Urban Transportation Planning
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Module No. # 07
Lecture No. # 33
Transportation Surveys Contd.

This is lecture 33 on urban transportation planning; we will continue our discussion on transportation service in this class, and complete our discussion in this class itself on this particular topic. You may recall in the previous lecture, at the end we discussed about home interview survey, which can also be called as household survey. We know now there are basically three methods available for home interview survey or household survey. Number one, you can actually send out surveyors to the households, to collect information from the members of the house hold, or you can collect the information telephonically after sending the format or questionnaire to the households in time. Third possibility is, you can send the questionnaire to the households with a replayed paid envelop and request them to fill up the questionnaire and send back to you, there are three possibilities.

And when we discussed about the sample size for the household survey, we realised that the sample size suggested by BPR Bureau of Public Roads USA is based on the conditions, based on the socio economic characteristics prevailing in the USA, and the same sample size may or may not be relevant for developing countries like India, where the socio economic characteristics lie over a wide range, compared to the range over which these characteristics fall in cities of developed countries. In that context, I suggested that the sample size I suggested by the BPR can be simply doubled for our condition. For example, for cities with one million and more of population, instead of four percent as suggested by BPR, we need to have at least eight percent as the sample size.

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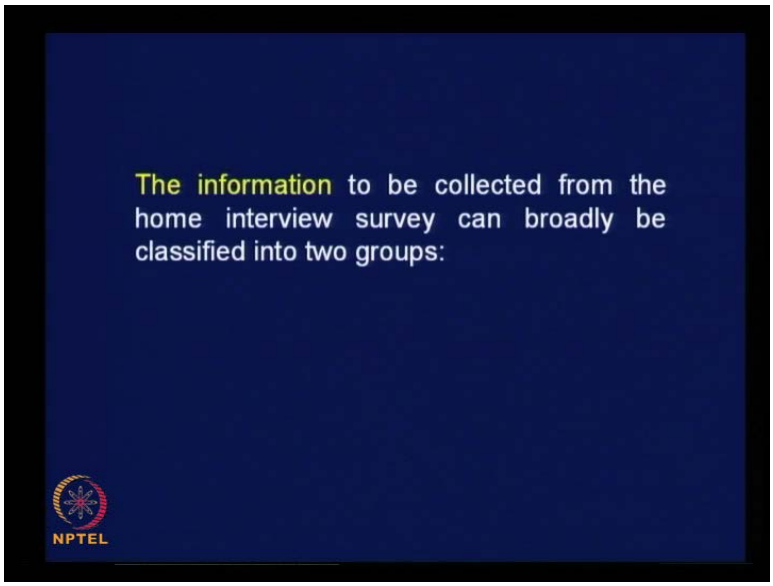

And with that background, let us look into some more aspects of home inter survey. The information to be collected from the home interview survey can broadly be classified into two groups, what are the information? We have already discussed about the two sets of information; one about socio economic characteristics of the household. Then, second one, the set of information related to the trips made by the different members of the household.

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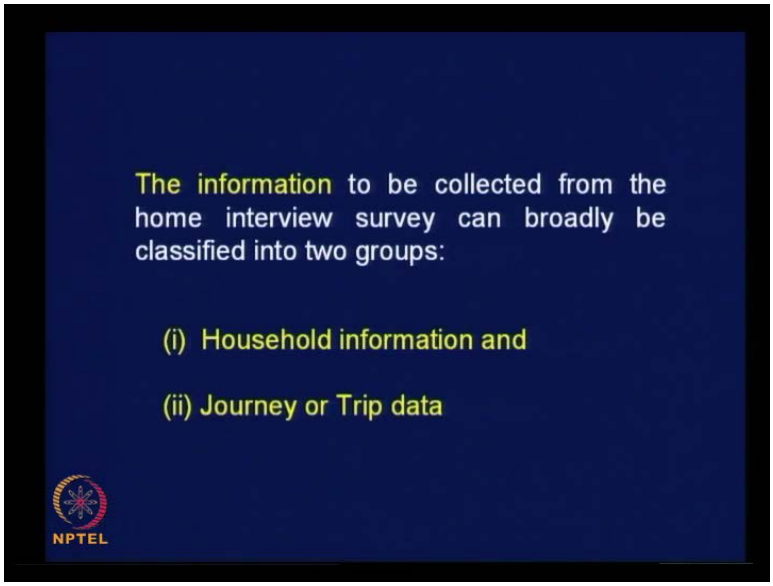

Household information, basically related to socio economic characteristics and journey or trip data, and what exactly needs to be collected as household information.

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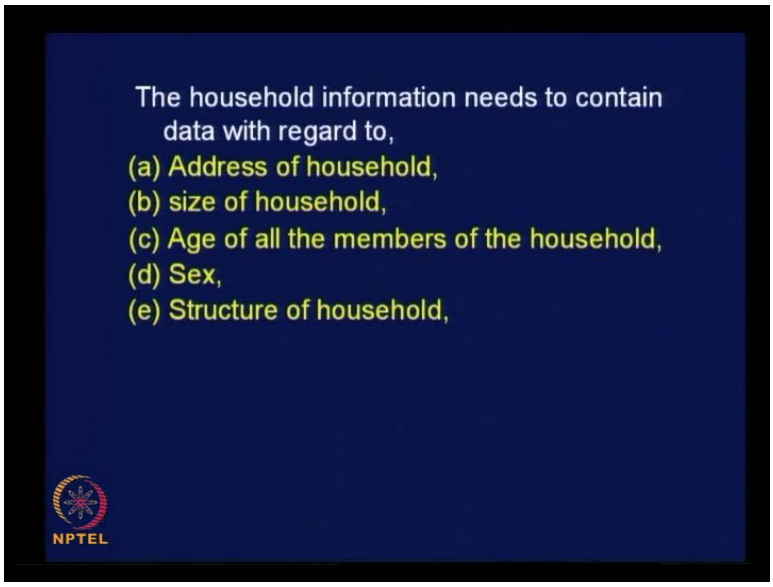

You can list out several aspects related to household characteristics, starting from the address of the household itself, even though you might send out questionnaire. Still you can check for the correct address and record the correct address of the household. Then, general overall size of the household, total number of persons in the household, age of all the members of the household, sex, structure of household, this implies the type of relationship between the members of the household; grandfather, grandma, father, mother, daughter, son like that kind of relationship or cousin, brother in law and so on. There could be so many kinds of a relationship between the members of the household, that is what is meant here as structure. This structure is very important again for developing countries like ours, because the head of the household is the caretaker of most of the activities of the household, and he or she is the person who will be making most of the trips. So, the structure is a very important aspect which governs the trip making behaviour of the household members.

