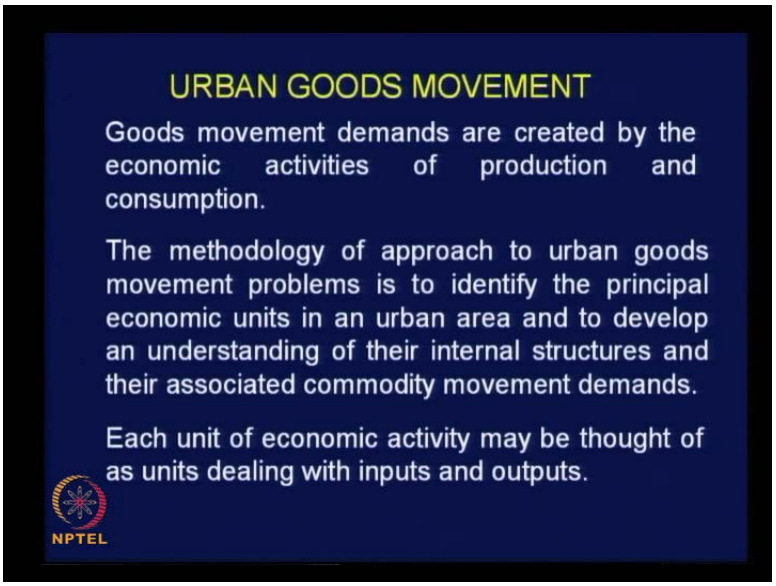
Urban Transportation Planning
Prof. Dr. V. Thamizh Arasan
Department of Civil Engineering
Indian Institute of Technology, Madras

Lecture No. # 39
Urban Goods Movement

(Refer Slide Time: 00:26)



This is lecture thirty-nine on urban transportation planning. We will discuss on urban goods movement in this lecture. The first question to you is, why discuss about urban goods movement in urban transport system planning course? You may recall, so far we were discussing about passenger transportation, travel pattern, travel demand and so on. And at the end of the 4th step, namely route assignment, the output, that we get is the actual traffic flow in the links of the transport system network after completion of the previous steps namely, trip generation analysis model, split analysis and trip distribution analysis.

The kind of traffic flow that we get as a result of route assignment is traffic pertaining to passenger or person transportation alone is concerned with only person trips. We have not so far taken into account trips made by goods vehicles, but when you try to compare the result of a modelling exercise with the actual traffic flow on the transportation system network, it may not match with your result because there will be additional flow of traffic in terms of goods vehicles. Unless we account for the goods traffic also, we will

not be able to actually compare your theoretically estimated traffic flow with the actual observed traffic flow in the field. So, that is how you must realise the importance of analysing urban goods movement.

Urban goods movement in terms of frequency of service, schedule of operation route adopted for movement from an origin to a destination is relatively flexible compared to passenger transportation or person movement. Person movements adhere to strict schedule of operation, so we have to plan in such a way, that people are able to move as per their own schedule, whereas in the case of freight transportation in urban areas, you can even divert truck traffic through some other route even though it could be little round about to reach their destination, that flexibility is available. And you can fix timings for movement of goods vehicles on arterials in a city road.

So, that is how it is not very important for us to really stick to the schedule of operation in respect of goods transportation to your significant extent. That is how the goods transport analysis is little different from passenger transportation analysis, otherwise we need to do the analysis similar to what we have done in the case of passenger transportation, demand analysis.

We have to identify the causal factors and then think of the trip generation for goods movement, then mode choice for goods movement, trip distribution and finally, assignment of route for goods vehicles. They are similar to what we have done in the case of passenger transportation. And the first other question to be answered is, what creates demand for goods movement? This question can be answered easily if you answer the question of what is really causing the demand for person movement about which we have discussed in detail enough in the previous classes. What are the general causal factors for movement of people?

In general, you can say socio-economic activities generate demand for mobility, is not it. Shall we say, that the same reason is holding good for generating demands for goods transportation also? There is no socialising aspect in goods movement; it is only economic related movement. So, we can say economic activities generate the demand for goods transportation, is not it.

What we really understand by economic activity, any response? What is economic activity? Let us consider a plant involved in manufacturing. Of course, all of you will

agree, that manufacturing is one of the important economic activity is something is produced in the plant. So, at the end of the production process what do they do? They market the product, is not it, send the product to different marketing centres and then finally, it reaches the consumers. Shall we say that in principle, the basic elements related to any economic activity is nothing, but production and consumption; that is it. That is what we need to understand by any economic activity.

There is some production process and there is some consumption process going on simultaneously; if there is no consumption, there is no economic activity, please remember. There should be consumers, of course. Obviously, when there is no production, there is no economic activity.

So, we can give this statement with the understanding of the concept, goods movement demands are created by the economic activities of production and consumption. Having understood this fact, how to relate this activity to goods movement demand? Because goods movement demand is occurring over space in the urban area, as well as, over time.

