**Urban Transportation Planning**
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**Lecture No. # 40**
**Urban Goods Movement Contd**

This is lecture forty on urban transportation planning. We will continue our discussion on urban goods movement in this class and complete our discussion in this class itself. You may recall, we started our discussion on this topic urban goods movement in the previous class. Now, we know that the main causal factor for generation of demand for goods movement is related to the economic activities in an urban area. Then, we realized, that we need to identify the economic activity unit to fix the origin and destination of goods movements, as well as, other related issues.

Accordingly, we identified three categories of economic activity units. Can anyone list the three basic economic activity units as we have identified during the previous class?

Manufacturing plan, resident and freight terminals

And, freight terminals. Yes, we have identified three important economic activity units, they are: industrial units, in general, or manufacturing plans and then, households and 3rd one is the freight terminals.

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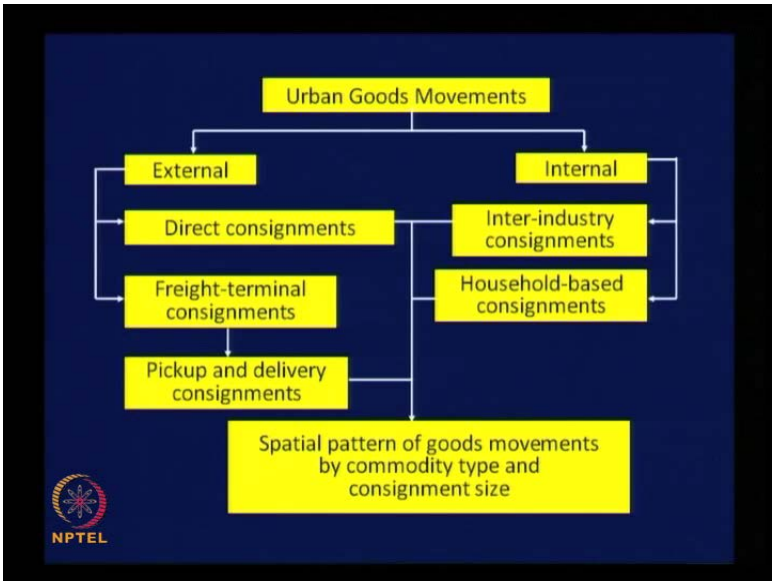

And to summarize what we have seen in the previous class, we can refer to this flow chart about which you are familiar. Now, goods movements can be categorized into external and internal type of movements. Again, we can categorize external type of movements into two types: direct consignments from external location to the industrial units, say manufacturing plans, or consignments received by the industrial units through freight terminals.

That is what is indicated here, below direct consignments as freight consignment terminals and freight terminal consignments involves pickup and delivery consignments because the freight will be divided into smaller units and smaller trucks will be used as pickup, as well as, delivery trucks. In the case of internal movement there could be two categories, one is between industrial units or manufacturing plants, inter industry consignments; the other, household based consignments.

All these movements together provide us finally, spatial pattern of goods movements by commodity type and consignment size. Now, we need to realize, unless we model this spatial pattern of goods movements, either by commodity type or consignment size or both, we will not be able to predict the future scenario with regard to spatial pattern of goods movement. So, there is a need for modeling goods movement also, as we have done in the case of person trip in urban area.

So, what are the related issues in modeling demand for urban goods transport? Shall we just model following the same principle, that we adopted for modeling person trips or should we have to have different strategy? In modeling person trips, you may recall, we incorporated the variations in the perceptions of individuals also, in respect of the modal characteristics, like travel time, comfort, convenience. So, we went to a disaggregate level in the modeling process.

Because we wanted to incorporate the randomness associated with individuals in decision making process, my question is, should we have to take that random part into account in goods movement demand analysis? It is not the case of individuals making trips; it is the case of moving goods. So, there is no way the randomness or variation from the thought process might influence goods movement. So, this implies, that there is no need for segregation of travel demand analysis or disaggregation of analysis to the level that we did in the case of person trips. Aggregate level analysis will be sufficient to

take care of this particular aspect of goods movement. And another related issue is with regard to the spatial location of economic activity units.

Can we use the same traffic zones that we already identified and fixed for analyzing person trips or should we have to have different set of traffic zones? How about zoning, any response? Could you have the same set of zones or we need to have different set of zones for goods movement analysis? Definitely, we cannot have a different set of zones because of the reason that ultimately, we are going to put both, passenger vehicles and goods vehicles together. So, when they are combining these two traffics, unless their points of origin and destination and other related aspects are same, we will not be able to aggregate both the traffic together and then decide on the requirement of transportation infrastructure. Therefore, we need to stick to the same zoning regulation, as we have followed, for passenger transportation. Also, we need to collect information zone-wise.

Once we decide to fix the zones, then zone centroids are going to be the origins and destinations of goods movement also. This implies that we have to collect information with regard to all these economic units zone-wise, is not it.

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To summarize what we discussed, this is the first point to be remembered. The great majority of freight demand models applied in practice have been of aggregate type; now, we know why it is of aggregate type. The application of these models generally follows the four step process adopted for travel demand model. There is no variation, as far as,

the different steps to be followed. Are we are going to do trip generation analysis, mode choice analysis, trip distribution analysis and route assignment with respect of goods?

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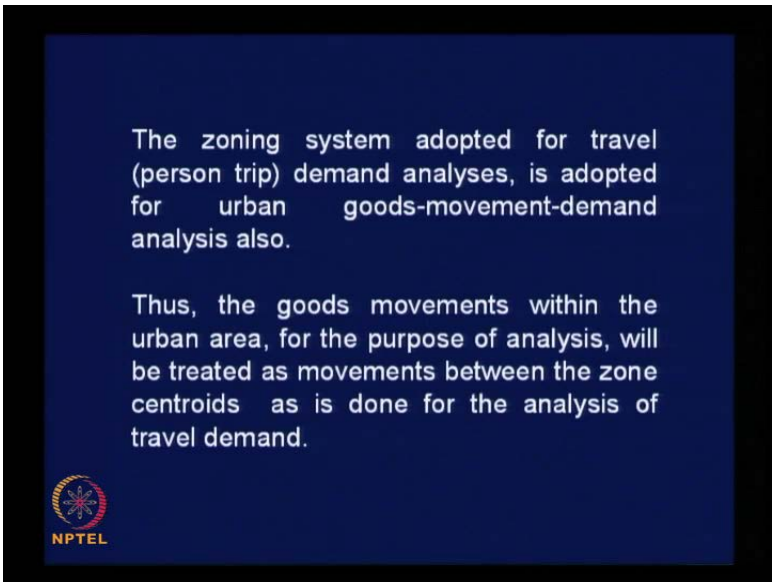


The zoning system adopted for travel or person trip demand analysis, is adopted for urban goods-movement-demand analysis also, there is no change at all. Thus, the goods movements within the urban area, for the purpose of analysis, will be treated as movements between zone centroids, as is done for the analysis of trip demand, clear. So, that we are able to define the trips made by goods vehicles also, as we done, as we have done in the case of person trips.