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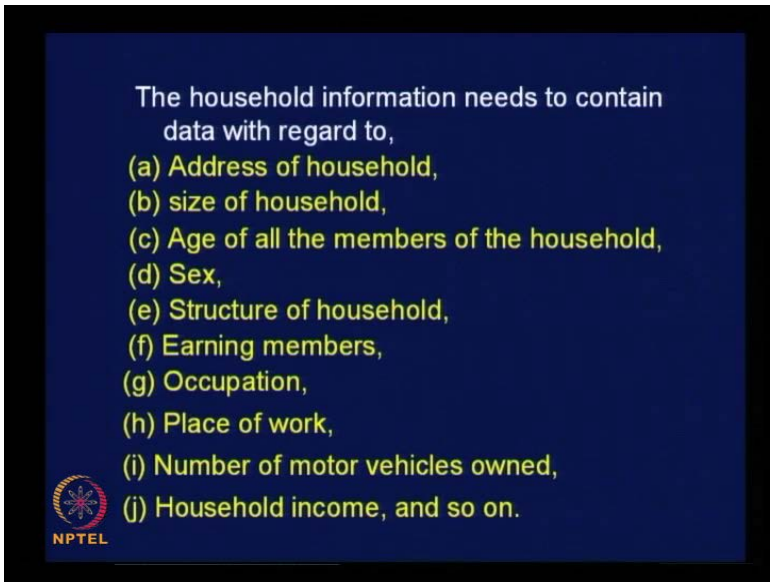

Earning members or number of employed persons, occupation; the nature of job in which they are employed, and place of work, it is an additional information to have an understanding of the location where the exact work place is located, so that later on you can cross check the Zonal movement, inter Zonal movements. And number of motor vehicles owned, under our condition we can also include non motorised vehicles, like bicycles that is also important, household income and so on. Please note that I have listed household income as a last item, because it is rather difficult to collect accurate information about this particular aspect. Still you can try out and, if possible you can collect information about indicators of household income as and when required.

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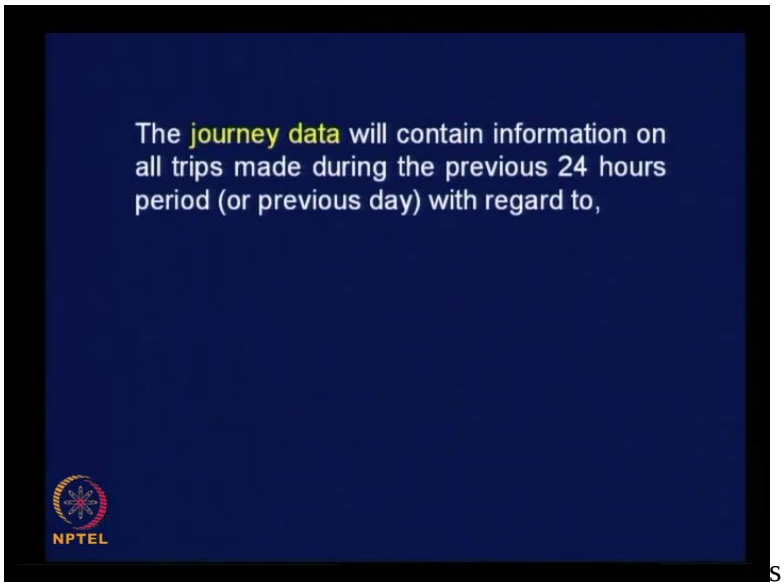

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Then, the journey data will contain information on all trips made during the previous twenty four hours that is the most important aspect. What, is that previous twenty four hours, if your date of interview is let us say tenth, you will be collecting information about all trips made on ninth. Why previous day or why not some other date, one week earlier or fifth days earlier; any response. They might tend to lose one or two information's. They might forget about the trips actually made, so it is better you collect the information when everything is fresh in their mind. So, most probably they may not forget about the trips made in the previous day that is the idea, nothing else.

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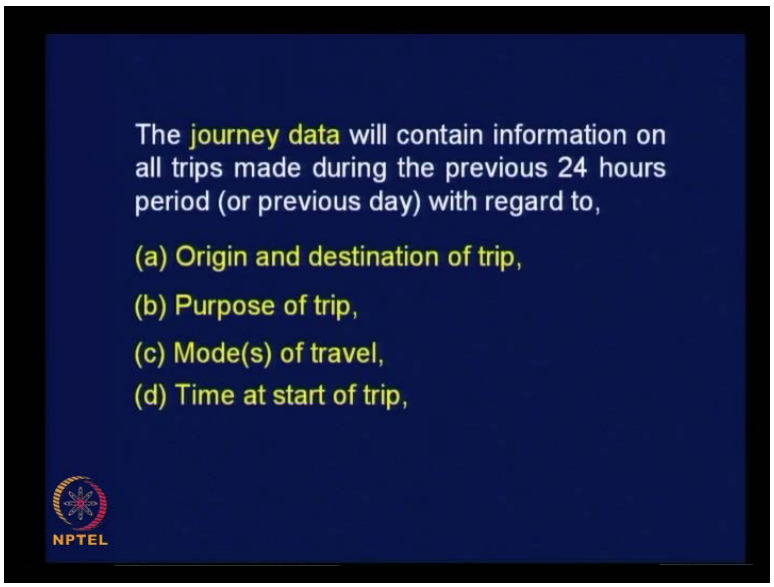

The information to be collected with regard to trip, or origin and destination of trip. This information has to be collected for each of the trips made by the household member, one might make more than 1 trip; purpose of trip, modes of travel, time at start of trip, time at finish of trip. These are all the things required for us to do the four step analytical process.

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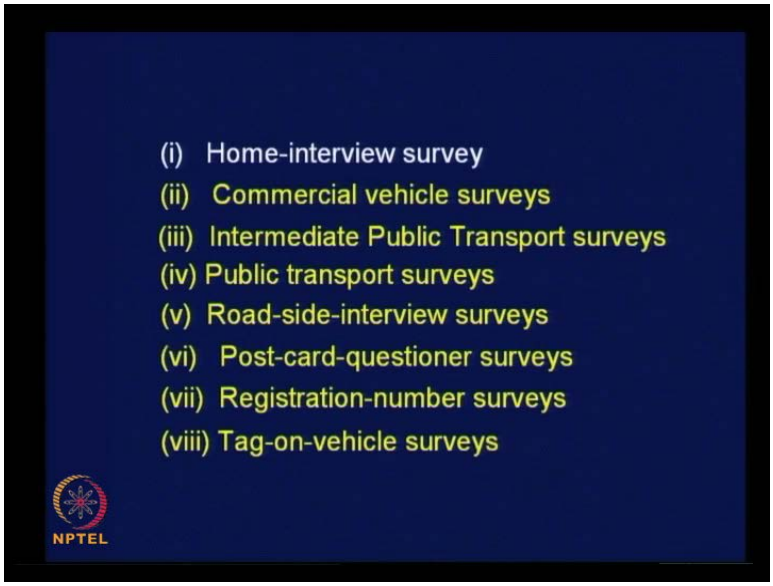

Now, you may recall this list, we have listed totally eight different types of surveys and we have now completed our discussion on the first one, namely home interview survey. Basically, we collect information from households about socio economic characteristics and the trips made by each member of the household, and we normally resort to sampling. Then we will discuss about commercial vehicle surveys and so on.

