Decision Support System for Managers
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Module – 07
Decision Support System for Finance
Lecture - 35
Costing and Pricing for Public Transport

Hello and welcome to "Decision Support Systems for Managers". We are into Module 7, 'decision support system for finance', and today we will be doing Lecture 2, 'costing and pricing for public transport'; ok.

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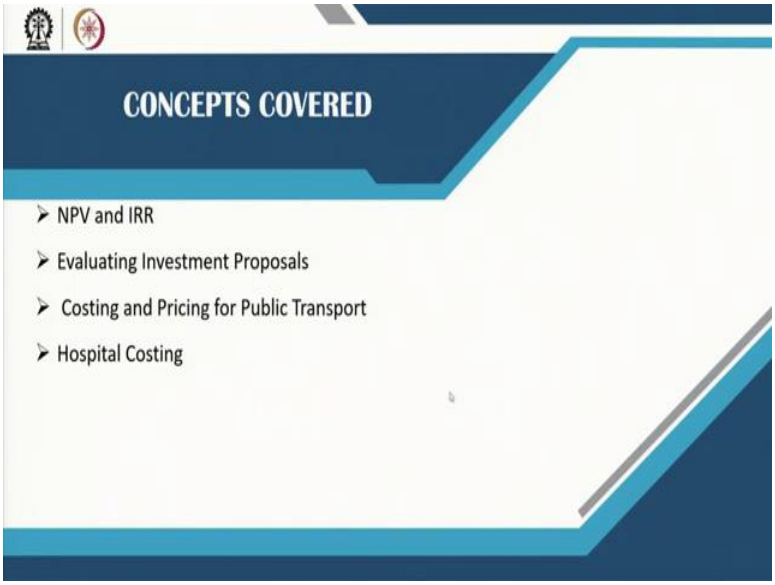

Now, the backdrop here is this. We had covered NPV and IRR, we have covered evaluating investment proposals. Today, we will do the third part, costing and pricing for public transport; ok.

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Now, the backdrop is basically we will just give you a backdrop see. Public transport is something which is very close to our heart, ok. We in India even though the country has progressed much, but still our public we most of us depend tremendously on public transportation systems; ok.

Take the case of the metropolitan cities, particularly Kolkata and Mumbai. If you do not have local trains, if you do not have metro that is a tube rail, if you do not have tremendous number of public buses, in the case of Calcutta it was Calcutta state transport

corporation, now it is WBTC West Bengal Transport Corporation. In the case of Bombay, it is best, Bombay Electric and State Transport. So, if you do not have these public transportation systems your total transportation system will collapse. Lakhs and lakhs of people use this transportation system; ok.

So, unless you have a public transportation system your entire system will collapse. Your industry will suffer, because your workers are coming by the public transportation systems. Bombay local trains, the Mumbai local trains is world famous, famed for its on time movement, also famed for tremendous crowd on the trains. So, unless you have, if proper public transportation system in a country like India, it is very-very difficult; ok.

But, somehow public transportation systems may be because of momentum of an early start or maybe the planning has been done in that way, public transportation system is very very well developed in the two cities of as I have mentioned Kolkata and Mumbai. Delhi also, with the metro railway system coming into force has a very very efficient public transportation system, ok. This is the backdrop; ok.

Having said that when I speaking a public transportation system, who made you catering to? You are catering to the middle class, particularly middle class the lower middle class, sometimes upper middle class and anyway the class below the middle class of population; ok. So, the lower income groups. So, one is the middle income group and the lower income group.

When you are in to this MIG and LIG segment, middle income and lower income segment, then you have to be very cautious in fixing fares for these public transportation systems, because one you have you have two prompt aspects. One hand, it is that the public transportation system is run on public money. So, you just cannot allow you, allow it to keep on running at a loss, because someone else is paying for this transport and is not using it. So, you have to use this money very judiciously it is public's money; ok.

The second dimension of public transport is fares; fare; fare, for public transport is a very-very sensitive issue; very-very sensitive issue. Slightest increase in fare may create lot of sentiments among the people, ok. So, fixing fare and second you have to be very cautious. So, first word of caution it is people's money. So, it cannot allow it to run at a loss for perpetuity, because it is peoples harden money that they have given as tax and

you are supposed to run the system for every one judiciously and efficiently, efficiently. So, one is that aspect.

And, but while running it judiciously efficiently there will be focus and pressure on cost, controlling cost and where ever required increase the price. But since it is a public good there will be a problem, because you are dealing with people who are in the lower middle class or in the LIG that is Lower Income Group category; ok. So, increasing fare is not that easy, there are lot of public sentiments attached to it; ok. So, now, but; so, what is this actually? Price that is what we mean by pricing public good is always a matter of debate.

With a falling rupee and increased cost of spares the operating cost for public transport is on the rise; ok. Falling rupee, now the rupee has stable, but is if you see the trend over time the rupee has indeed fallen, if you see the trend over last 10 years, yes. Now, operating cost of public transport is on the rise, because of the fuel prices, falling rupee has a direct impact on it and increased. But now, the fuel prices is I mean fuel prices moderated by the oil companies, so we cannot actually directly attributed to the falling rupee may be increased cost of spares.

More than the vehicle the spares is a big headache; ok. More than the vehicle the spares is a big headache. The operating cost public transport in the rise. The increasing fares is not always possible, economic conditions of the population and political compulsions being the reason; ok.