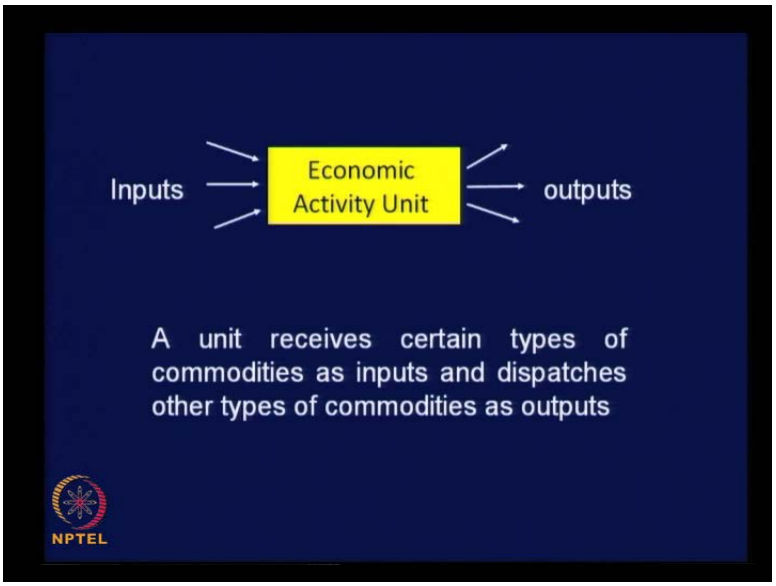
How to relate goods movement demand to spatial locations in an urban area? We need to identify the various economic activity units, where exactly they are located, how much they are producing, where do they send their products and so on, is not it?

So, next important step is identification of economic units and before identification, we have to really define what we really mean by an economic unit. So, next point is or the procedure or rather the methodology of approach to urban goods movement problems is to identify the principle economic units in an urban area and to develop an understanding of their internal structure and their associated commodity movement demands.

Why should we understand their internal structure? To have a clear understanding of the commodity or input recoverment of that particular economic unit and, and other, their associated commodity movement demands with regard to the outputs, as well as, input of the raw materials and other related items for the process, is that clear.

Now, each unit of economic activity may be thought of as units dealing with inputs and outputs. Is this statement agreeable for the purpose of planning? We need to understand any economic unit as a unit located in space at a particular place, which need some inputs and which sends out a set of outputs.

(Refer Slide Time: 09:21)



To firm up this idea, we can just define any economic unit like this. Any economic activity unit will receive inputs from various sources creating demand for transportation and then, may send out different kinds of outputs to different destinations.

And so we can state, that a unit or an economic activity unit receives certain types of commodities as inputs and dispatches other types of commodities as outputs. With this understanding, let us try to categorise the different types of economic units that might exist in urban areas. Any, anybody, you can just attempt to categorise the different types of economic units based on this definition.

(Refer Slide Time: 10:30)

Let us try to categorise, it is very simple, I have already given this example. A manufacturing plant receives inputs of raw materials and semi-finished product. If the plant is related in or involved in the finishing activities, then they will be receiving semi-finished products also as input and dispatches semi-finished if it is dealing with raw materials and finished products if they are dealing with finishing job for other destinations. Other destinations could be warehouses or marketing centres or another factory for further processing, is not it. So, any manufacturing unit can be clearly understood as one of the important economic unit. If there is a manufacturing unit, then you can define that as an economic unit for the purpose of your freight demand analysis or goods movement demand analysis.

Any other possible type of economic unit, which attracts movement or generates demand for goods movement on a regular basis? Suppose I say, that every human being is an economic unit, would you agree with this statement? Everyone of us constitute an economic unit based on the definition, that any economic activity unit receives a set of inputs and gives out a set of outputs, are we not doing that? We, as human beings, also receive a set of inputs and give out some output. Where do we do that normally? Where do we receive the input for our normal day-to-day life? Obviously, at home, is not it? So, shall we say that a household or a residence is a very important economic unit in a city or town?

We buy different kinds of commodities, is not it, and in the process generate goods vehicle movement to our home. When you buy a refrigerator, some small light commercial vehicle brings the consumer to houses, is not it. So, that is how we can understand every household as an economic unit.

What is the kind of output given out of households, which influences the demand for goods transportation? Generally, garbage, most common item, which needs some goods movement process to be cleared of from home, is not it? So, we can say that households receive food and other consumer products and dispatch garbage for disposal. Please understand, we are discussing about urban goods movement, which is little different from intercity or regional goods movement. That is how we consider households as economic units because households generate demand for goods movement.

Then, any other similar units, which you can think of as receiving inputs and then, dispatching outputs to various destinations? How do we send a parcel of weighing, say 50 kilograms from our place of living to another location to reach, maybe, sending to a friend or relative? How do we do that? There are parcel services or goods transport services. So, you just talk to the concerned travel agent, they come and collect your parcel from home and there is a small, light vehicular movement to their office, which is typically a goods transit or goods transport terminal where they collect lot of goods from various sources, different kinds of commodities. What do they do then? They put them all together based on the destination in different vehicles and dispatch to different destination points, is not it.

Shall we say that transport, goods transport terminals are very important economic activity units? Based on the definition, that any economic activity unit, basically receives a set of inputs and dispatches a set of outputs in the context of urban goods movement, it may not be valid very much in the context of goods movement at the national level or regional level. We are confining our discussion to urban goods movement.

It is very much appropriate to consider freight terminals, which are receiving goods, that are either consolidated into large consignments for external locations or goods, that must be separated into smaller consignments for distributions within the urban area, isn’t it. Goods terminals, when they receive goods from out station, they just divide the consignment to smaller ones and then send it to the various destination points, maybe

retail outlets. So, that is how we can consider freight terminals as one of the important economic units.

Now, put all these things together. Are we convinced that these three are the important economic units, which really generate goods movement demand in a city or town? What is happening in day-to-day life in cities and towns? Take for example, the vegetable wholesale market located near the intercity bus terminal in the area named Koyambedu in this city, what is the activity going on there? It is a huge area, if you go there, there will be hectic activity going on in most 24 hours every day, what do they do? They receive vegetables in bulk from various sources and then, the output is simply dividing them into smaller units and dispatching to various retail centres and of course, in the process, they do the process of selling the commodity and after sales it is dispatched to various outlets. So, they are receiving input and then giving out a set of outputs. So, for all practical purposes these whole sale markets also can be treated on par with freight terminals.