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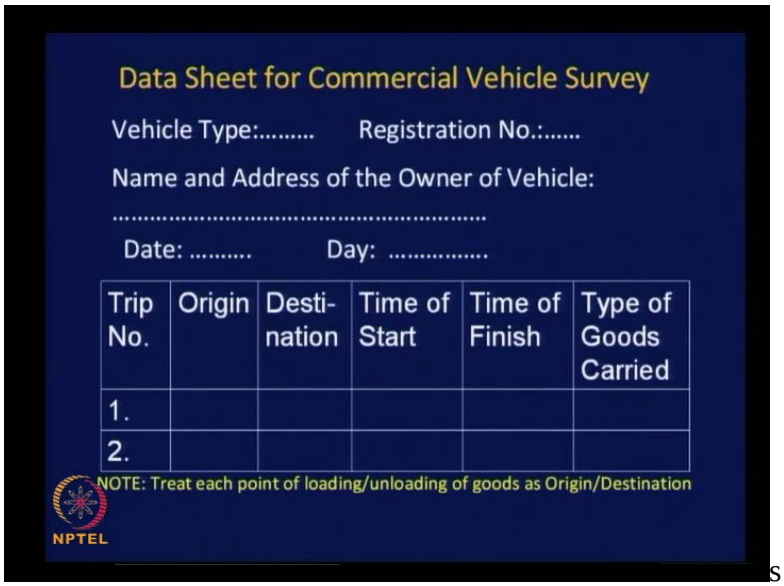

What is a commercial vehicle, in this context commercial vehicles are goods vehicles, they could be trucks or light commercial vehicles or tractors whatever, motor vehicles used for carrying goods are termed here in this context as commercial vehicles. Our interest is to know the loading added to the traffic by the commercial vehicles in the network, city road network. That means we need to have information about the complete movement of the commercial vehicle within a day, twenty four hours information. So, this can be obtained only by capturing information about every trip made by a particular commercial vehicle. Now, the first question to be answered is, how many commercial vehicles are operated in an urban area, how will you get this information, then who is the owner of the commercial vehicle. These are all the questions to be answered first, do we have any source to get this information. Luckily we have a good source, reliable source. You may know that every motor vehicle has to be registered with regional transport office of that particular area.

So, we can get complete information about all the registered commercial vehicles from RTO's office, and the address of the owner is also available, even if it is sold out to somebody else, the ownership is transferred and that is also recorded. So, even up dated information will be available with the concerned authority. It is very easy to get complete information about the total number of commercial vehicles, category wise as well as address of the owners, having known this information, then how to go about getting the information in a systematic way. So we need to prepare a questionnaire or form like this,

which will be distributed to each of the vehicle owners, to get filled up and return back to us, starting from vehicle type, registration number of the vehicle, name and address of the owner of the vehicle, date, day, date on which you require the information, and day normally whether it is to know it is a weekend or start of week and things like that, better to have some information about the day also.

And for each trip; trip number, you should know the origin, destination, time of start, time of finish, type of goods carried, and the footnote is also important. Treat each point of loading, slash unloading of goods as origin, slash destination. This is quite common for goods movement in urban area. Mostly light commercial vehicles will be carrying goods in large proportions and you will find these vehicles will be distributing goods to all the retail centres. So, there will be number of stoppages, loading, unloading points and so on. So, we have to request them to indicate all the details, so that we can track the movement of these vehicles completely within a day.

And is it that easy to get this information from the vehicle owners, because unless people give information voluntarily, we will not be able to get relevant data. There are so many issues; some may be worried about giving information, because it might be related to their income tax return. So, we have to inform the vehicles owners that this information will be treated as confidential information, will not be revealed to any other organisation authority, and the planning bodies are empowered to give this assurance. And then we should have some communication medium to talk to the vehicle owners, and tell them about the importance of this information. We must tell them that they are helping as to help themselves later, after the entire transport system network is improved. They can drive their vehicles faster, and they can save lot of energy, as well as they can make the distribution process more efficient.

The best approach is to talk to the association office bearers. All these vehicle operators will have their own association, and involved the regional transport officer as well as other government officials, but give more importance to the members of the association of the vehicle operators. Talk to them, be friend to them, tell them that it is for their good this kind of information is collected, and nominate representatives among themselves to collect this kind of information, and after collecting information also you must discuss with them, if they have any queries, and they feel that if some information given is not reliable and so on. So, in that process it should be possible for us to get accurate

information about movement of commercial vehicles, in the study area, even though the format appears to be very simple. Getting accurate information is not that easy, but if you have approach, it is possible to get such information.

And please note that, we are not asking the detail information about goods, just we simply ask type of goods carried, whatever information is, may be vegetables and fruits or some other commodity, grocery items things like that, that is our interest. We do not want to have accurate information about these aspects, surveyors should understand these things very carefully, and we should not insist on very accurate information on certain things, after all our interest is to track the movement of these vehicles.