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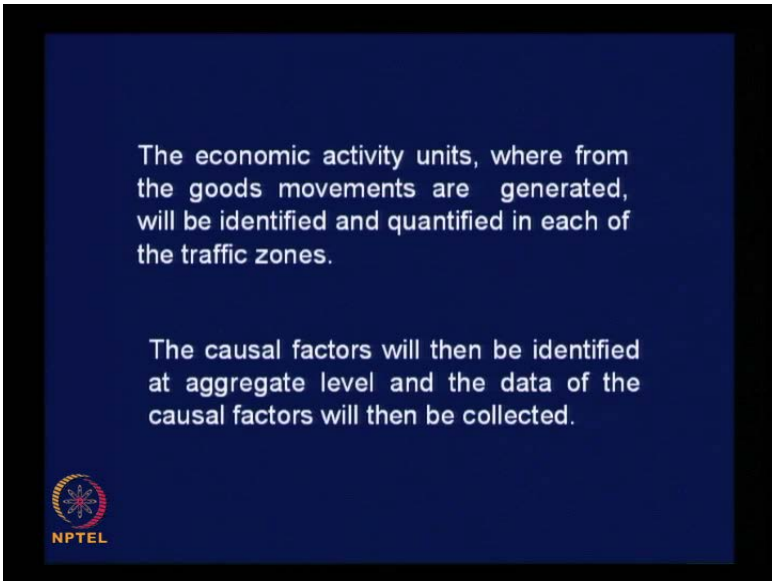


The economic activity units, namely manufacturing plants or truck terminals or households, where from the goods movement are generated will be identified and quantified in each of the traffic zones. That means we need to have zone-wise information with regard to each of these three types of economic activity units.

The causal factors will then be identified at aggregate level; there is no need for disaggregation. And the data of the causal factors will then be collected after identification of the causal factors. Most of the causal factors as you know will be economic factors.

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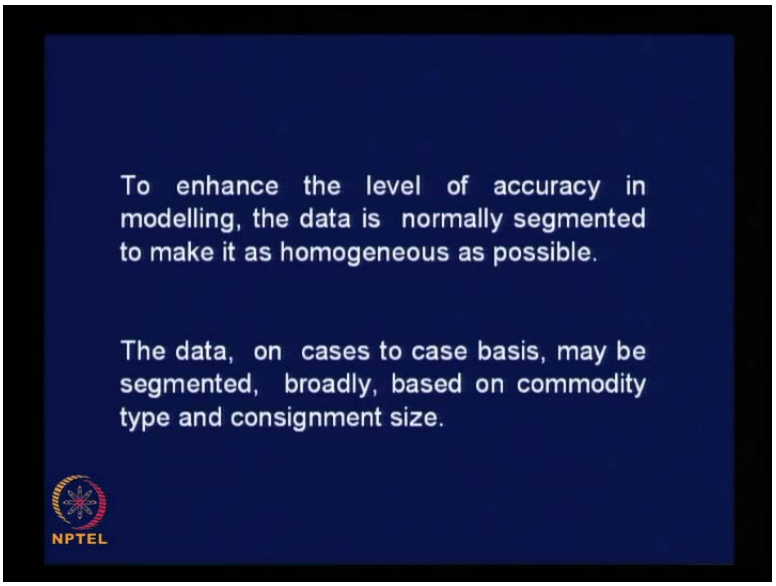


And as we did in the case of passenger transportation, to enhance the level of accuracy in modeling, right, the data is normally segmented to make it as homogenous as possible. The objective is to enhance the level of accuracy of your models.

The data on case-to-case basis may be segmented broadly based on commodity type and consignment type. These are the two basis on which normally goods movement data is segregated. And if it is a very small urban area, not involving too many economic activity units, even you can do the analysis without much of segmentation.

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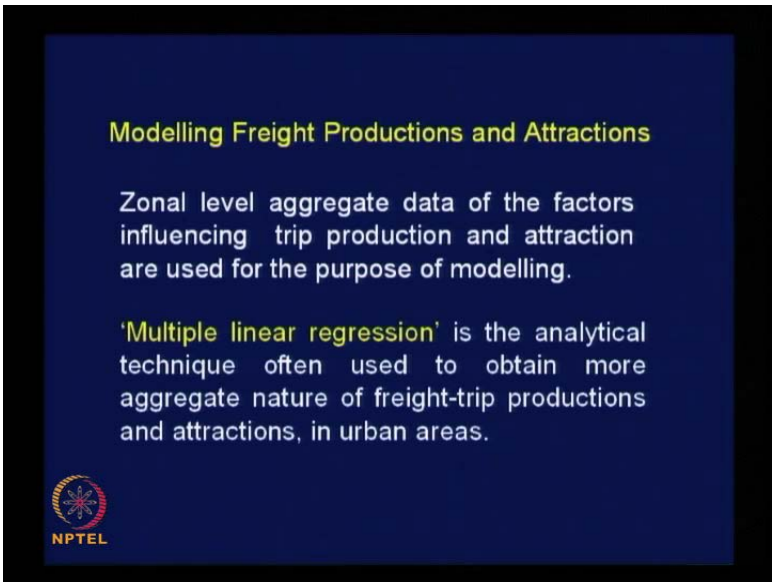

Let us first look into modeling freight productions and attractions, as we did in the case of passenger transportation. You may remember the steps that we followed for trip production analysis in the case of passenger transportation.

The independent variables were derived from household characteristics, is not it, for modeling trip productions and for modeling trip attraction. The independent variables were derived from land use characteristics of various traffic zones, which are related to commercial establishments, industrial units, educational institutions, in terms of floor area or in terms of number of employed persons in various units.