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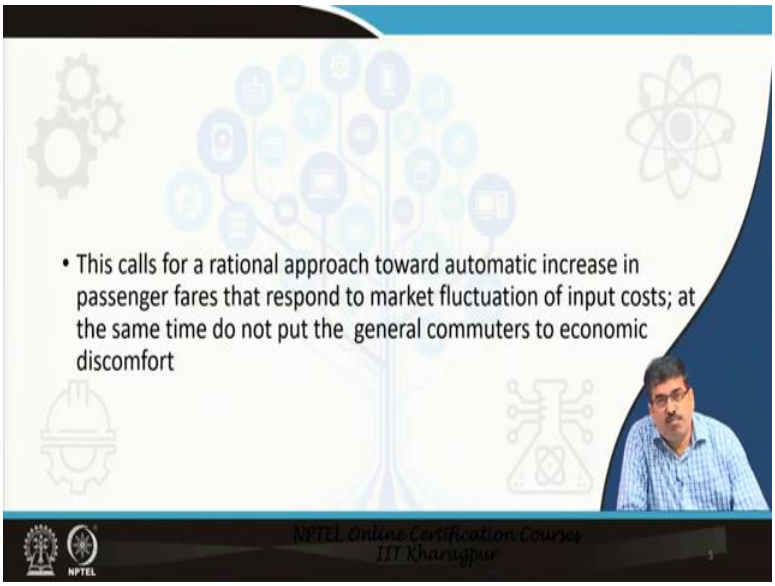

So, this cause for the rational approach towards increase in automatic toward automatic increasing passenger fare that response to market fluctuations of input costs and at the same time do not put the general commuters to economic discomfort. So, one hand, you are trying to save your business and the other hand you are also trying to keep the public's concern in mind; ok. So, that is why we say that doing this is a very-very difficult task.

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Now, we will just tell you about just give a snapshot of this public transportation system in West Bengal, ok. Now, population density of West Bengal is 1029. Population of Kolkata 14.7 million. Everyday approximately 2.6 million people from suburbs travel to this city. So, you can imagine how many people are using public transport.

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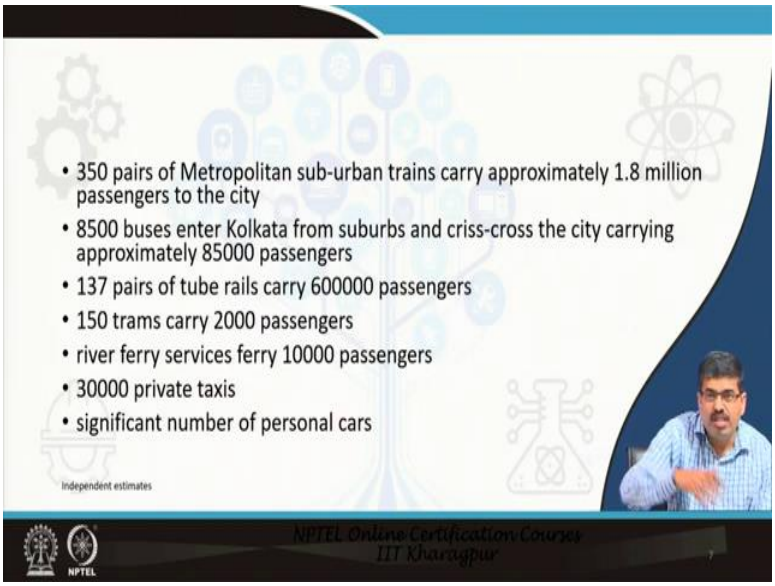

Look at the extent of public transport. 350 pairs of metropolitan suburban trains carry approximately 1.8 million passengers. 8500 buses, 85000 passengers. 137 pairs of tube rails, almost 6 lakh passengers. 150 trams, 2000 passengers. Rivers, ferry services 10000 passengers. 30000 private taxis. Significant number of personal cars, ok. Some of these numbers are as per independent estimates and they may fluctuate a bit over time, situations everything; ok.

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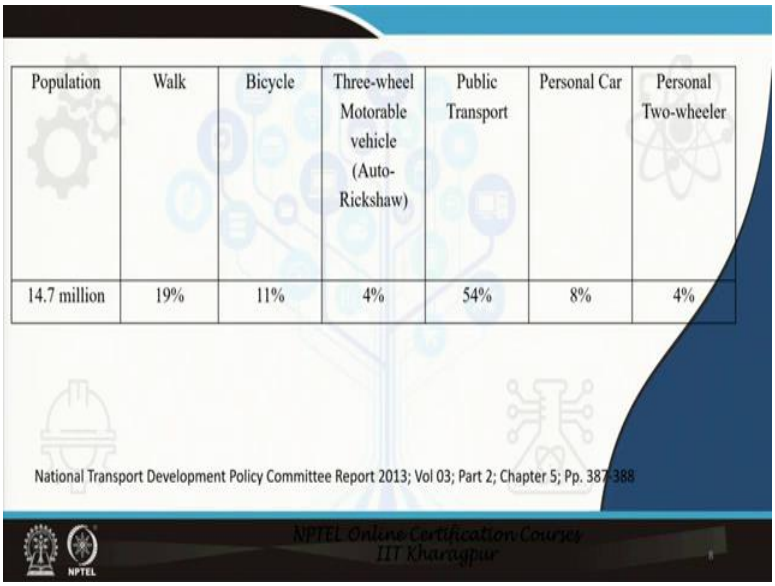

So, look at this structure, we have population of 14.7, the references national transport development policy committee report. 19 percent walk within the city. 54 percent use public transport, 54 percent. So, imagine you are doing a costing and fixing fare for these types of people 54 percent.