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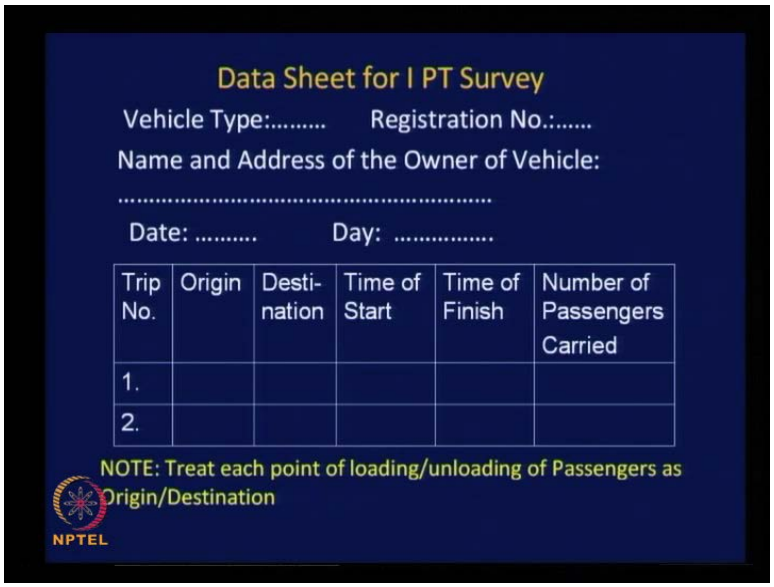

Then, survey of IPT vehicles; Intermediate Public Transport vehicles; namely car, taxies, auto rickshaws, as well as cycle rickshaws under our conditions; If a city has cycle rickshaw service that also comes under IPT service. The format is same as we have followed for commercial vehicle survey as we could see here; type of vehicle, registration number, name and address of the owner of the vehicle, day, date, trip number, origin, destination, time of start, time of finish, number of passengers is carried, because it is IPT, they are not carrying goods.

The similar procedure can be adopted in this case also for collection of data. Get the addresses and ownership information from RTO's office, and then talk to the association people to convince them about the importance of your exercise, and get the data,

required data in the format, and also the foot note is very important in this case. Treat each point of loading unloading of passengers as origin destination. An auto rickshaw may stop at different points, load people, unload people; we have to request the auto rickshaw driver to treat each loading unloading point as origins and destinations, so that we get complete information about the passenger's movement as well as the vehicle movement simultaneously.

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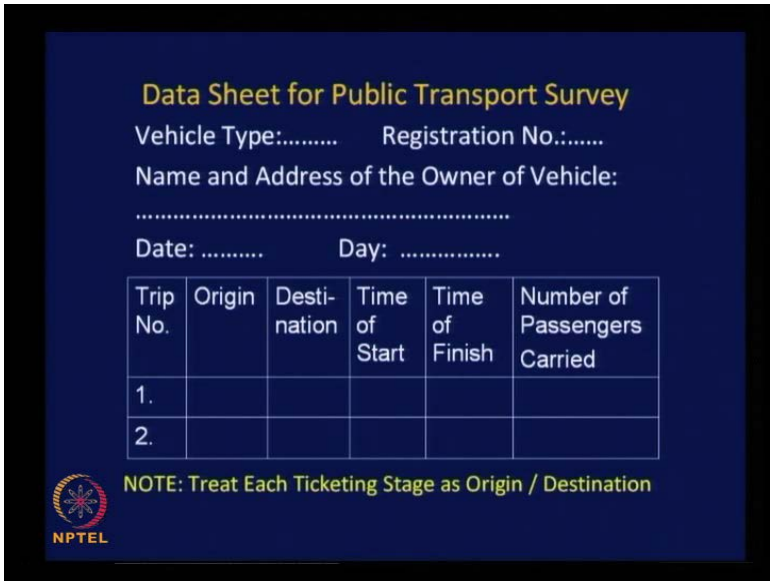

Then, information on public transport survey, most of the cities have only two modes of transport; namely bus and train, and train service is available only limited number of cities like Chennai, Mumbai, Calcutta and Delhi as of now, some more cities are going to get this survey shortly. And the information to be collected is similar to the previous case of IPT, and we have to request them to treat each ticketing stage as origin, destination in this particular case, what do you understand by ticketing stage. I think some of you would have noticed the bus conductors making some entries in a folded sheet, that sheet is called trip sheet. Trip sheet is nothing, but a matrix. If there are 14 stages between an origin and destination, then there will be a 14 matrix in that sheet, and conductors will be making entries of number of passengers travelling from stage 1 to stage 3, 1 to 5, 1 to 8, 1 to 14 and so on, that is what they do. After selling of tickets, they will have the total number, they will look at the serial number or now things are getting changed, they do everything electronically, so these entries will be automatic, so that is how they make entries. So, it is possible to get this kind of information from public transport operators,

for movement of passengers from one stage to another stage, total number. You can get very accurate information, because it is recorded and it is very much related to the financial aspects, fair box revenue.

So, there cannot be much of error in this thing, so your data can be believed to be accurate. Of course if you have systems of issuing pass, such information has to be collected separately and then put into this general pool of passenger movement. In our country, in several states free pass is issued to students and in such cases, there will not be entry corresponding to free pass cases in your trip sheet, because trip sheet is prepared based on tickets issued, and pass holders will show just their pass and get something ticked or punched. So you must get information about travel of pass holders using this transit vehicle separately and then pool them together. Otherwise the information to be collected is same, and you need not have to struggle much as in the case of IPT or commercial vehicle survey, because there will be a limited number of public transit operators. You can straight away approach the operators and get the information from one central location.

And this is what we have done so far, we have completed discussion on four different types of surveys; starting from home interview, commercial vehicle survey, intermediate public transport survey, and public transport survey. And let us see, how to go about doing road side interview survey, I think all of you understand the purpose of conducting road side interview survey, and where do we conduct the road side interview survey. Road side interview surveys are conducted at the point of intersection of the radiating roads and the cordon line. This is mainly to capture the external to external, external to internal and internal to external trips. That’s the purpose of this road side survey or cordon line survey, and as I indicated here there will be interview of the drivers at the road side. Let us see how to go about doing this survey. This will also be done for twenty four hours period, one complete day; one full day.

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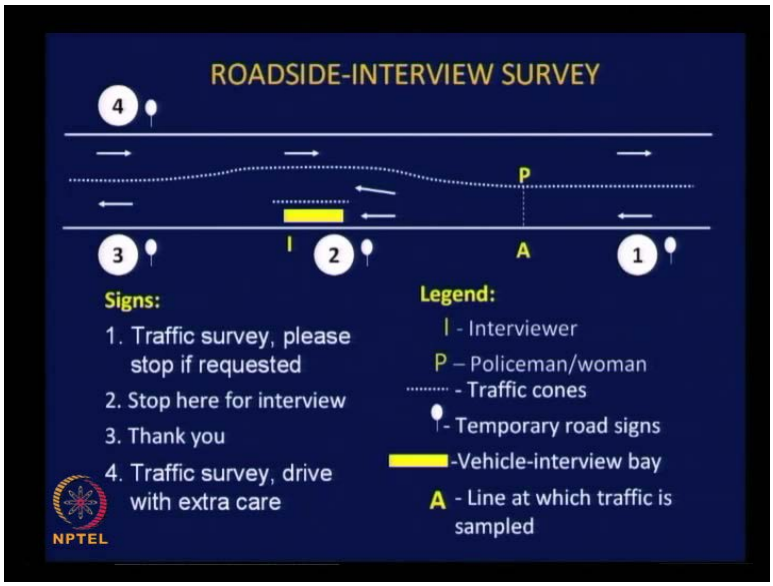

This is the layout of roadside interview station. I have shown a stretch of road with two way traffic movement, and the details shown pertain to roadside interviews survey for one direction of traffic, not both the directions, survey details pertain to only one direction of movement, and if you look at the signs installed at the location; sign number one, here informs the drivers with this message traffic survey, please stop is requested. So that will be informed or that information will be provided well in advance, of the actual survey location. Then, signage two, stop here for interview, somewhere here. Sign three, thank you, because they spent some time to give information we have to thank them, thank you. And signage four, on the other side is for the opposing stream of traffic, because you are creating a bottle neck here, reducing the payment width. So, you have to inform them that traffic survey drive with extra care.