We have a huge wholesale market for steel in this city, are you aware of it? And steel from various points arrive at that location, which is about 40, 50 kilometres away from the city centre and from there it is distributed to retail outlets. Even though it is a whole sale market for a particular product, for all practical purposes, for our analysis we can treat that as a freight terminal, right, whose area of coverage is confined to the city only, whereas we may have freight terminals whose catchment area or hinterland extends beyond the city limits. But they will be operating through the city transport network. Can you think of an example of that kind?

(( ))

Yes, right. You consider the sea port in this city of Chennai, what do they do? They receive inputs from all over the world, commodities of different kinds, bulk commodities, right and brick bulks, these are the terminologies used in sea transportation, containerized cargo and so on. All these things are received at the freight terminal, namely sea port and then, some of these commodities find local market within your city and most of the items are sent beyond the city limits, but through the city.

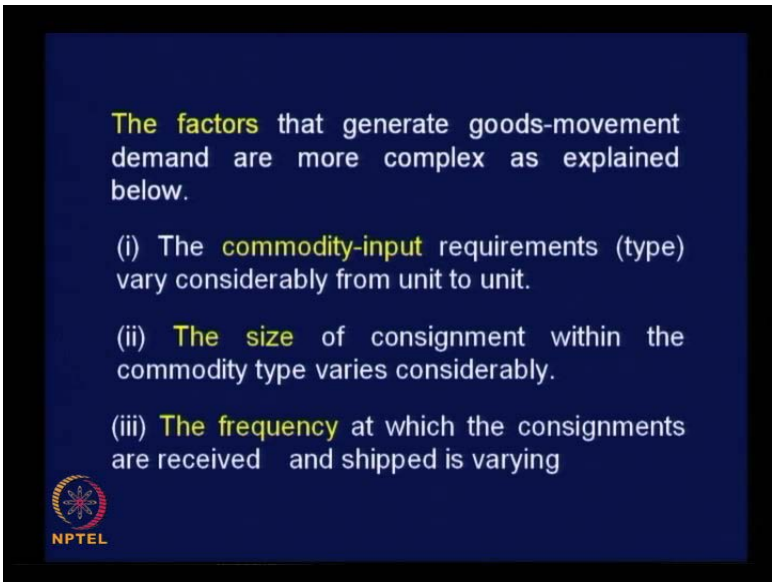
So, we need to have a separate treatment for such kind of freight terminals, you cannot generalise freight terminals and just have a single formula to deal with or analyse the

demand generated by freight terminals. They are freight terminals of different kind, which would be contributing more for external-to-external traffic and relatively less for the external-to-internal and internal-to-external traffic, clear.

On the same lines, think of goods transportation by air airports, what is their coverage area? National, as well as international, right. So, when the consignments are received at air transport terminal, they also are to be treated on par with the treatment that we give for the consignment received through waterway transportation. They are terminals of different kind.

And as far as our discussion is concerned, we are going to discuss about these economic units whose jurisdiction will be limited to the urban area with the realisation, that we have other kinds of economic units, which are to be treated differently, for example, sea port, airport and so on.

(Refer Slide Time: 21:54)



Now, the factors that generate goods movement demand are more complex, as shown here. The first point is this: the commodity input requirements, type, vary considerably from unit to unit.

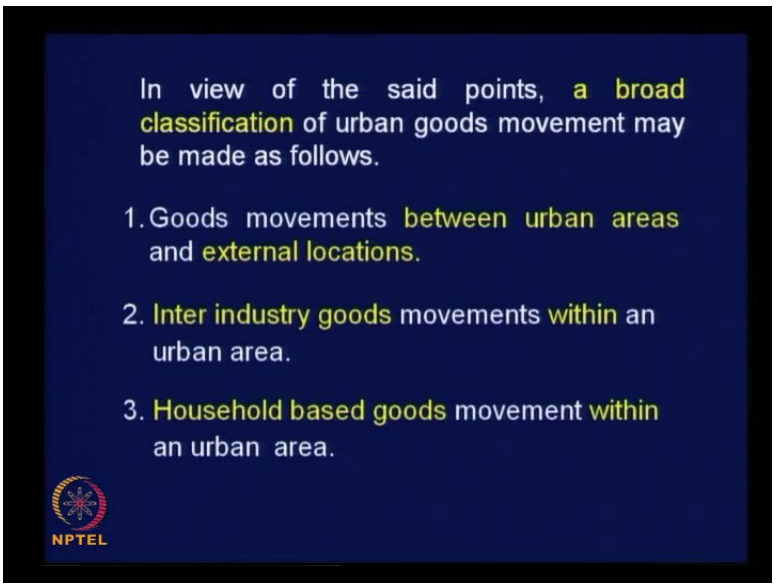
There may be similar manufacturing plants; we have for example, we, in this city car manufacturing plant, as well as, heavy vehicle manufacturing plant. The commodities might be same, but the consignment size will be totally different or different plans may

require different types of commodities. If there is a textile mill, the mill may require yarning input and clothing items will be going as output. If it is a spinning mill, then the input is going to be raw cotton and output is going to be yarn. So, the type of commodities, inputs and outputs will vary depending upon the type of the economic unit.

The size of consignment within the commodity type varies considerably, that is what I said, industry could be same; depending upon the level of operation, the size of commodity consignment will be varying.