In this particular case, we are going to make use of aggregate data, both for trip production, as well as, for trip attraction and we have identified households as one of the important economic activity units generating demand for goods movement. Can you now tell me, what are the possible variables related to households, which can be considered as influencing factors with regard to goods movement?

You may recall, we used different factors related or different characteristics of households, right, in case of trip production analysis for passenger travel, starting form household size, number of employed persons, vehicle ownership, is not it, number of students, household income and so on. Keeping this in mind, can you just point to the, point out a set of characteristics, which are aggregate in nature, which can be considered as variables in explaining the demand for goods movement?

Yes, household income, if possible; any other characteristics? What is the output of this economic activity unit, namely household? Mostly garbage, that is what we discussed, is not it, and the garbage is, generation of garbage might be proportionate to the size of the household itself, is not it. And the income or an indicator of income, maybe, vehicle ownership, is not it. All these things at aggregate level for the whole traffic zone, there is no need to worry about individual household characteristics.

Zonal values related to household size, household income or vehicle ownership of households should be fine, clear. And for trip attractions, the characteristics of truck terminals, if they are located in those zones and the characteristics of industrial units, right, which are related to intensity of goods movement. Of course, my intention here is not to go into that much detail, as to what we did in passenger transportation, just indicate to you the methodology of approach.

Zonal level aggregate data of the factors influencing trip production and attraction are used for the purpose of modeling, zonal level aggregate data. And this is the analytical tool used, as we have already used for person trips. Multiple linear regression is the analytical technique, often used to obtain more aggregate nature of freight productions and attractions, in urban areas. Zonal average values will be the input for the modeling process.

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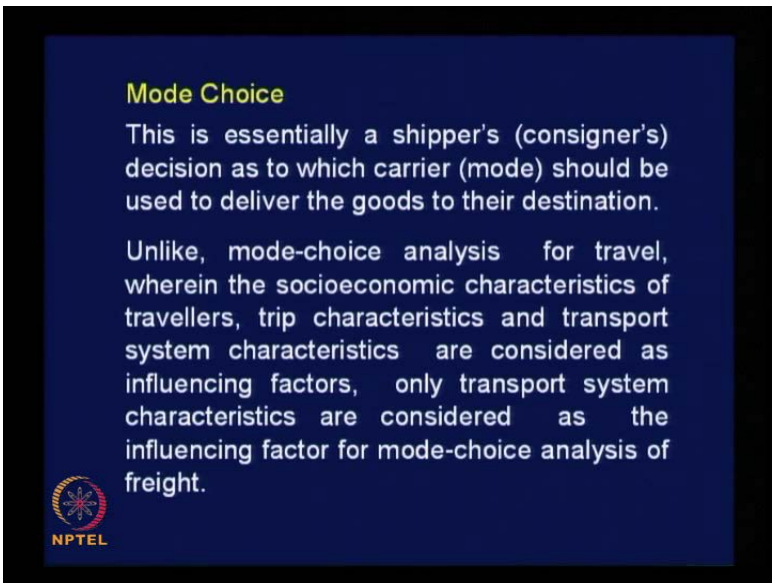


Then, mode-choice analysis - can we adopt the same procedure, that we followed for passenger transportation in analyzing choice of mode for goods transportation? First, let us think of the factors that might influence the choice of mode in the case of goods transportation. In this context you should recollect the factors that we listed in respect of passenger transportation. We identified three baskets, where from we can pick the relevant variables.

I hope, some of you will be able to recall what we discussed. One basket is related to socioeconomic characteristics of the travelers; the other baskets related to characteristics of the transport system and 3rd one related to trip characteristics, mainly related to trip purpose and trip length, is not it, that is what we discussed. Now, my question is, should we have to have all the three baskets here also and make use of all the three, or not necessary?

Do you think that socioeconomic characteristics will have relevance here? No, so that basket can be thrown off, there is no need to hold it. Do you think, that the trip length is going to matter much, as far as, goods movement is concerned, after all the range of length of trip considering the way goods are transported, is not much in urban areas. Trip length is not going to matter much in choice of modes. And trip purpose, the only purpose is movement of commodity, so that is also irrelevant. So, basket pertaining to trip characteristics also can be thrown off.

You only hold the basket pertaining to system characteristics, transport system characteristics and pick out the variables for analyzing mode choice, with respect of goods movement from this particular basket. So, the factors are related to transport system characteristics, is not it. That is the major difference between mode choice analysis of passenger transportation and mode choice analysis with respect to goods transportation.

This is essentially as shippers or consigners decision as to which carrier or mode should be used to deliver the goods to their destination. If you are sending a commodity, we become the consigner or shipper, that is the meaning here. The person who is sending the commodity decides the mode.

As I mentioned to you, unlike mode choice analysis for travel where passenger transportation is involved, where in the socioeconomic characteristics of travelers trip characteristics and transport system characteristics are considered as influencing factors, only transport system characteristics are considered as the influencing factors for mode choice analysis of freight, characteristics related to transportation system.

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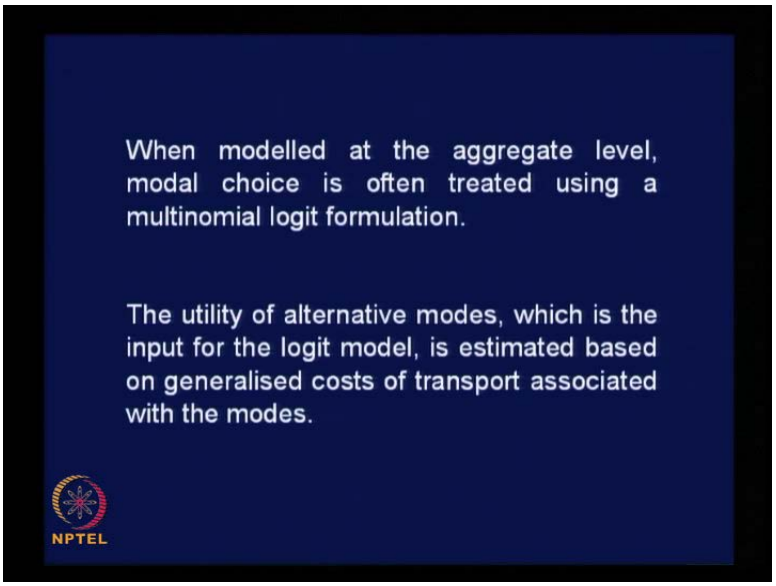


And the model, or when modelled at the aggregate level, the modal choice is often treated using a multinomial logic model, as we did in the case of passenger transportation; analytical tool is same as we used earlier. The question of utility comes into play because we are using logic model. How the utility of a model is estimated here?