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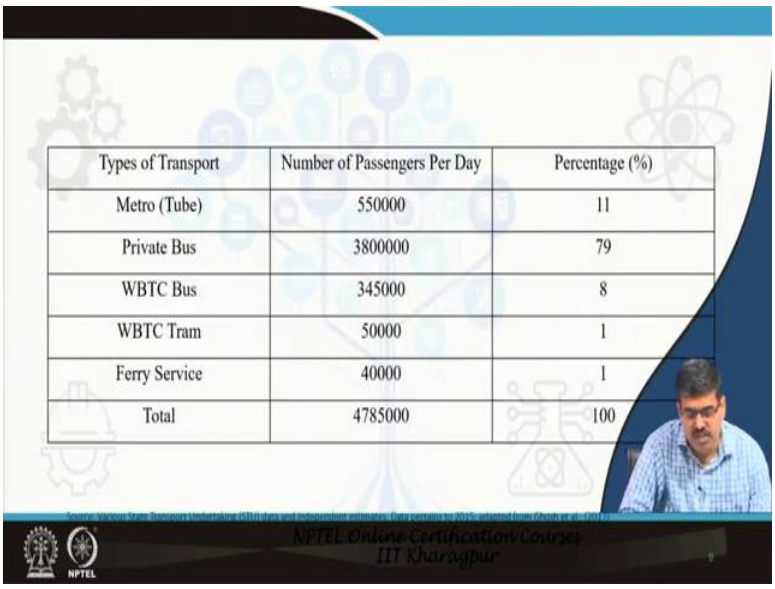

This is the number of passengers per day; ok.

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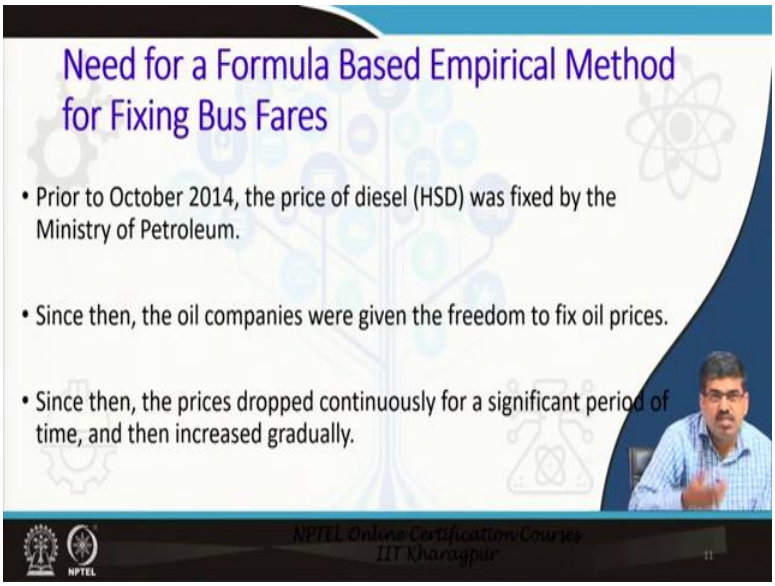

What is the present method of fixing bus fares? Basically, you need a present method of fixing bus fare is whatever the existing fare add 10 percent, 20 percent; ok.

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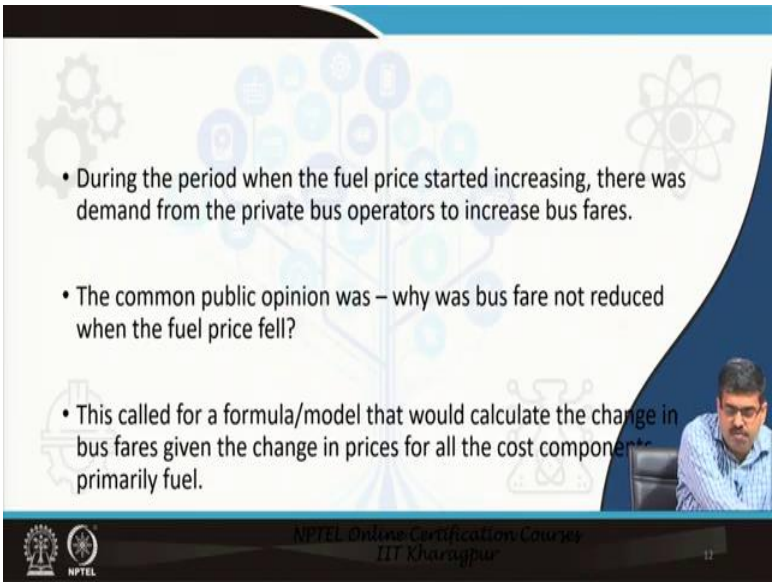

Now, with the oil companies increasing the fare, etcetera. So, we would like to develop a formula.

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So, developing an empirical model. Now, see this is the cost components of operating a bus; fuel, operations and maintenance, staff and others, fixed cost, ok. Fuel, operations and maintenance, staff and others, fixed cost.

Fuel cost is the most important cost in any public transport system, particularly road, buses, ok. 50 percent of the cost is fuel cost. 25 percent cost is people cost. Operations and maintenance cost is not that much, I will tell you why. And, fixed cost the cost of the bus capital cost is 15 percent.

Why operation and maintenance cost is not that much is because, anyway the as per the rulings of different state governments, after 15 years the bus cannot be on the road, ok. Average, for the first 4-5 years there will be no repairs and maintenance cost. In some cities, the bus companies, the bus manufacturing companies enter into a contract with the dealers that if after running a bus for 4 or 5 years, they return the bus, actually 4 or 5 years means the up to that time the bus more or less intact, after that only the repair start, the corrosion starts; ok.

If at the end of the 4th or 5th year you return the bus, they will give you a new bus, at only little extra cost. Now, the bus operators have done a calculation and they found out that if you do this rather than keeping the bus there for 15 years, you save a lot of money, because as the years increase the maintenance cost keeps on increasing. So, this is the

structure of a like fuel cost, operations maintenance, staff and fixed cost; ok. So, this is the cost parameters; right.