The frequency at which the consignments are received and shipped is varying, that is very important point. The frequency of receipt, as well as dispatch of commodities, if the manufacturing unit has got a sufficient storage area, they may not be receiving the commodities frequently, as well as, they may not be sending out the outputs frequently. They will store enough of them and send it in bulk to various destinations. If they do not have, then there will be frequent inputs, as well as outputs, as well as, if the size of the plant itself is small, the frequency will be more; in large size plants, the frequency is likely to be less. So, these are the factors related to generation of goods, movement, demand, very important factors.

(Refer Slide Time: 24:14)



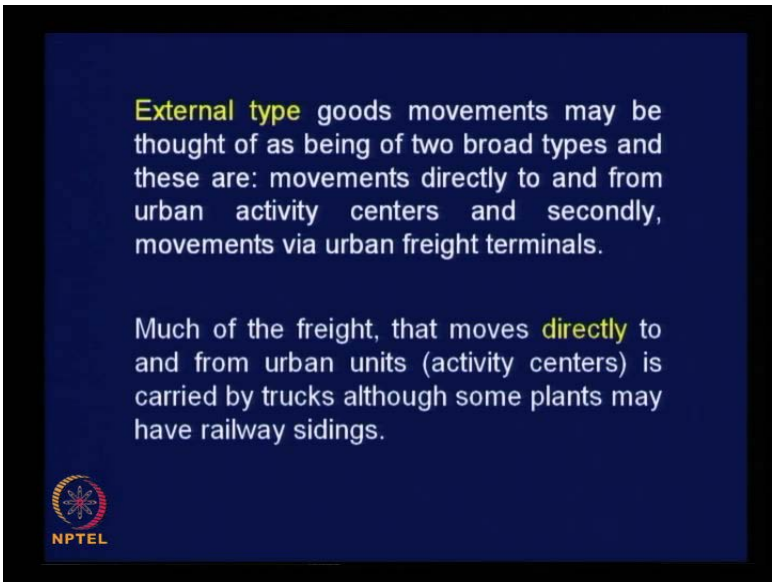
And so, in view of the said points, the factors influencing demand as well as the definition of economic units, a broad classification of urban goods movement may be

made as follows. In any case, we have to analyse goods movement demand, so let us try to classify the goods movement into different types.

First, we can divide the goods movement as goods moving between urban areas and external locations or simply external-to-internal and internal-to-external trips involving goods. Second, inter industry goods movements within an urban area or goods movement between economic units, within the city or town itself. And third, household based movement within an urban area.

So, this is how we are going to divide the goods movement, analyse each one of them in detail, clear. This division is based on the identified economic units, as well as the related complexities, that we discussed about. First, let us see in more detail about the first category, namely, good, goods movements between urban areas and external locations.

(Refer Slide Time: 25:50)



External type goods movements may be thought of as being of two broad types and these are movements directly to and from urban activity centres and secondly, movements via urban freight terminals.

Are they logical or not? When there is an economic unit, let us say, small manufacturing plant, they may either receive the inputs directly from sources to their factory site or if the commodity requirement is reasonably of smaller size or if they feel, that making use

of the available public transport system like railways is more economical, then they may receive their input at freight terminals. From there, it will be moved on to the exact destination point where it is required for further processing. So, we can divide this internal-to-external and external-to-internal movements as direct movements and then movements through freight terminals, clear.

Of course, much of the freight, that moves directly to and from urban units or activity centres is carried by trucks; huge trucks will be carrying because the movement is direct to the factory or the manufacturing plant, although some plants may have railway sidings also. When they receive inputs directly from sources, raw materials of large quantities, like a thermal power station, they may have railway sidings, so that train loads of inputs can be dispatched to the economic activity centre easily.

(Refer Slide Time: 27:53)

Then, how about freight that moves through transport terminals? Freight that moves via a freight terminal will involve a pickup or delivery truck of smaller size obviously, because it has to be moved over shorter distance only, there is no need to employee huge trucks within the urban area. The reason is the constraints within the urban area for movement of larger vehicles, as well as, the convenience with which the commodity can be moved through different paths using smaller vehicles, pickup and delivery trucks.

And freight terminals may cater to one external mode or in some cases, may serve two or more modes. If freight agency is operating through modes: rail, waterway, airway, as

well as, road transportation, there are travel agencies dealing with all the modes of transportation, they collect commodities from various sources to be dispatched through different modes, that is also possible. A freight terminal need not cater to only one mode, there could be terminals catering to different modes of transportation.

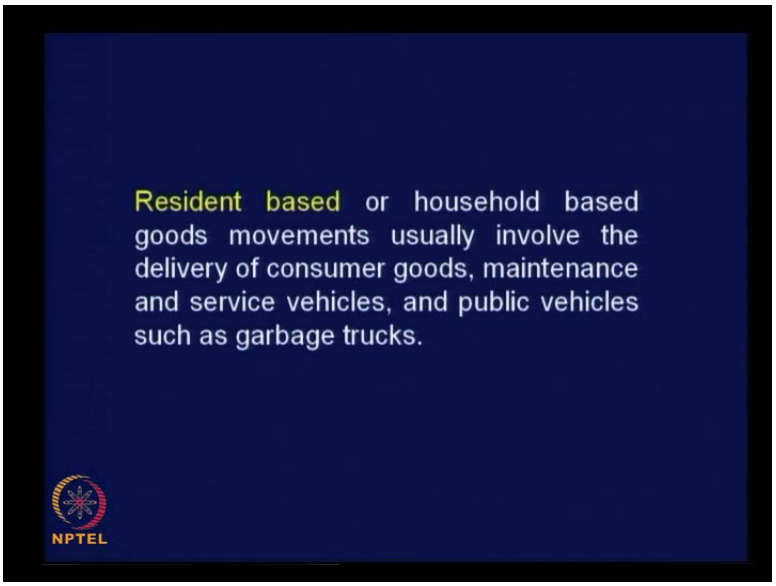
(Refer Slide Time: 29:19)

Then, about inter-industry movements within the urban area or movement between economic activity centres are virtually all accomplished by trucks of various sizes, not lighter vehicles, trucks of various sizes. Why, because it is a movement of semi-finished products, normally between economic activity units.