The utility of alternative modes, which is the input for the logic model, is estimated based on generalized cost of transport associated with the modes. Can anyone guess the factors that may decide the generalized cost of goods transport? I think you are clear about generalized cost of passenger transportation or person trips, what are the factors that influence the generalized cost of person trips?

Level of comfort, service, yeah, trip charges.

Yes

That is it.

Yes, you may recall the factors, that are put together to work out the generalized cost of transport in respect of person trips are travel time, travel cost, comfort, convenience, level of safety. All these factors converted into equivalent money value and added, that is what we mean by generalized cost of transportation.

On the same lines, can we think of a set of factors that are to be considered to work out the generalized cost of goods transport? Time is a very important factor because time is essence of commerce. Any other factor? No other factor is involved. Goods transportation, of course nothing related to comfort or convenience, yes, out of pocket cost, the actual freight charges paid, then transport time.

Yes, safety, to some extent safety, if it is not safe what happens? Your goods is lost, is not it, or some pilferage takes place and there is a likelihood of damage to your goods also during transportation. So, all these factors converted into equivalent money value will provide you the generalized cost of goods transportation. Of course, we will see few other factors related to generalize cost while discussing distribution of trips made by goods vehicle.

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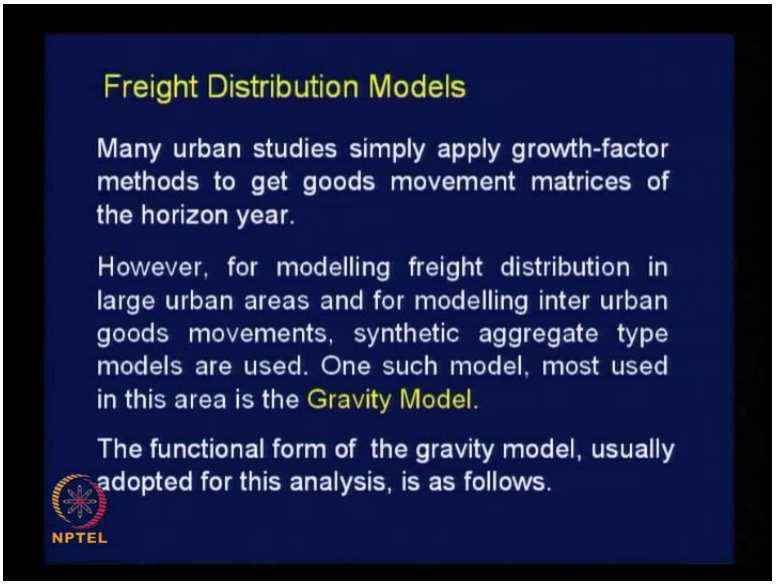


Freight distribution models - you may recall, how we analyzed passenger trip distribution influencing factors were trip, production trip attraction and then, some factor reflecting the facial separation between traffic zones, is not it, considered as friction factor, is not it. And the model, that we used is the gravity model of trip distribution, is not it. That is what we did in the case of passenger transportation; similar approach is used here also. Of course, many urban studies simply apply growth factor methods to get goods movement matrices of the horizon year, that is one approach, which we also know, we can do trip distribution simply by growth factor methods.

But to be more precise, particularly in the case of large urban areas and intercity situations, it is better to use some synthetic models, like gravity model. For modelling freight distribution in large urban areas and for modelling inter urban goods movements, synthetic aggregate type models are used. One such model, most used in this area is the gravity model. The functional form of the gravity model, usually adopted for this analysis of distribution of goods trip, is as follows.

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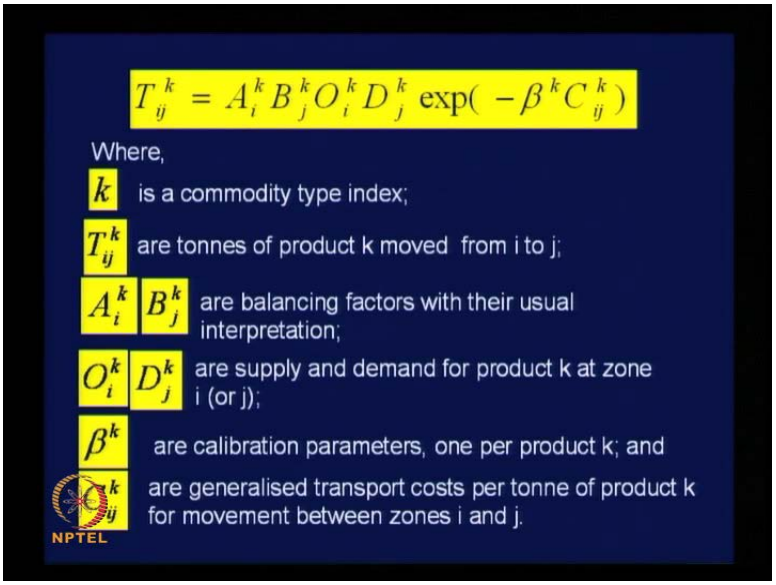


This is the gravity model formulation for goods movement distribution. You will try to understand the explanation for the notations. Of course, k, which you find everywhere, stands for the commodity type, particular type of a commodity because we are going to segment the data based on commodity type. That means, we are going to develop different models, one for each of the commodities, based on the segregation. T ij k is tonnes of product k moved from i to j, measured in weight, terms, tones. A i, B j are balancing factors with their usual interpretation, as we did in the case of w constraint gravity model. O i and D j are supply and demand for the product k at zone i or j, depending upon whether it is supply or demand. Beta k are calibration parameter, of course, applying separately for each type of commodity and C ij are generalized transport cost per tonne of product for movement between zones i and j. This is generalized cost of transportation.

And this in practice, is used as friction factor, expressed as a function. Generalized cost is expressed here as e power minus beta k C i j, is not it, exponent of minus beta k because it is going to have reducing effect as the generalized cost increases. So, this is nothing, but w constraint gravity model, which is already known to us. The only difference is the friction factor here is expressed in terms of generalized cost. So, in this context it is better to know, how exactly the generalized cost C ij is calculated with respect of goods movement.