These are all the important mandatory signage's that will be provided in survey location, and then I stand for interviewer. The interviewing person will be locating himself or herself at this point. Then p police man or women, I do not want to be gender biased, so it could be either policeman or police women, here at the centre of the road. And then the dots indicate traffic cones, because it is only temporary traffic arrangement you can use traffic cones, and create space for conducting your survey, and of course there are temporary road signs, and this is the vehicle interview bay, where you are actually stopping the vehicle for interviewing the driver. And, A line at which traffic is sampled, why sampling the traffic. You can see two arrows here. If, you are choosing a vehicle for

interview you are just pushing the vehicle this way. If, you are not choosing a vehicle for interview that vehicle can be allowed to go straight without stopping. If, the traffic is moderate, and if you feel that you can stop all the vehicles and get the required information without causing undue delay to traffic, then you need not have to do sampling you can stop all the vehicles for interview and allow the vehicles, but on major roads, if you stop each and every vehicle it will create the sever traffic conjunction. It might extend to kilometres, it will be extremely difficult.

You would have seen the kind of toll collection booths that are provided on national highways in our country. There will be at least six booths for an approach of two lanes. So, we provide three booths for each traffic lane generally, and if you want to do that way on urban roads it never be possible, and that too only temporary work. So that is how we need to be very careful and be practical. One full proof method of sampling is doing 50 percent sampling, by stopping vehicles with registration numbers with last digit as odd number or even number. Look for vehicles with the last digit of the registration number as odd number and stop all those vehicles with the ending number as odd number, so that you do automatically 50 percent sampling, or fix even number stop all the vehicles with the last number being even number. So, that way you will automatically be doing 50 present sampling. That is how in most cases the planners manage to sample the traffic wherever possible. And, this is a very detailed exercise in the systematic approach has to be there, to conduct the whole of the survey, and what kind of information is collected in this survey.

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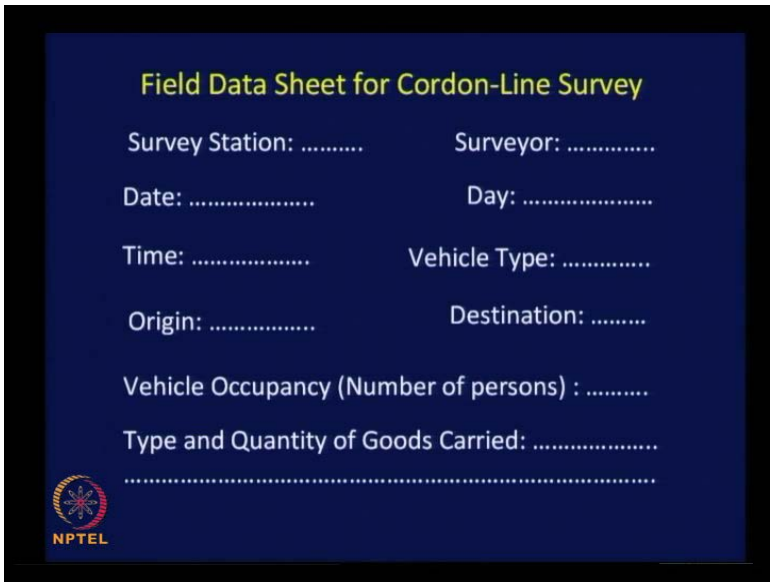

This is the survey data form, survey station, surveyor, date, day, time at which your surveying, vehicle type, origin, destination, vehicle occupancy number of persons and type and quantity of goods carried. I have put both passenger information as well as goods information, and passenger information can be entered even for goods vehicles, number of crew members in the vehicle can be entered, so that we get some additional information. How many fellows are actually travelling. It's quite common in our country that goods vehicles are used partially as passenger transportation, number of people travelling in trucks. So, making entries on both this aspect will be very useful, and please note that the surveyor can enter the details in all the 6 aspects, the first 6 aspects, before the vehicle comes to a stop position, to save time and the information to be filled after stopping the vehicle are only these things; origin, destination, vehicle occupancy and type and quantity of goods carried, quantity means you should not insist on the driver to give information about how many kilograms of goods driver is carrying. You can simply ask give two three options, empty. So, quarter full, half full, three fourth full or completely full, that is good enough for our purpose.

So, we must have some strategy and try to get as accurate information as possible. In this case we are stopping the vehicles for getting the information, but it may or may not be possible at all the surveys stations. So, if you want to reduce or the stoppage duration of the vehicles, you can fill up the same thing in a kind of a post card and request the driver

to provide the information, that is what we are going to see in the next type of survey post card questionnaire survey.

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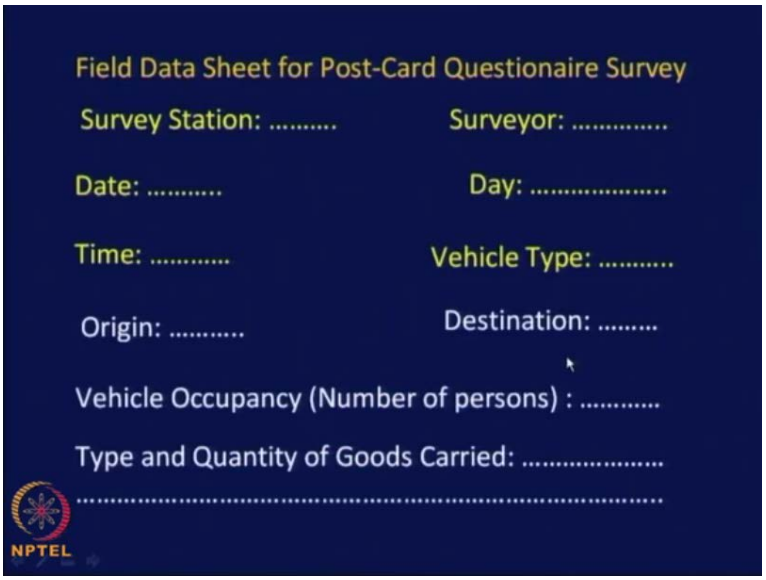

In this survey, this is the kind of information we will be asking for same as we have done in the case of roadside interview survey, and the surveyor will fill up the information pertaining to the yellow coloured things. This information will be filled up by the surveyor himself or herself at the station. Then, the filled form or the post card with replay stamp affixed will be handed over to the driver with the request to fill up the rest of the information and post it as early as possible. So, that the stoppage of vehicle is almost minimised, may me few seconds of time is sufficient just to hand over the card and request the person to fill up the details and post it back.