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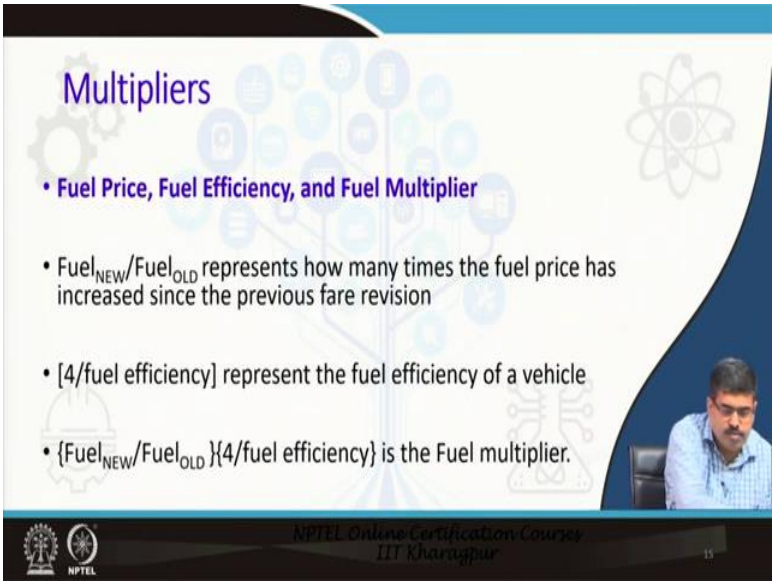

Now, we are developing a, this financial formula for this; ok. Now, see, fuel new by fuel old, what does this mention? Let us take this and then you will understand.

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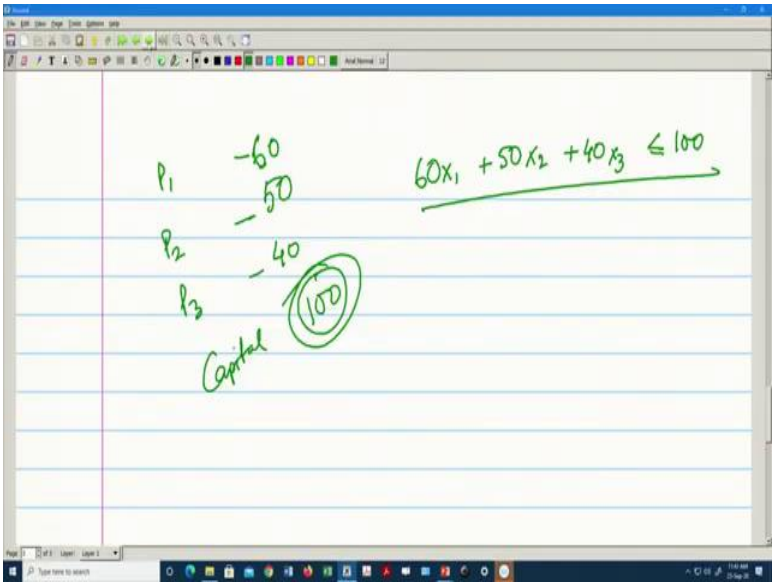

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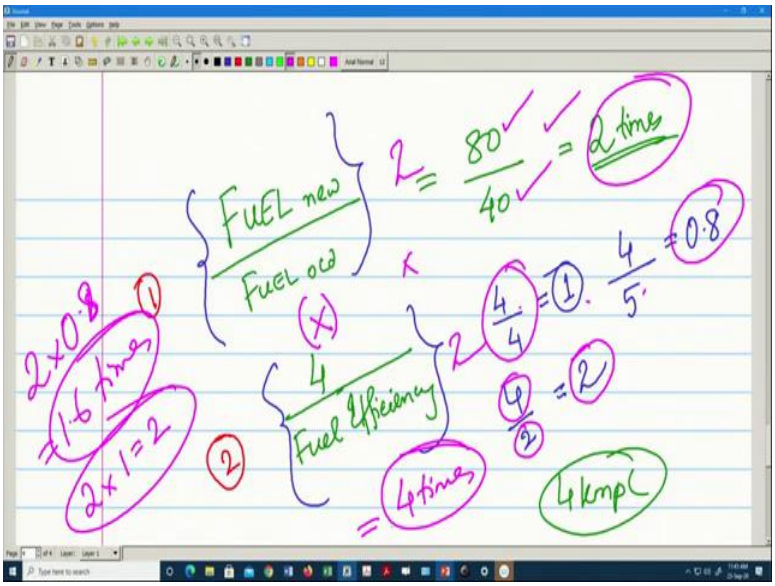

Fuel new by fuel old, say my new fuel price is 80 rupees, my old fuel price was 40 rupees. So, how many times have the fuel price increased? 2 times, right. My fuel price is increased 2 times. Agreed? This is the first part of the formula, fuel new by fuel old, ok. 4 by fuel efficiency, just a second 4 by fuel efficiency. Let me write down then I will explain you. Fuel, this is one aspect, 4 by fuel efficiency.

What is this 4 by fuel efficiency? See, my vehicle will give me 4 kilometre per litre is my fuel efficiency of a city bus, ok. It cannot go beyond 4 kilometre per litre, ok. Some buses even go as low as 3 kilometre per litre, ok. So, 4 kilometre per litre is the fuel efficiency of the bus; ok.

Now, if my bus; if my bus I am using blue ink if my bus gives 4 kilometre fuel efficiency, so 4 is the standard numerator my bus also gives 4 kilometre fuel efficiency. So, my fuel efficiency is; so, this quotient is 1, ok. If my bus is giving a fuel efficiency of 5, ok, so it is 0.8. If my bus is giving a fuel efficiency of 2, then my quotient is 2; ok.

What is the formula? Fuel new by fuel old multiplied by 4 into fuel efficiency, ok, clear? What does this mean? Let us say my new fuel price is 80 rupees, my old fuel price means may be 1 year back was 40 rupees. So, any way I will have to multiplied by 2 times. So, the bus fares should increase twice because I am paying for fuel price double.

Now, fuel efficiency of the bus is any way 2, my standard fuel efficiency is 4, but somehow in some parts may be the road condition is so bad that the vehicle is giving only 2 kilometre fuel efficiency; if just, just a hypothetical one, just hypothetical one. So, the multiplier effect is again 2. That means, what? I got a multiplier effect here as 2, multiplied by again multiplier effect I am getting as 2. So, my bus fare should be increased by 4 times; ok; 4 times; right.