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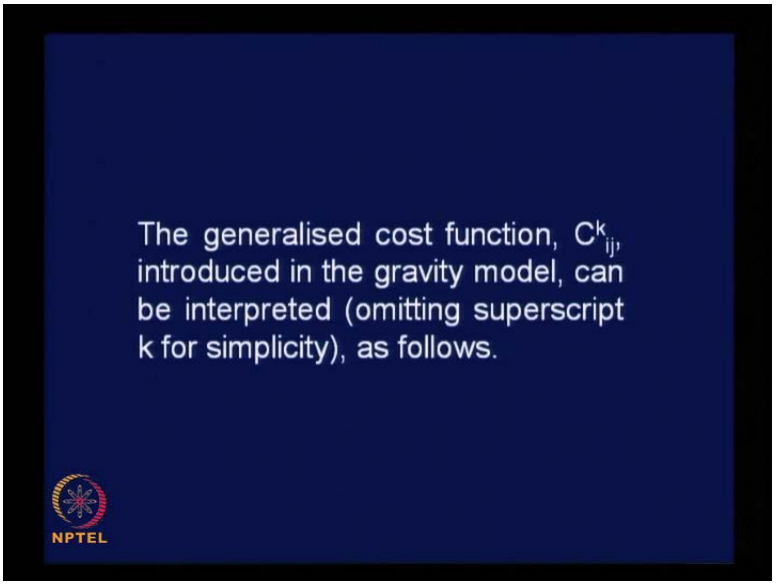


The generalized cost function, C ij k introduced in the gravity model here, can be interpreted, of course omitting superscript k for some simplicity. For understanding, we can write C ij to be as follows.

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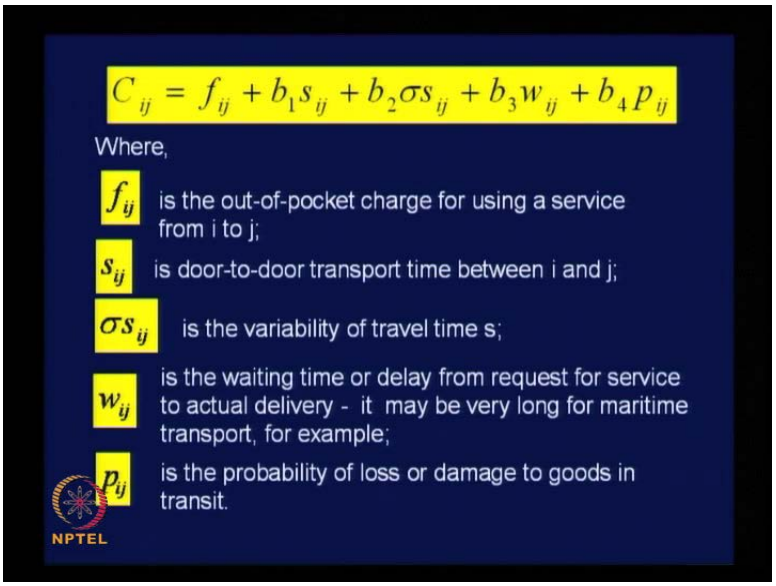


C ij is calculated using this equation, need not worry about too many terms being taken into account, they are very simple and relevant. F ij is the out-of-pocket charge for using a service from i to j, nothing, but the freight charge, actually paid at the counter directly. And S ij is door-to-door transit time between i and j. That is also definitely a factor because time is money and we have to consider time as a factor while working out generalized cost even in goods transportation. And this is the interesting aspect; sigma S ij is a variability of travel time. Why this variability of travel time is the major factor? And why we are not taking variability of time in the case of passenger transportation?

In the case of passenger transportation, passengers or travellers know about the characteristics of different modes of transport, their departure times, arrival times, all those things are known and overall, they follow some shift. So, that is how people choose appropriate mode with complete knowledge about the timing.

Whereas, in the case of goods transportation, the travel agents collect your commodity for transportation, and they collect different types of commodities from different sources, put them all together, then arrange them destination-wise, is not it, and then send them in bulk. This process with some agents, maybe less, maybe taking less time, somebody else might take more time and if you work out the total transportation time, that includes this processing time also. So, there may not be a fixed time as far as your transport time is concerned, they will be variable, there will be seasonable variation. If there is higher

demand, it will be, the trucks might move faster. If the demand is less, you will find that transportation time is more. That is how the variability becomes a factor. And if the travel agent is larger organization, probably you may do it faster; smaller one, they will wait for the minimum break in, breakeven level before dispatching your consignment. That is how the variability is a factor here, in the case of freight transportation.

And w ij is the waiting time or delay from request for service to actual delivery of service. It may be very long for maritime transport for example, waterway transportation may send a request to come and collect your commodity for transportation, but you may have to wait for a long time. Or even if you may just take your commodity to the seaport and it might be lying for days at the seaport weighting for the arrival of the vessel pertaining to that particular destination, right, so this is also a factor. And p ij, very important, is the probability of loss or damage to goods in the transit. All these factors contribute to the generalized cost of transportation of goods.

Another related question is this, why the coefficients b 1, b 2, b 3 and b 4 for S ij, sigma S ij, w ij and p ij respectively, why no coefficients for f ij? These coefficients stand for arrived weightages, perfect. These are just weightages assigned for various factors that influence generalized cost of transportation. You are not going to do any regression analysis based on experience; it is possible to assign weightages for different aspects of… Let us see little more about these coefficients.