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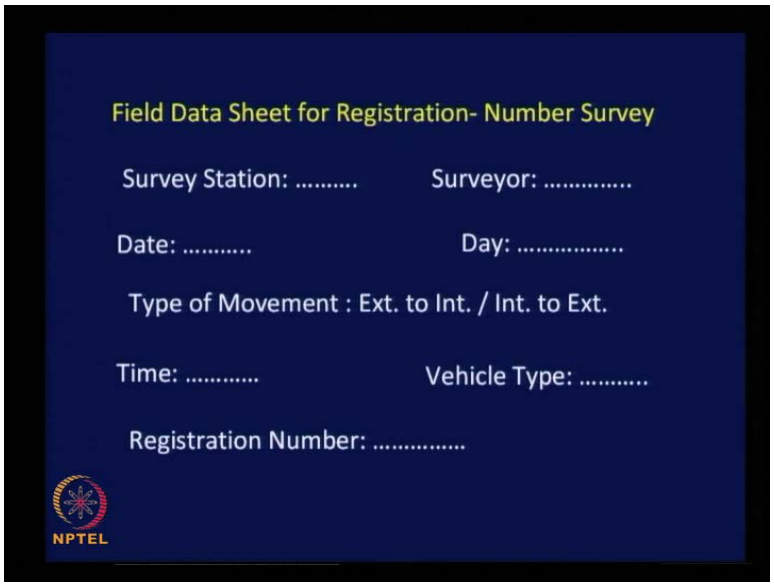

And suppose, you do not want to stop the vehicles at all, there is the situation where you will not be able to stop any vehicle for some reason. Then try to have some compromise still have a count of all the vehicles, crossing your station. So, you can note down the registration number of the vehicle, type of vehicle and direction of movement, that information you can note down, and then try to do something to get the kind of information that you are looking for. So, the information to be recorded here in survey station, surveyor, date, day, type of movement, external to internal, internal to external. These are the 2 possibilities at any survey station at the cordon line. It could be going out or coming in, and then time at which you are observing the vehicle, vehicle type also you can note down, registration number. If, the vehicles are moving very fast, may be you can create some mechanism to slow down the traffic, may be some temporary speed breakers, or use of police men to slow down the movement of vehicles in such a way that you are able to clearly note down the registration number. So, once you do this exercise based on this data, how will you get the three different types of movement that we are looking for; internal external, external internal, external external, any suggestion.

So, this exercise will be done at all the survey stations simultaneously in your study area. You may have twenty, thirty or even more that hundred survey stations, major roads, crossing were cordon line. Conduct this exercise at the same time for 24 hours period simultaneously at all the stations. Some vehicles would have been observed at two stations, where it has might have entered somewhere and then run out to some other

station, or a vehicle might have entered, done some work inside the study area and come back through the same station, that is also possible, go out.

So, all this possibilities are there, and you can do a kind of matching of the registration numbers of vehicles, with that you will be able to fix the timing as well as station at which a vehicle is passing. It is possible, we are recording the timing as well as station number, because station identity is always there, surveyor name, survey station information is there, station information is normally station number. So, once you have the station number, time of crossing and vehicle type and the registration number. If, you try to match the registration numbers, it is possible to track the complete movement of the vehicle, whether it is going to be external external or external internal. External internal, means the vehicle would have crossed only once into your survey area and stayed there. Then it is clearly external internal.

And there could be movement away from your study area, and the vehicle would not have returned, then it is internal external movement. And if it is entering through one station and exiting through another station it is external to external. And if the same vehicle is observed through the same station, going in and going out, then 2 movements; external internal, then internal external. So, all these things can be easily studied by matching the registration number with the computer programmes available. It is easy for you to do this kind of matching business, just type out the codes of the survey stations and registration number of vehicles and time of crossing and type of vehicle; you will be able to clearly get the movement pattern of these vehicles, that is possible.

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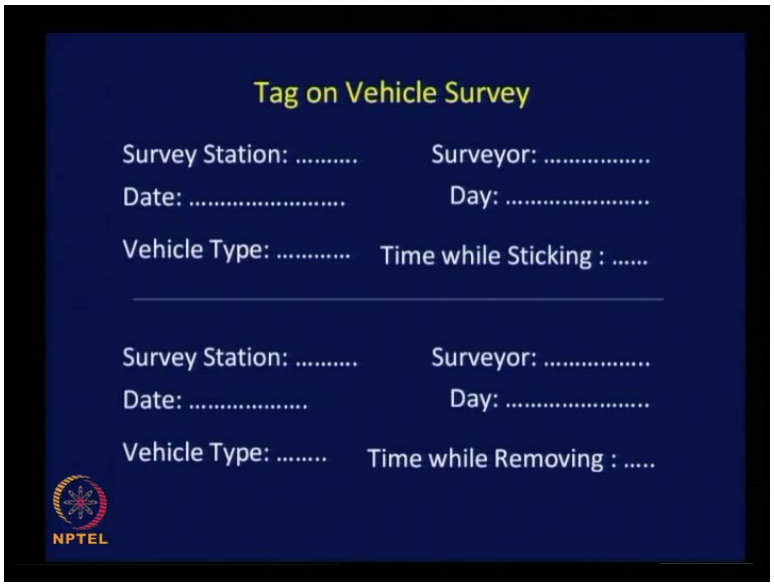

Then tag on vehicle survey, this is similar to registration number survey, but you will be able to capture the movement immediately on completion of your survey. Let us say you are preparing a tag with this information. Tag is nothing, but a sticker kind of small label. You are making entries about survey station code, surveyor, date, day, vehicle type, time while sticking the tag normally on one corner of the wind screen of the vehicle. So, you are requesting the driver to almost slow down to enable you to stick a tag on to vehicle and then allow the vehicle to pass.