If my fuel efficiency is 5, so my bus fare should be increased by 2 into 0.8 that is 1.6 times, ok. If my, if the formula and my bus fuel efficiency is same then no problems only the fuel price increase will be there. So, 2 into 1 is equal to 2; ok.

So, this is the first part of the formula. Then, will come the weightage, because you have already got; what is the fuel weightage? 0.5; right. So, with that you will have to multiply 0.5; ok. So, let us move forward, ok. So, this is fuel new by fuel old, fuel efficiency is the fuel multiplier.

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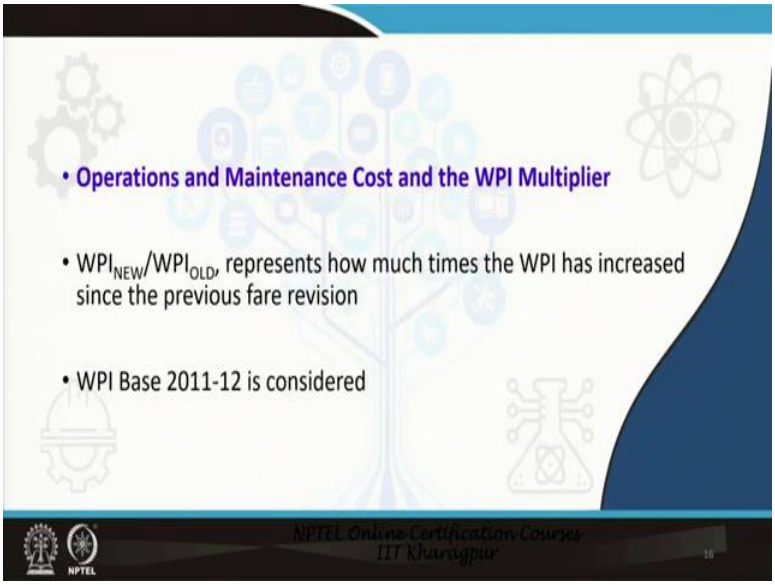

Now, operations and maintenance cost. Normally, we take this as a Wholesale Price Index, WPI new by WPI old, ok, simple. Wholesale Price Index new means the year in which you are going for fare revision as of today and the Wholesale Price Index when last fare revision was done old. Whatever is the increase that is your multiplier.

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Staff and other cost and the CPI multiplier; Consumer Price Index, staff cost, staff buy food from the market, so we cannot use whole sale index, we have to use CPI, Consumer Price Index, ok. So, consumer price index new means as of today consumer price index when the last fare was revised. So, and consumer price index rural plus urban is to be taken; ok; clear. Because everybody is using the buses; right. So, again you will have, you will get some multiplier; right; ok.

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Investment cost, this is important. Standard cost of a bus is 25 lakhs, 2.5 million, ok. So, whatever is your investment divided by 25 lakhs. If your investment is say 50 lakhs and your base price is sorry your base price that you have considered is 25 lakhs, then you paid double [FL], so the bus fare also should be 50 lakhs by 25 lakhs, 2 times. This is the weight is calculated, just like I showed you there.

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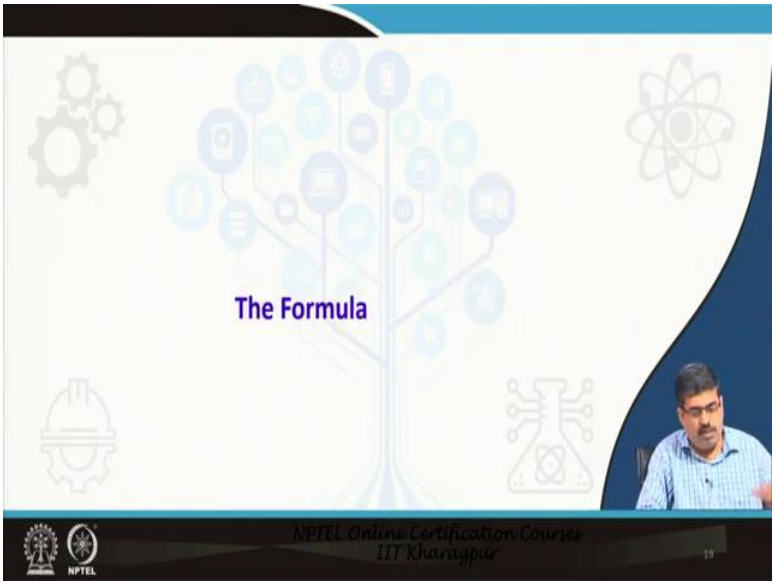

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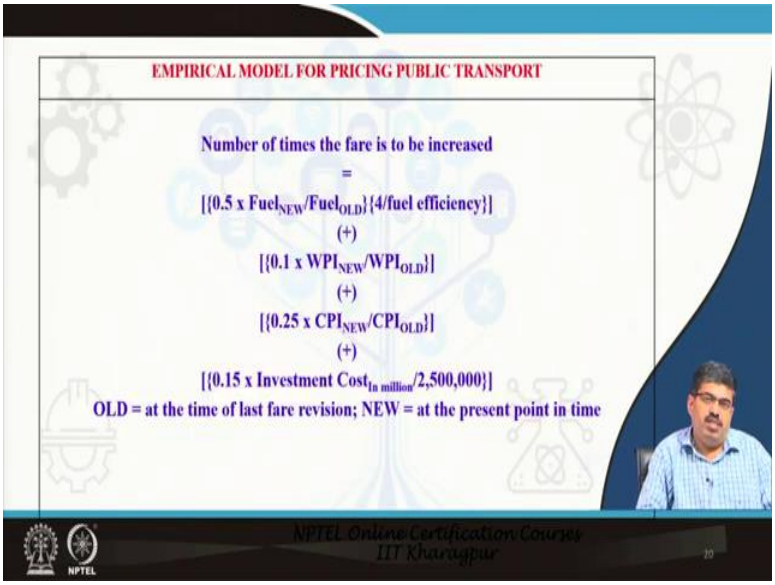

What is the formula then? Remember we said 50 percent of fuel, number of times the fare is to be increased. Look at the table very carefully. 0.5 into fuel new by fuel old into

4 by fuel efficiency. This we calculated. 50 percent was for fuel. Next weightage was for spare parts. 10 percent weightage was given. Remember, we are saying the buses are replaced to remove the spare parts cost.