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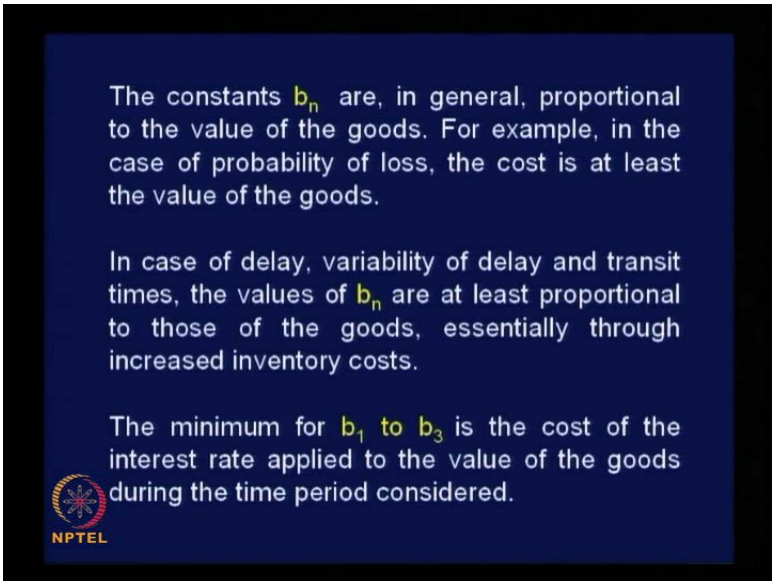

The constants b n, b 1 to b 4 are, in general proportional to the value of the goods. If the value is high, probably the coefficients may have relatively higher value. For example, in the case of probability of loss, the cost is at least the value of the goods, is not it. That is how the coefficient value has to be worked out.

in the case of delay, variability of delay and transit times, the values of b n are at least proportional to those of the goods, essentially through increased inventory cost.

What do you understand by inventory cost in this context? Delay, variability of delay, transit times, all these things will influence on the need for storage at your plan site. If the transit time is more, if the delay is more, you may have to procure sufficient quantity of the commodity in advance until you get your next supply to account for all these variations. That means you need to have another separate infrastructure in the form of storage facilities, which is again, needing some investment. You work out that investment. If somebody is delivering the commodity as and when you require, then that is the advantage. If it is not happening, then whatever investment you are making in the storage infrastructure, is going to be added to these components, which will cumulatively increase the generalized cost of transportation; that is the point.

What is the minimum for these coefficients? The minimum value for b 1 to b 3, b 4 it is very clear, it should be equal to the cost of the value of the commodity, b 1 to b 3 is the cost of the interest rate applied to the value of the goods during the time period considered, even though in urban transit it is not going to be very significant, but still you can work out the cost of the time based on the interest rate. Annual interest rate you can work out, then daily rate, hourly rate, then you can find out the money value of the time of goods transportation, have that as a minimum value for these coefficients. Now, I think, you will be able to appreciate the concept of generalized cost of goods transport, it is very important.

Then, the 4th step, route assignment for goods traffic and in the case of passenger transportation, individuals choose the route for travel, particularly when they are using their own mode of transport, personal vehicle. When they use transit modes, of course route is fixed, that is not much of choice and who is fixing the route in the case of goods transportation?

The consigner or somebody else? As a consigner we cannot fix the route for the movement of goods vehicles, it is operator of the goods transport system who is fixing or deciding about the route to be followed. So, that way, the route assignment is relatively simple in the case of goods transportation. It is decided by one agency, which is operating the goods transport service.

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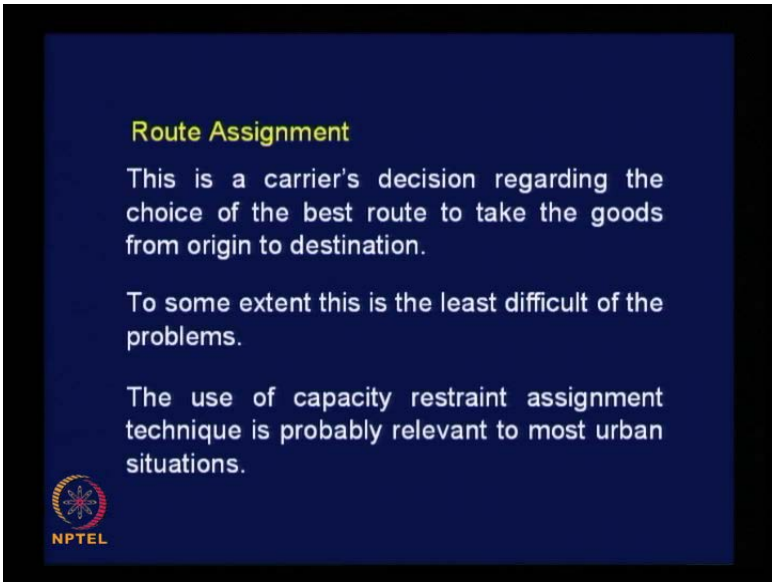


This is a carrier's, carrier means operator here, decision regarding the choice of the best route to take the goods form origin to destination. To some extent this is the least difficult of the problems, as I mentioned to you earlier.

The use of capacity restraint technique is probably relevant to most urban situations about which we have discussed; the context of passenger transportation, the same concept can be applied here too.

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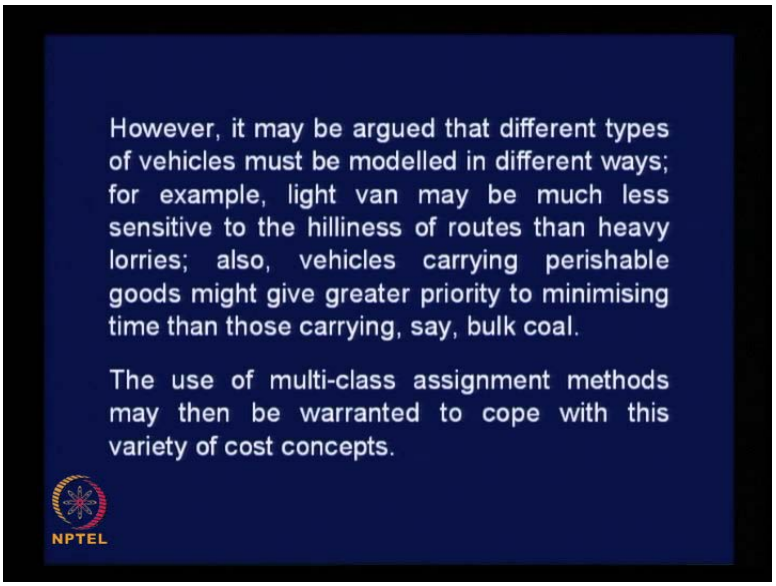


And there is one issue related to this particular assignment. It may be argued, that different types of vehicles must be modeled in different ways, you cannot put all the vehicles together, covert them into PCUs and assign on various alternative routes. For example, light van may be much less sensitive to the hilliness of routes, as well as, the other geometric restrictions of a route, narrow lanes, by-lanes and things like that, then may be lorries. That means, based on the geometrics of road network, you may have to fix certain rules based for heavy trucks, you cannot just assign the truck traffic along any route just because it is a shortest route because of these constraints.