Let us say a tag is a stuck onto wind screen of a particular vehicle, and it is never collected later, that means the vehicle has gone into a study area and may be parked somewhere for the whole day. And let us say at a survey station a person is seeing a vehicle with a sticker already in, stuck on the wind screen. Then that sticker has to be collected, tag has to be collected, and the following entry has to be made; survey station code again, surveyor, date, day, vehicle type and time while removing. Make this entry also; in the same sticker you have both the information.

You have a record of the movement of the vehicle, once you collect your sticker, and if stickers are not collected probably, either they are internal to external or external to internal movement. And these stickers while you're making entries there will be a back copy. You can always have a record of the vehicles, which are following a particular type of movement. So, this is another way of collecting information about regular

movement at the cordon lines. And please note regarding registration number survey, now with the availability of video cameras. Another possibility is install video camera and capture the traffic flow, in such a way that the registration numbers are clearly captured, that is possible. Then you can just play your video recording at the desired speed, and casually I mean the visually note down the registration numbers, record the registration numbers, that is also possible you can do the whole thing, whole recording business in your laboratory. There, is no need to worry about recording in the field that is also possible. With video technology now available for this purposes registration numbers survey need not be done manually, you can just capture the traffic flow and record the information later.

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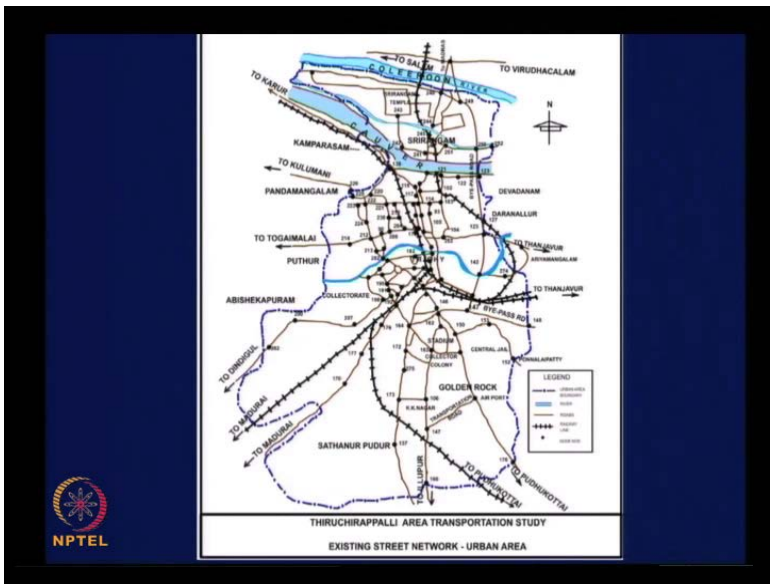

This is just to give you information about the city, about which we are familiar Tirchirappalli city. This is a coded road network of Tirchirappalli city. It is nothing different from what we have discussed. I told you that all the road intersections will be considered as nodal points and the stretch of road between intersections will be links. One interesting aspect that you could see here is, there are no cross roads, but still we find some road numbers, along these roads. In this particular city there were number of minor street crossings, across major roads. Those minor roads are not really included in the general road network for the purpose of analysis, because of those cris crossing roads, there were significant change in the traffic volume and composition on the stretch of the road. So, these nodal points were fixed based on the level of variation in the traffic

volume and composition. You would have had number of cross roads in between, those things are not considered. Whenever you have distinct change in the traffic volume and composition, those points were marked and those were taken as a nodal point that is how the links and nodes were finalized for this particular city.

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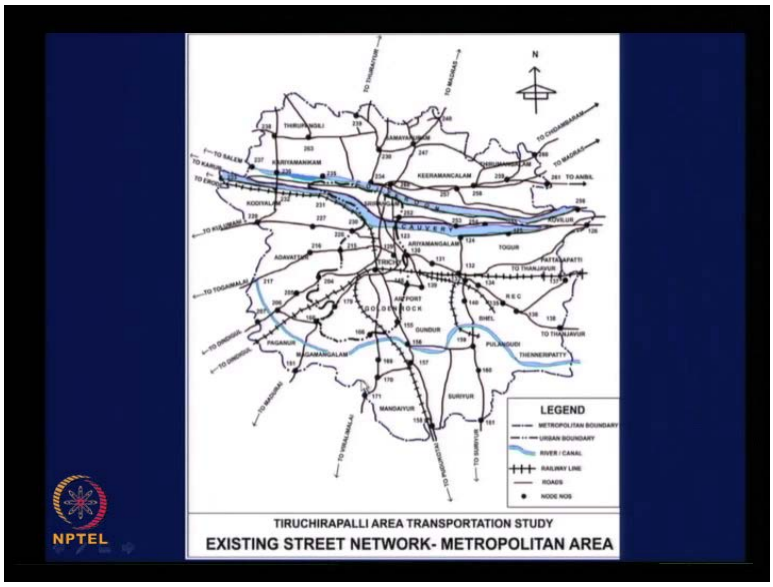

This is for the urban area bounded by the municipal boundary and for the whole of the planning areas similar exercise was done. This is just existing straight network considered for the purpose of planning, and this information is more relevant to what we have been discussing now. This line, municipal boundary is the inner cordon line or internal cordon line, and they conducted cordon line surveys along this boundary also on the roads that are crossing the cordon line. Look at the location of the cordon line stations. They are not exactly at the point of intersection of the cordon line and the radiating road. For example if you want to do ideally the cordon line survey for this road, the survey station should be somewhere here, but they had the station here. You can afford to do such changes provided; there is no major change in traffic flow as well as composition in the rest of the stretch.

If this location is more conducive, suitable for your survey, you can choose such a location. And this is what we need to understand about the practical difficulties, for example this is the Srirangam urban area, it is practically an island between two rivers and look at the survey stations. They are located outside your urban area, this is the

urban area boundary, but the cordon line survey stations are located outside, normally it should be inside or at the point of crossing, it is mainly to take care of. The three major streams of traffic going out of this urban area to three different cities. So, that was possible only when they do the survey at this point. The whole of the traffic is crossing this river, because there is only limited crossing point and then diverge into different directions, and it is very important to capture the traffic in different directions. So, that is how you can see three dots here, three survey stations located outside your urban area boundary. So, these are all the practical issues that are to be tackled, that is where you need to have a complete understanding of the urban area, the traffic pattern, socio economic characteristics and so on.