So, wholesale price new means as of today buses wholesale price old when the last fare was revised, so 0.1, ok. 0.25 was the staff salary weightage. So, 0.25 into CPI new by CPI old plus 0.15 was your investment proposal weightage. 0.15 into investment cost divided by 25 lakhs. Old means at the time of last fare revision, new means at the present point in time. So, if you apply this formula you can come up with whether your systems are changing.

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Let us give and go for an illustration. Fuel price 2018 was 71, fuel price during the last fare revision was rupees 58. Fuel efficiency is 3.5, remember we took a base of 4. Cost of bus 25 lakhs. Wholesale price index in September 2014, 111.8. May 2017, 107. Why did we take say 14? Because in the year 2014, the last fare revision was done. CPI, 148. CPI in 2017, 129. Here is the data given. So, very simple.

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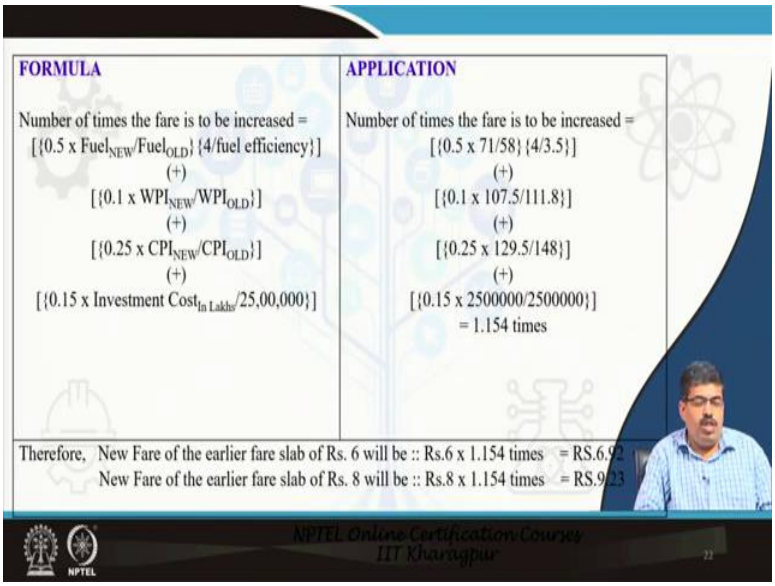

We will use the formula. This was the formula you can see it in the left-hand side. Now, I applied number of times the fare is to be increased 71 new fuel price old fuel price is 58. Standard was 4, my first city it is 3.5, so 4 by 3.5. Then 10 percent, wholesale price consumer price, ok, then capital 1.154 times. Therefore, new fare for the earlier slab of, so 1.154 times the fare should be increased. Look at the application column; ok; one last, one 1.154 times the fare should be increased; ok.

Therefore, new fair for the earlier fare was 6 rupees. How many times you are increasing? 1.154 times. So, 6 rupees will become rupees 6.92, so almost 7 rupees, ok. New fare for the earliest, if the fare was 8 rupees, then it will be 8 into 1.154 this will become 9 rupees 23 paisa or simply 9 rupees. This is the way by which you can raise your public transport systems, ok. This is also another dimension of finance; ok.

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Now, this is of; so, we are just prepared a table by which we are showing the how the fares will increase; ok; clear!

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Now, it is another approach to fixing public transportation fares. This is called as the passenger kilometre approach; ok.

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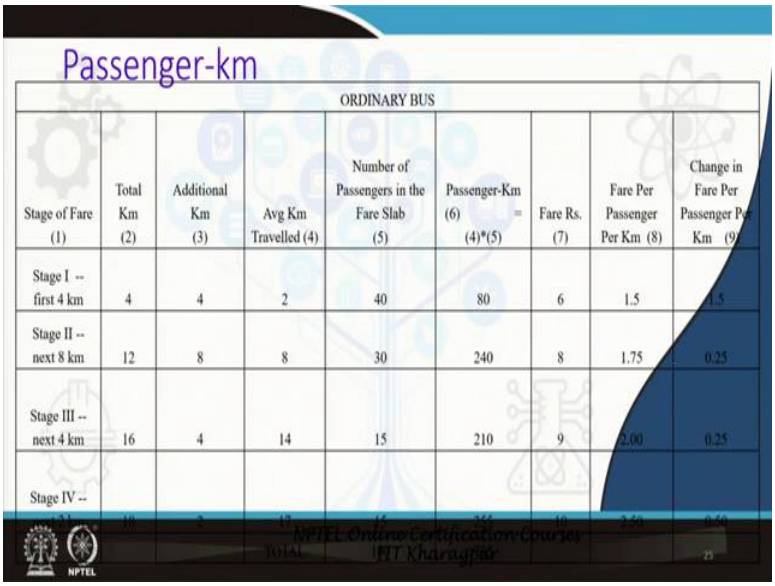

Now, I will just briefly cover go through it, ok. Passenger kilometre approach basically means that you know the bus fares will give the example of Calcutta. You see stage I, first 4 kilometre is 4, kilometre is 4. Stage II is next 8 kilometre, so that means, what? 4 plus 8, 12. We are going through column 2, column number 2. Stage II, next 8 kilometres is 12. So, what is the additional kilometres? 4 in stage I, an additional 8 kilometre for stage II; ok

So, what is the average? Average kilometre travelled is first 4 kilometres is 4 and for the next 8 kilometres half of that, so another 4. So, first 4, 4 kilometres, next 4, 8 kilometres. We will demonstrate. We will show it, then it will it will not confuse you; ok.