When they do it for a production process, they cannot just move these commodities using small sized vehicles, it will be always truck movement, even though it is within the urban area because of the necessity related to the process. Of course, these inter industry movements involve the distribution of semi-finished products between plants, as I said, the distribution of finished products to warehouses and retail establishments and so on.

In all the cases, the size of the vehicle is going to be relatively larger because it is between unit to unit. And how about the commodity movement related to households?

(Refer Slide Time: 30:38)



Resident based or household based goods movements usually involve the delivery of consumer goods, as we were discussing earlier, maintenance and service vehicles.

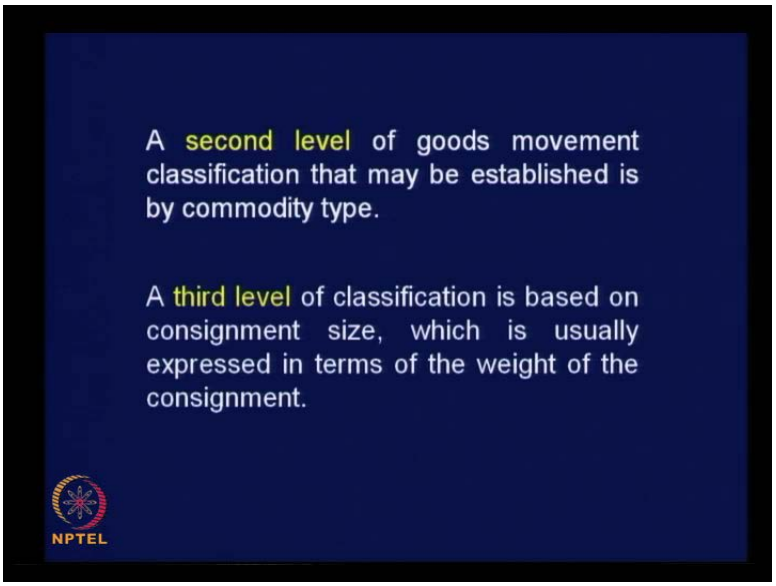
What do you understand by maintenance and service vehicles? What kind of maintenance vehicles and service vehicles are coming to residential areas? The most common, yes please...

garbage trucks coming into the...

Yes, the normal site in a city residential area is movement of garbage trucks for collection of garbage, day-to-day activity. Other types of service vehicles, of course the trucks, which are very special to Chennai city is water tankers. Lot of people buy water, so movement of water tankers is quite common sight in most of the residential areas, that too during summer. And other service vehicles, related to sewerage system or electricity and so on, these are all quite common to attend to the day-to-day maintenance works. That is how we need to understand this category of vehicles and public vehicles, such as garbage trucks, as was pointed out earlier.

This is how we have been trying to classify the goods movement based on the type of industry external movement, as well as, household base movement.

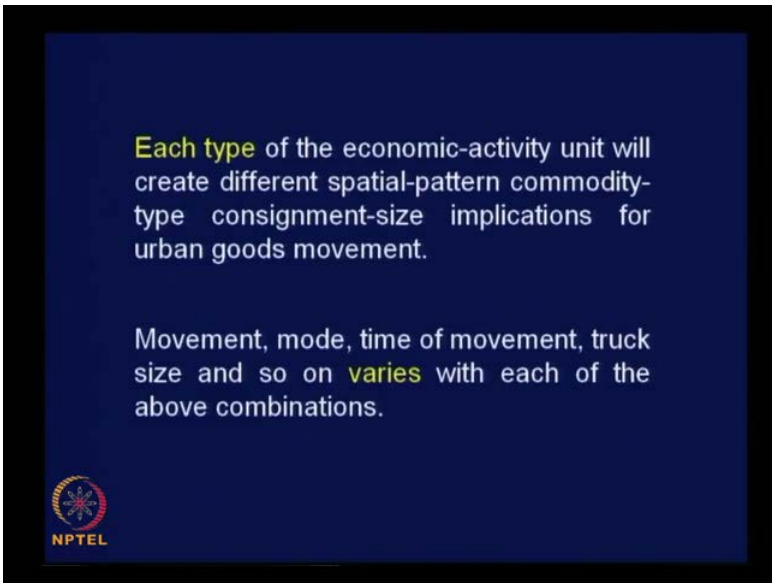
(Refer Slide Time: 32:19)



The other possible classifications are also there. In 2nd level of goods movement classification, that may be established is the commodity type based classification, at least (( )) division, like movement of bulk commodities, movement of packaged small units, movement of perishable commodities and movement of liquid commodities, movement of gas. So, you can classify, you know, within the system based on the commodity type, so that analysis will be easier.

And the 3rd level of classification based on consignment size, which is usually expressed in terms of weight of the consignment, these are all the possible classifications.

