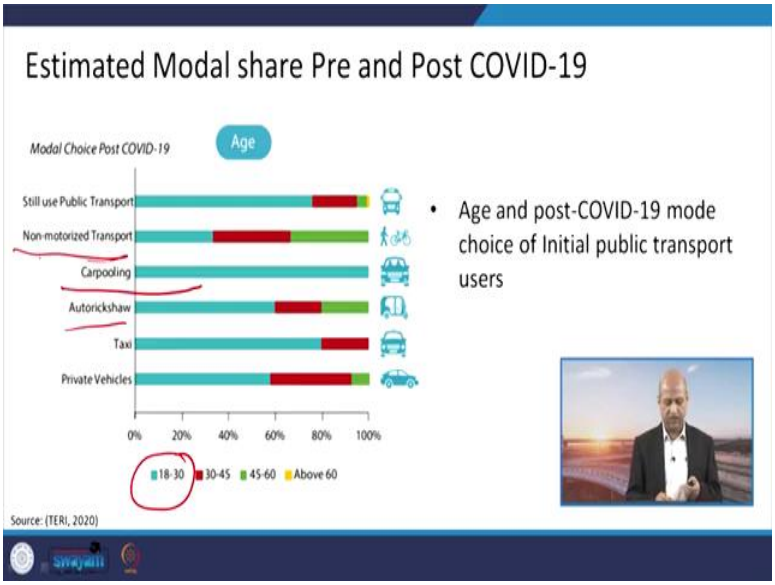

If you want to see the age related behaviour post COVID and behaviour for choosing different kinds of transportation systems then you will see that around 18 to 30% they are using like carpooling or auto rickshaw and they are the people who are mostly working, this is the age where lot of people work outside, so they are using almost all types of vehicles but less not, less number of NMTs, non-motorized vehicles comparatively. But 45 to 60% they are the people who are preferring NMTs, and then above 60% very less but public transportation system they want to prefer because they do not want to drive and it is difficult to drive.

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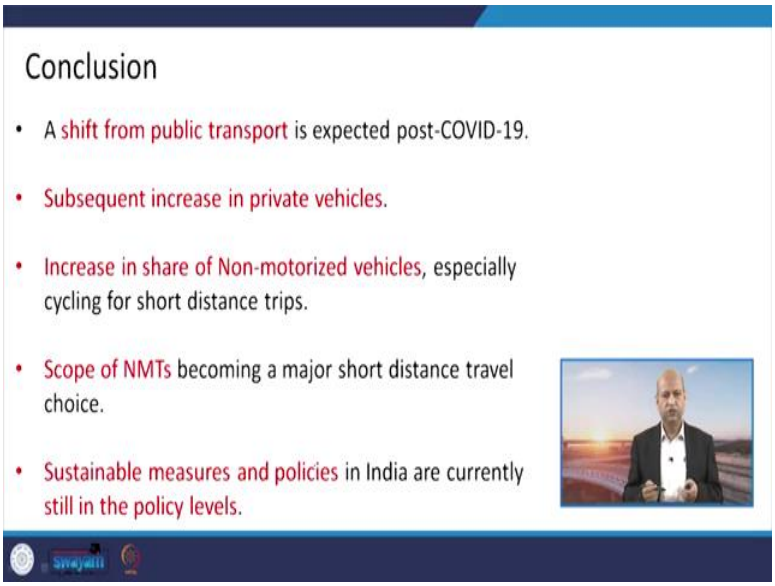

So, in conclusion we can say that the shift from the public transportation is expected due to the COVID situation and people may prefer for longer period unless the situation is very safe, so public transportation system will be affected very severely because of this situation but overall we want to shift towards public transportation systems so that lot of benefits are there in terms of saving the cost as well as saving emissions in terms of greenhouse gases or air pollutants, so it is much more environment friendly, you can say.

But of course, there are certain issues like in privately owned vehicles you have more freedom, you can go from one place to another whenever you want, but for public transportation system you have to see when bus will come or when train will be arriving only then you can travel. Then we need to increase the share of these NTMs or Non-motorized vehicles, especially cycling for short distances and so for that maybe we need to have dedicated lanes for that cycling tracks, etc., that investment is needed.

So, lot of scope is there to improve the infrastructure related to NMTs for shorter distances and then sustainable measures or policies for transportation system, again we have to work out that how much investment is going towards infrastructure and what is the disparity between urban infrastructure related to this public transport and the privately owned vehicles or NMTs.

So maybe we need to invest more into separate lanes for NMTs and as well as for public transportation system, so that the privately owned car or 2-wheelers etc., people may shift from this kind of transportation system to either NMTs for shorter distances and to the public transportation system for larger distances, so that is all for this particular lecture.

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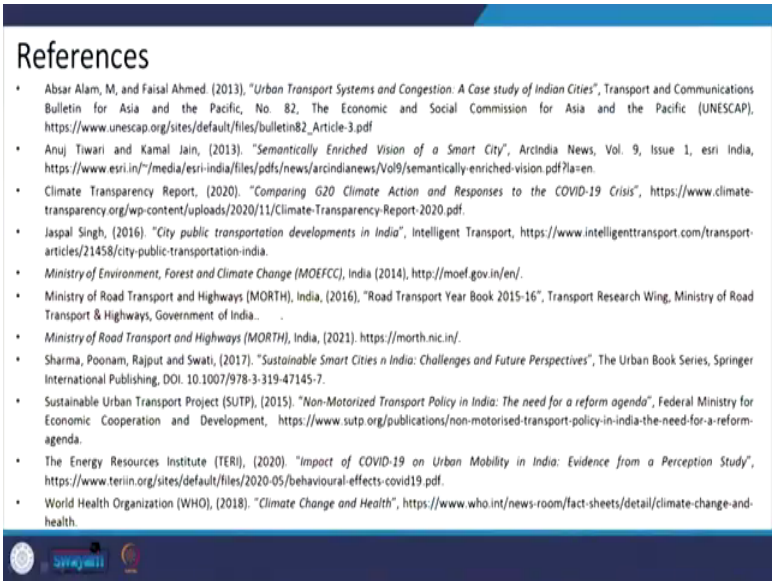

And again there is a good list of references which you can use for having more information related to different topics which we have covered in this particular lecture and thank you again for your kind attention and see you again in the next lecture. Thank you.