Also, vehicles carrying peripheral goods might give greater priority to minimizing time than those carrying, say bulk coal, or any other bulk commodity, which are not perishable. So, these are other issues related to fixing or assigning routes for goods movement.

So, what to do use multi-class assignment? The use of multi-class assignment methods may then be warranted to cope with this variety of cost concepts. What do you understand by multi-class assignment? Divide the goods vehicle into different classes based mainly on their size and speed, right, and do separate assignment for different categories of vehicles for goods transportation. You may have to divide the goods vehicle into, maybe, three or four categories depending upon the (( )), some extent the type of commodity being carried. And then, assign each category of vehicle separately

based on the requirements and other sensitivities related to the operation of such vehicles.

There are other related issues in assigning goods traffic. Suppose, you are doing transport system planning for a city and normally, there might be some regulation with regard to goods vehicle movement on city roads. It is, slightly in a city, that heavy trucks may not be permitted on arterial roads during day time, 6 am to 10 pm, no heavy trucks on arterial roads because they interfere with the other passenger vehicles and their movement will be restricted to only rest of the period in a day.

So, while you assign this kind of vehicles, you must integrate this volume of traffic with the volume of passenger traffic pertaining to that time period and then get the total of passenger and goods traffic. You cannot simply assign this traffic during peak hours and combine both the peaks together to get the total traffic, it may not work. So, there are certain regulations imposed on goods vehicle movement and if there are certain paths, which are found to be very sensitive and completely prohibited from goods movement, you must identify those paths and exclude those links from your goods movement network itself. So, that is how assigning goods vehicle movement is slightly different from assigning passenger vehicles.

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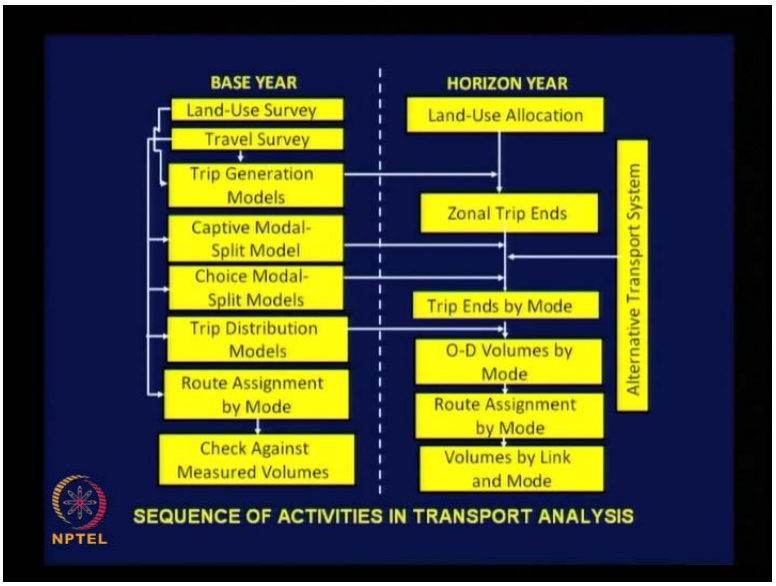


Now, let us get back to the flow chart about which we are much familiar. You are very clear about the list on the left hand side all the steps including land use survey, travel

survey and so on. You do all the steps in respect of passenger transportation and get finally, route assignment by mode and which can be used to check against measured volumes. As I mentioned to you earlier, the measured volumes will contain both, passenger vehicles, as well as, goods vehicles.

Now, we have discussed about the four steps related to goods transportation also. So, again, start here separately for goods transportation, trip generation models for goods transport, captive modal-split model for goods, model for transport. If there is any, if a particular commodity is carried only by a particular mode, then there is no choice issue. Let us say, coal being transported to a thermal power plant form seaport. If train is the only mode used for that purpose, there is no need to include that commodity for your mode choice analysis, is not it. You can treat that as a captive mode, is not it, or that commodity as a captive commodity, captive to only train.

So, this is also applicable in the case of goods transportation choice modal-split models and then trip distribution and route assignment. Do the route assignment considering all the restrictions imposed on goods vehicle movement and then add that to get the total volume of traffic; that, you do theoretically and then check against measured volumes. And once your models are ready, once your models are calibrated, then apply your models to predict the horizon year situation.

The requisite for the horizon year modeling process is the clear idea about the horizon year land use condition. You would have divided your study area into, say 200 traffic zones, and of course, in the horizon year also, you are going to have only 200 zones or more. As far as number of zones is concerned, it should remain as 200. You visualize a horizon year condition, include all future possible developments and fix the number of traffic zones. There will be not be any change as far as number of zones are concerned in base year and horizon year. And you predict the horizon year land use by all possible means, including the process of modeling, namely (( )) model of land use to predict the future land use situation. So, once you do the prediction process, you are very clear about the different activities zone-wise for the whole of the urban area within your outer cordon line.

Having known the zonal characteristics, you apply your trip generation models, right, and get zonal trip ends, both in terms of trip production, as well as, trip attraction for

horizon year condition, clear. And then, before you do mode choice, think of the possibility of introducing any new mode of transportation in the urban area. If there is a possibility, put that also as an additional alternative mode in the choice analysis.

Since your mode choice model as a general category of model, which can take into account, any additional modes, you just apply mode choice model, including captive modal-split model, as well as, choice mode, choice model after introducing the new mode. At the end of the exercise, you will get trip ends, again at the zonal level. By mode you would have identified the mode for each of the trip ends at ever traffic zone and then, do trip distribution analysis using the calibration model and you will get O-D volumes by mode, connecting all the zone centroids, clear.

This exercise has to be done separately for passenger transportation and separately for goods transportation, even for horizon year condition, because the models are different. You have to do two different exercises and then route assignment by mode and finally, volumes by link and mode. This you will get exclusively for passenger transportation and goods transportation, add them together to get the total traffic scenario, clear.