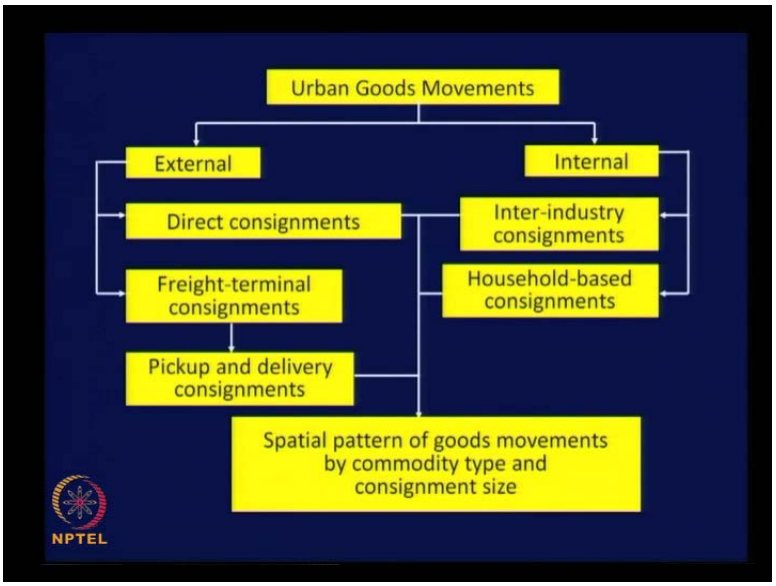
(Refer Slide Time: 33:40)



And please note each type of the economic activity unit will create different spatial-pattern, commodity-type consignment-size implications for urban goods movement. Spatial pattern is going to be different, commodity type is going to be different and then, the size of the commodity is also going to be different. That is how we see variety of goods transport vehicles on urban roads. It is not, that all the vehicles are of same size, different types of vehicles based on the need, as illustrated here.

So, the movement, mode, time of movement, truck size and so on, varies with each of the above combinations. With these complexities, how do we just take an overview of the situation and develop some methodology to analyse freight transport demand?

(Refer Slide Time: 34:51)



We can develop a methodology as shown in this flow chart. Urban goods movement can be first broadly classified into external and internal movements. When we say external movement, this clearly indicates internal to external, as well as, external to internal movements. The term external is again used here with respect to your cordon line, for that you (( )) or mark of for the purpose of planning, that is the reference line always.

With reference, that line only we just designate movements as external movements and internal movements. As I said, this external movement also should include external to external movements also because such traffic also congest your city roads, particularly when you have huge transport terminals, like seaports, airports and so on.

Then, if you take external movement, you can have direct consignment to the economic activity unit from external sources that is clearly one type of movement that will have a particular frequency. Schedule of operation because it is coming from external sources, the size of consignment, type of consignment, everything will be different. So, it should be possible for us to develop models to deal with this category of freight movement separately directly coming to the economic activity unit from external sources, as well as, directly dispatched from economic activity unit to locations outside your planning area.

Then, from external sources it may reach out to freight terminals and then send to various economic activity units. So, this will have the nodal point where the size of the

consignments is changed. If it is to be dispatched to external locations, the size will be increased; all smaller things will be put together to make larger consignments. If it is to be distributed inside, then it will be disintegrated and the size will be reduced and distributed through appropriate means of transport, normally small size road vehicles.

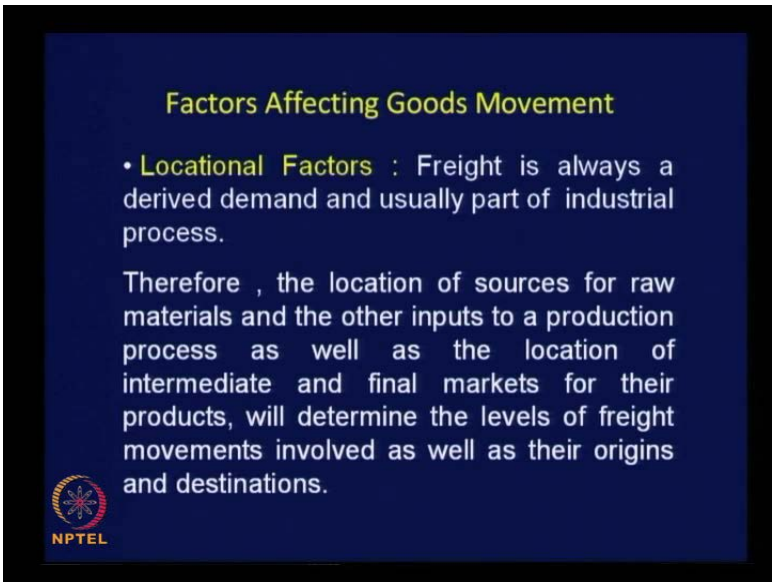
And these two categories of movements, of course, this is, as indicated here, pickup and delivery consignments will be resulted from this kind of movement if it is moved through freight terminals.

If it is internal, it could be inter industry consignments. As we discussed earlier, this is going to be using large size vehicle and type of commodities will be limited in numbers. There may not be different kinds of commodities because it, it is only inter industry movement. Then, internal movement could be household based consignment, this will have varieties of commodities, varieties will be more. So, that is the difficulty we will be really earning a difficult to analyse this kind of movement, household based movement.

So, all these movements together produce spatial pattern of goods movements by commodity type and consignment size, that is what we see on our roads, is it agreeable? So, this is one approach of taking an overview of the whole situation and trying to segregate the movements based on the pattern of movement and finally, trying to understand the traffic flow goods movement in city road networking.

Even though in terms of percentage of vehicles, the goods traffic may constitute what percentage? Roughly, about 5 percent of the vehicles, that we observed on city roads or goods vehicles; a small percentage. And if you convert them into equivalent PCOs, maybe, it may constitute a slightly higher percentage, but still, they are not very significant, but because this fact we cannot afford to neglect. Analysis of goods movement, we have to analyse, incorporate this also into the passenger or person trips so that we get a total picture of the traffic flow on city road networks and there are other related issues.