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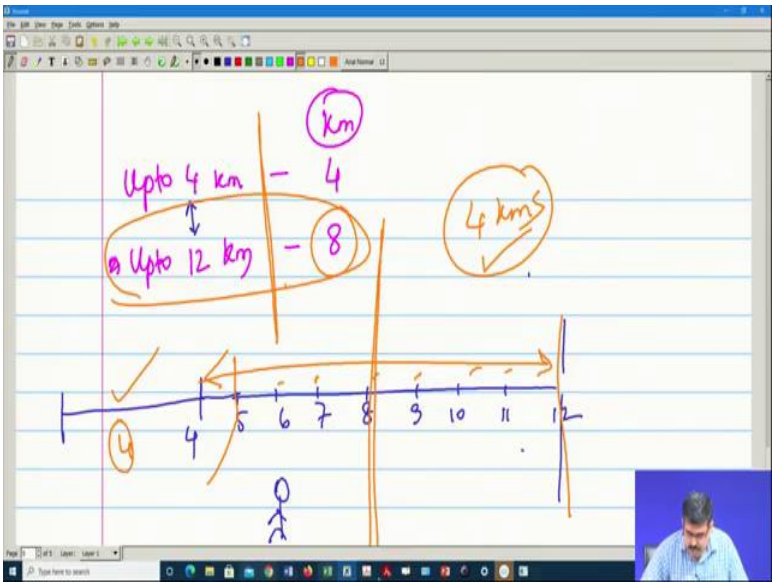

This is the way bus fares are done. Up to 4 kilometre me your what is the kilometres? 4 kilometres up to 4. Now, up to 12 kilometres means what? In this slab of 4 to 12, in this slab of 4 to 12, how many additional kilometres are there? This slab of 4 to 12, 8 kilometre, right. First 4 kilometres is done gone up to 12 kilometres, this first 4 then balance 8; ok.

So, if a person is has cover, has moved beyond this 4 kilometre, how much is the average distance travelled? So, this is my bus, my bus is starting from here, 4 kilometres is gone. Now, next 8 kilometres, ok, so 5, 6, 7, 8, 9, 10, 11, 12, ok. So, this is, ok, sorry, right, ok, fine. So, now, the person the person is moving, ok. Normally, you will see some people will go up to 5 kilometres and get down, some people will go up to 12 kilometres only, some people will be here, get down here, get down here, get down, get down, get down.

So, on an average this entire distance of 4 to 12, on an average you are travelling half the distance. So, 4 kilometres you are travelling. So, up to 12 kilometres, how much distance you have travelled on an average? First 4 kilometres you have travelled, and next you have travelled another 4 kilometres. So, though the bus slab is up to 12 kilometres you have travelled on an average 8 kilometres, ok. This is what we are trying to say; ok.

So, this is what is there in column number 4, ok, how much additional kilometres we have travelled, ok. So, in this way number of passengers we have just made an estimate how many passengers will be there in each slab and then passenger kilometres, that is

passenger in to average kilometre travelled, ok. So, what is the fare and fare per passenger kilometre; ok; so divided by the fare; ok.

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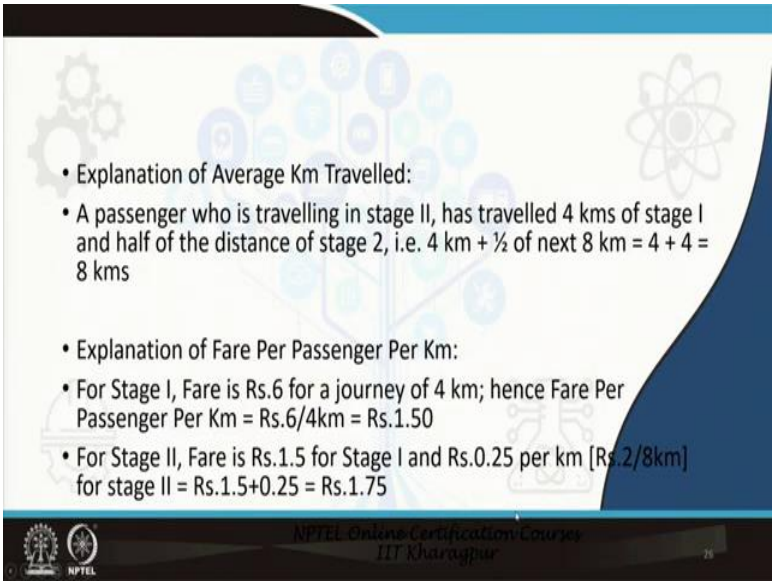

Now, explanation of the average kilometre travelled, we have just explained you; ok.

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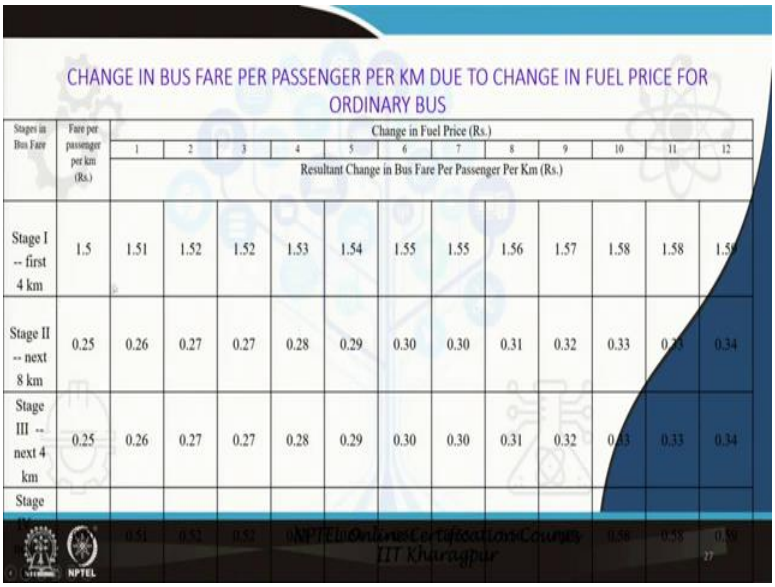