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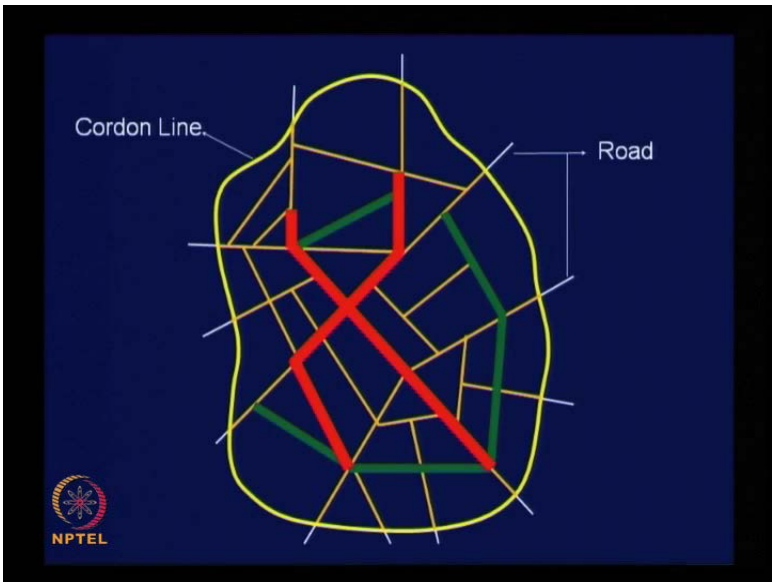


And let us say, after assigning the traffic in the road network, let us say the white line indicate road network and yellow line is the cordoned line. So, after assigning the traffic you will get some indications about the traffic volume level in each of the links of the whole of the network, is not it.

And let us say, some links are loaded to this extent, some relatively lesser volume of traffic. And another set of links may be loaded heavily, shown in green color, and some more sets might be very heavily loaded like this. This is the kind of scenario you will be getting after completion of exercise for the horizon year condition. This scenario you can get by adopting all or nothing assignment technique without putting any constraints on capacity, then only you will be able to get this scenario with total volume along shortest paths.

And you should as a transport system planner must get some clue to provide solution for the problem. After all, you may recall, initially we defined the transportation problem, we start with problem definition and finally, we have to give the solution for transportation problem at the end of the planning process. At the end of route assignment, this is what you are getting.

So, as a system planner what will it do to meet this demand? Because it is easy for you to tell the decision makers, that so many person trips are made in the city per day and we provide the necessary infrastructure, but that is not the right way of giving the result. As a planner you must clearly indicate, what kind of infrastructure needs to be provided, where it has to be provided, to what extent. So, how do you answer these questions, any suggestion?

For example, the red lines may extend, in practice, over more than 10 kilometers for example, right. So, shall we say, that these red lines indicate heavy traffic corridors, is not it, traffic volume is heavy. What do you do to solve this problem? One possibility is, check the capacity of all the links involved on this route and if the capacity is sufficient, then it is fine, there is no need to augment your infrastructure. In most cases the capacity is likely to be much less and it may vary from link to link.

And you must also keep in mind your goals and objectives while taking decisions. What is your goal of transport system planning? If your goal is to minimize energy consumption, to minimize air pollution, then keep those goals in mind and try to provide a solution. What solution will you provide? Obviously, a very good public transit system along this route because route is already identified. You know the volume of traffic, definitely this route can patternize, provide the required patternage for a transit system, public transit system, recommend an appropriate transit system along this traffic

corridor. And while recommending, you can do different types of, or you can make different types of proposals, maybe, a good bus system with exclusive bus lanes or a light rail system or a metro rail system. It is possible to provide different alternative solutions.

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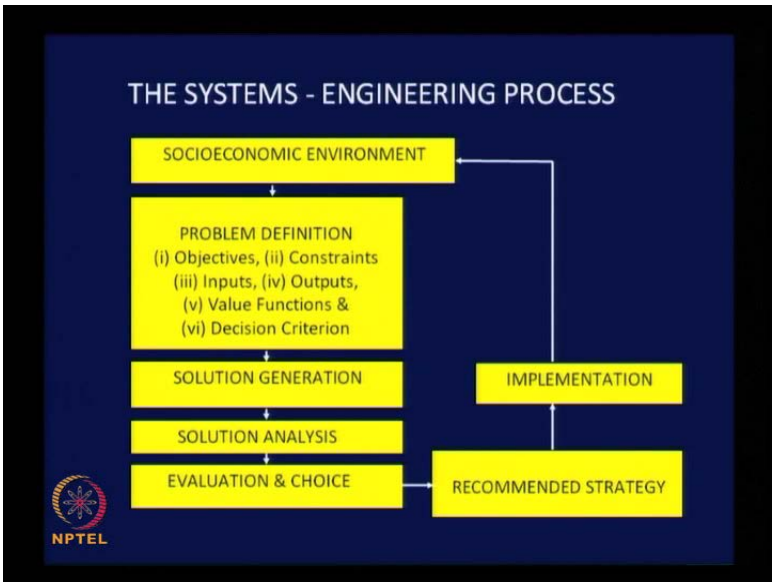


Then, how to come to convergence and take a decision? In that context we should look into another flowchart about which you are familiar, which we saw at the beginning. Solution generation, solution analysis, evaluation and choice, make alternative solutions and evaluate each of the solutions and choose the right one based on economic principles.

Based on economic principles you work out the cost and benefits in each case and choose the one, wherein the difference between cost and benefit is maximum if you have maximum benefit out of a particular system. Then, you recommend, that particular system to precede transport solution along the identified major traffic corridors.

What about the green ones? If you are recommending, let us say, a metro rail system along the red colored corridors, maybe, the green ones being heavily trafficked road, next to the red one, you can think of a good bus system feeding traffic at regular intervals to the metro, as well as, meeting the natural demand for transit.

So, if you do this way, probably you will be achieving the objective of providing a transport system with high level of energy efficiency, as well as, you can achieve a greater extent the environmental protection, which is one of the important goals of any transport system planning.

Once you decide about a particular alternative after choosing the alternative recommended strategy, you have to recommend how these schemes have to be implemented. In phases normally, in a single phase, in one go or two phases or three phases, you have to clearly spell out the stages at which each infrastructure has to be developed in the urban area and there implementation and this process has to be continued at regular intervals, maybe, once in 5 years.

So, this completes our discussion on urban goods movement, as well as, our discussion on the whole of the course, urban transportation planning, right. And I will be happy to interact with you later also, on this subject matter. We will close the discussion on the whole of the course today.