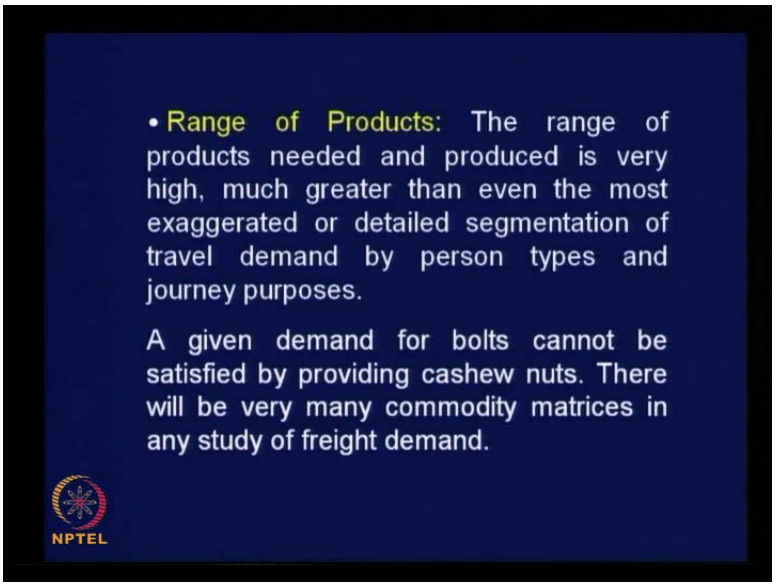
(Refer Slide Time: 39:40)



Factors affecting goods movement - one important factor is this, locational factors. If you look at the inputs for the manufacturing units, they may come from different sources. Location of raw materials is spread all over and this creates real problem in the analysis of goods movement. The location of sources for raw materials and the other inputs to production process, as well as, the location of intermediate and final markets for their products will determine the levels of freight movements involved, as well as their origin and destinations.

So, this is the real complexity related to the movement or inputs, as well as, outputs. In a particular city if you have a huge manufacturing plant, then you have to really study the geographic spread of the raw material input to the plant, as well as, spread of the output, that goes out of the plant, it will be a major task. In case of smaller plants it will be manageable.

(Refer Slide Time: 41:02)



Then, the range of products - the range of products needed and produced is very high, much greater than even the most exaggerated detailed segmentation of travel demand by person types and journey purposes.

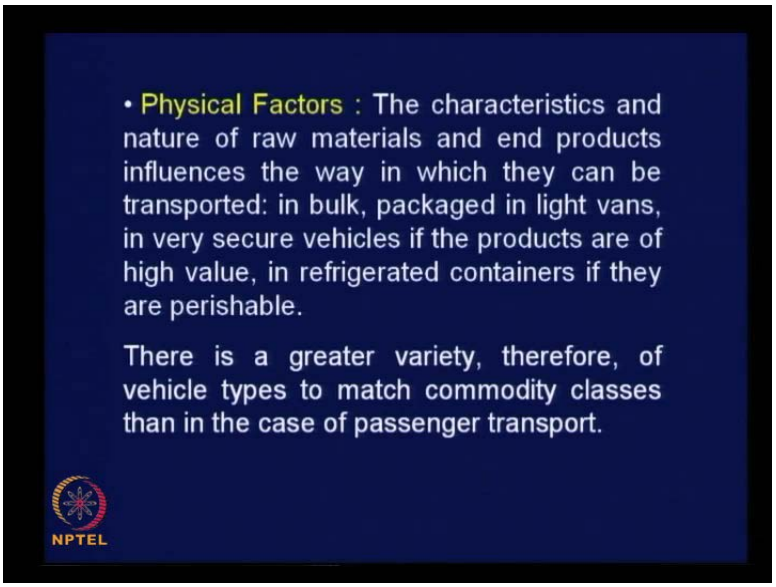
This is where the real complexity arises. You may recall we analysed person transportation demand after data segmentation. We know clearly, we cannot analyse the demand for even person transportation without segmenting data. We segmented data based on trip purpose.

How many trip purposes we identified? Work, education, shopping, social, recreational, personal business, let us say 5 categories, 5 different purposes and let us say, we divide the people based on the socio-economic characteristics into 3 or 4 categories, right. 4 into 5, there will be 20 sets of data and we will be developing 20 different models, whether it is for mode, choice or trip distribution or trip generation, whereas here, how many types of commodities are being handled in an urban area, hundreds. And if you try to segregate commodities based on the commodity type, and then develop models, the problem becomes highly complex, right. So, this is an issue, which has to be handled very carefully. Depending upon the need, you can aggregate them to certain level, but in general, data segmentation is going to be a complex process to analyse goods movement demand.

A given demand for bolts cannot be satisfied by providing cashew nuts. This statement made to make this point very clear. The commodities vary widely, right. When there is a need for few bolts, you cannot send just cashew nuts as substitute, you have to send only, that particular type of commodity; that is the complexity.

There will be very many commodity matrices in any study of freight demand. What is meant by this sentence? Matrices provide you the origin-destination movement pattern, is not it. So, those matrices, in the case of person transportation, we will create these matrices for work trips, education trips and so on, whereas here, you will have more number of matrices.

(Refer Slide Time: 44:06)



Physical factors - the characteristics and nature of raw materials and end products influence the way in which they can be transported: in bulk, packaged in lights vans, in very secure vehicles if the products are of high value, in refrigerated containers if they are perishable.

So, these physical factors make lot of difference under our condition in urban transportation. Transportation of gas for domestic consumption is a real issue that needs a special system of transportation. If you think of an industrial unit city, like Chennai, has petroleum refinery for example, how do we transport the input to the refinery. When it is received at the transportation terminal sea port, it is directly pumped to the refinery. So, pipeline is the mode of transportation, as far as provision of input is concerned.