So, if you can use this formula, but the first formula is better, but if you can if you want to use a passenger kilometre approach change in bus fare per passenger kilometre you have to change in fuel price, ok. Every change in fuel price of 1, 2, 3, 4, this is the first column, look at first row 1, 2, 3, 4, 5, 6, 7, 8, this change in the these rows and your bus

fare will keep on changing like this, ok, clear. Bus fare will keep on changing like this, ok. This is the; this is the explanation. For stage I fare is rupees 6. Fare per passenger kilometre is 6 by 4 kilometres 1 rupee 50 paisa, clear. So, every stage is explained in this slide; ok.

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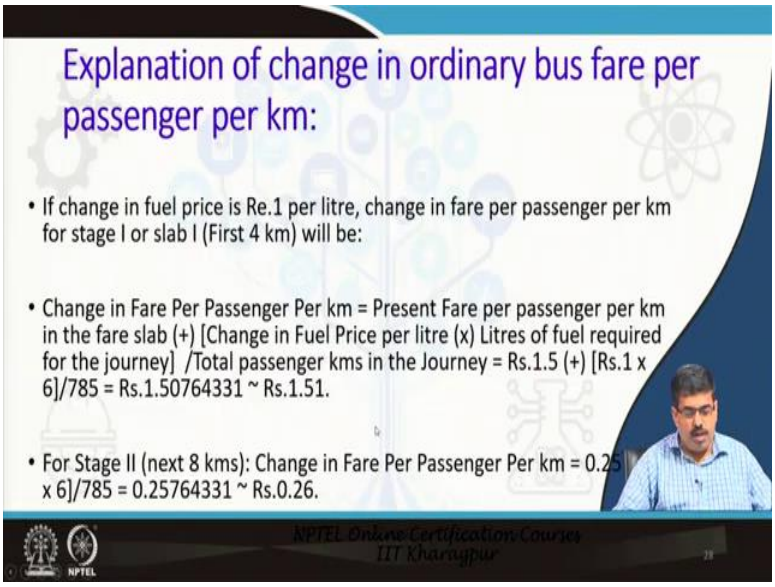

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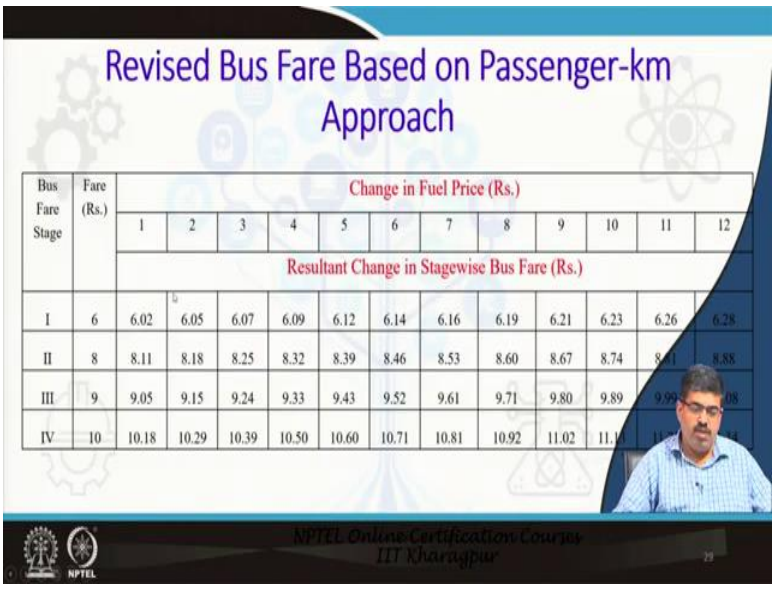

Bus Fare Stage	Fare (Rs.)	Change in Fuel Price (Rs.)											
		1	2	3	4	5	6	7	8	9	10	11	12
		Resultant Change in Stagewise Bus Fare (Rs.)											
I	6	6.02	6.05	6.07	6.09	6.12	6.14	6.16	6.19	6.21	6.23	6.26	6.28
II	8	8.11	8.18	8.25	8.32	8.39	8.46	8.53	8.60	8.67	8.74	[illegible]	8.88
III	9	9.05	9.15	9.24	9.33	9.43	9.52	9.61	9.71	9.80	9.89	[illegible]	[illegible]
IV	10	10.18	10.29	10.39	10.50	10.60	10.71	10.81	10.92	11.02	11.1[illegible]	[illegible]	[illegible]

Now, if your; what is explanation of this table? This is given in the next. If change in fuel price is rupees 1, change in fare per passenger per kilometre will be present fare plus change in fuel price into litres of fuel required for the journey divided by total passenger

kilometres in the journey, ok. So, the formula is slightly different, ok; how many litres of fuel you are requiring; what is the fuel efficiency? That will help you to get this 1 rupee 51. The formula is very clearly given in this slide you go through it very calm and quietly you will understand, ok, clear. And, this is the way by which you come up with the bus fare for all for the entire set up; ok.

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Now, this is an acknowledgement I have to make. Acknowledgement is to Mr. Narayan Swaroop Nigam, IAS, Principal Secretary, Transport Department who allowed us to do this part of costing for public transport systems.

And he is the principal secretary, transport department, government of West Bengal; he is also the managing director of West Bengal Transport Corporation. And he allowed us to do this work, provided us with all the data required, and to finish the work and take it to its logical conclusion. So, this is an acknowledgement to Mr. Narayan Swaroop Nigam; ok. This are the references; are also given.

Thank you!