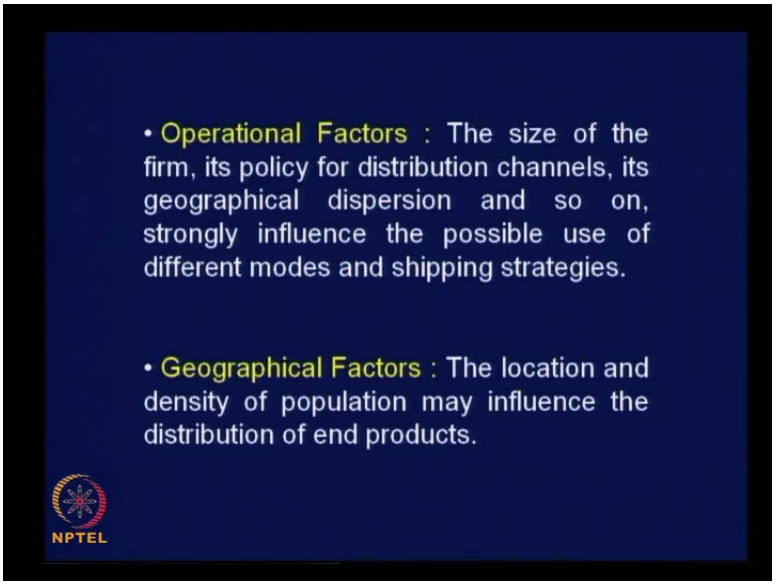
How do we transport the output? Using road and rail, is not it, these are the two modes of transportation. So, that is how the physical factors matters a lot. So, we must understand the intricacies in the process of economic activity related to each of the units, each one is going to be different.

If you take food grain transportation, they just arrive from different sources at the wholesale unit and then distributed it to retail outlets using a different system of transportation.

Another more common example is distribution of milk in urban areas. This has got a special methodology of transportation, how do they process the input? Milk processing units in trucks of various sizes, there is input at the processing plant, then huge storage system is there in the plant site, then distribute it using again trucks of different sizes to retail outlets.

There is a greater variety, therefore, of vehicle types to match commodity classes than in the case of passenger transport; that is the moral of the story. So, we need to have different types of vehicles, whereas in passenger transportation we are able to categorize the vehicles very easily. Even if you start from foot, it is going to be foot bicycle, motorized two wheeler, motorized three-wheeler, motorized four-wheeler, bus and train, but here numerous types of vehicles are required.

(Refer Slide Time: 47:33)



Then operational factors - the size of the firm, its policy for distribution channels, its geographical dispersion and so on, strongly influence the possible use of different modes and shipping strategies; it is a very important point.

We have car manufacturing plants in this city; they really congest the city road network because they have various options. The Hyundai car manufactured here, part of the product be produced, output is sent by road to different local destinations including the city in which it is located, as well as, the other parts. They make use of rail transport for long distance transportation also. They make use of waterway transportation to transport the output to various destinations outside the country.

National, international, local, all possibilities are there, that is why, the size of the firm and their policy to make use of different transportation channels matters much.

Then, geographical factors - the location and density of population may influence the distribution of end products. Do you agree with this statement? How the location of operation and the density influences the goods movement pattern? It is very simple. If you have isolated pockets, dense pockets in an urban area, the goods movement, remain in terms of vehicle kilometres, is going to be very high and if you have concentrated population in a particular corridor constituting major part of the population of the city, the goods movement pattern is going to be different and it is going to be relatively easier.

But unfortunately, in India, most cities are spreading out. We have not learnt to develop dense corridors, which is ideal to minimise transportation intensity and also to encourage public transit, we are just spreading out. Urban sprawl is the common feature in most urban areas in our country, which is not desirable, Americans do that.

Urban sprawl is a common feature, nobody wants to live in city centre, they want to live about 100 kilometres away from their office and drive happily every day because the transportation charge is quite less in such countries. We cannot afford to do that, but we are allowing, that kind of development in most urban areas.

(Refer Slide Time: 50:41)

Then, dynamic factors - seasonal variations in demand and changes in consumers' tastes play an important role in changing goods movement patterns. If there is going to be a significant effect on this we have to take, that also into consideration while finally, recommending development of infrastructure to meet the future transportation demand.

Then, pricing factors - as opposed to the case of passenger demand, where prices are almost fixed and known to every user, prices are not in general published because they are much more flexible and subject to negotiations and bargaining power.

In the case of freight transportation this is true. If you are a small consigner they are going to charge you more. If you are just sending large quantity of goods, you can bargain and send it for a lesser rate. So, there is no fixed schedule of rates are displayed or published by freight transport operators, it is this is one major difference between the passenger transportation and goods transportation.

You cannot just that easily work out the cost of transportation because it is bargainable; it is related to the regularity with which the consigner is sending goods and the quantity of goods being sent and so on. So, this is how analysis of freight movement is different from the analysis of person movement in an urban area.

To summarise what we have discussed so far, we tried to understand the reason for demand for goods transportation in urban area and it is clear now, that economic activity units generate the demand for goods movement in urban areas.

We can broadly divide the economic activity units into three types, namely, manufacturing plants, households and then freight terminals, for the purpose of analysis of urban goods movement. Then, based on the type of movement we can classify the movements as inter industry movement, movement from external locations as well as household based movements. And each movement has their own frequency as well as the pattern of operation. And then, we discussed about the complexities related to urban goods movement compared to the complexities of analysing passenger transportation demand.

We will close here for this class with this. In the next class we will discuss about the principles or the basics related to modelling urban goods movement demand.