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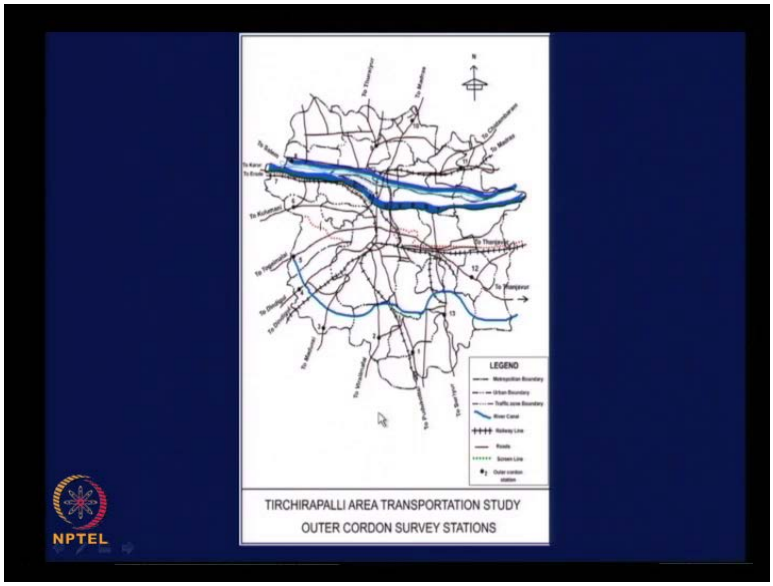

This is about the survey stations for the external cordon. You can see the dots or number, these are all survey station numbers, and here also based on the practical convenience, you can fix the survey station here for example, as a common station for these two radiating roads. See, there are two radiating roads if we have to fix 2 stations, you have to have 2 survey teams, spend lot of money and things like that, and for your planning purpose, if you feel that the traffic flow at this location, is good enough to provide the required information. There is no need to have 2 stations and you can economize on your survey work and have a single station here. Like that, some stations are at the exactly at the point of intersections, some stations are little away, based on the convenience of the

contact of survey and the space requirement so on clear. So, this is about the survey stations as fixed for Tirchirappalli city.

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And as you may recall, we talked about preparation of different inventories, when we started our discussion on transportation services. So, we need to have inventory of transport facilities also to complete the data collection process. So, the inventory of the existing transport facilities should be undertaken to identify the deficiencies in the present system, and the extent to which they need to be improved. The inventory of transport facilities consists of the following; inventory of streets forming the transport network, streets here means actually the roads, the English terminology for urban roads is streets, it is not the streets as we understand under Indian conditions, it means actual roads, what do you understand by inventory of streets forming the transport network, what kind of the information you will be collecting with regard to streets. Any way before collecting the information we should have divided the entire network into nodes and links.

We know what are the roads, which are going to be considered ultimately for your planning purpose, route assignment purpose that should be fixed first. So, you will know completely the nodes and links related to your analysis that is known to you. So your interest is only with regard to these nodes and links, and when you think of a street network, it involves both the links as well as nodes. What kind of information you will

collect with regard to links; length of the link, width of the link, number of traffic lanes available that is what is meant by width of the link. Any other information, whether you provide for (( )) parking on that link or not. So, many other information can be collected, and if you look at nodes the complete geometry of the intersection, number of lakes and traffic restriction on the intersection one way and movements and things like that. This is what we mean by inventory of street forming the transport network.

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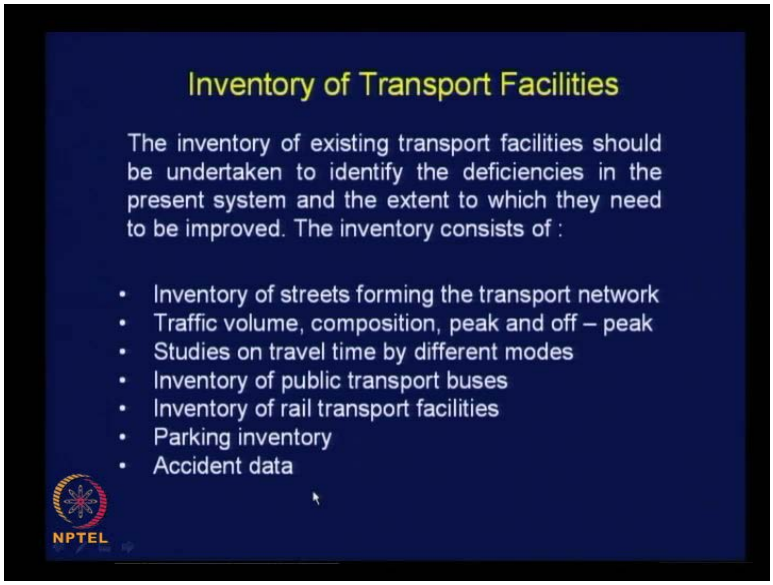

Then traffic volume, composition, peak and off peak, how to get this information and were to collect this information. I would say you have to collect this information at all the nodal points. Once you do this, you will automatically get the information related to your links. Node is an intersection with different legs or arms, these legs are nothing, but links. So, once you collect information about traffic volume and composition at all the nodal points, at all the intersections, you will automatically get information about the traffic volume and composition for your links. So, traffic volume and composition information has to be collected at all the nodal points, both for morning peak, evening peak as well as half peak hours.

Then studies on travel time by different modes very important, you have to actually observe the travel time on all the links, and the time required for crossing each of the nodes or intersection delays, also are to be collected. Inventory of public transport facilities means, the flit size, number of vehicles used, schedule of operation, routes of

operation, fair structure and efficiency of operation, management system, whatever is relevant for our purpose we have to collect from public transport operators.

And similarly, inventory of rail transport facilities, another mode of transport. Parking inventory, very important both on street as well as off street parking facilities, complete information about a capacity, average duration of parking, parking demand, all this information have to be collected with regard to parking. So, this is what we mean really by inventory of transport facilities, and of course this is only optional accident data. It is not really inventory; it is related information. Normally planners use to collect these informations, so that it provides additional input with regard to traffic condition on various links and nodes.

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Then inventory of land use in economic activities, as you know since travel characteristics are closely related to the land use pattern, it is of at most important that an accurate inventory of land use be prepared, how to prepare the inventory of land use. Obviously you have to prepare this inventory zone wise, for each traffic zone, having known the type of land use, get the information about the intensity of land use, that is it. Get information about land use and its intensity for each of the traffic zones. Data on intensity of usage of land for different purposes; such as residential, industrial, commercial, recreational, open space etcetera in each of the traffic zones are to be collected from concerned departments organisations, that is very important.

Please note that each and every building in an urban area would have got approval from some authority before construction; that means the complete record of every structure in the urban area is available somewhere, in some department. And please note all these buildings will be given power connection, by electricity board that means they have all the information about the activities here, and commercial tax department will be collecting tax from all this establishments if they are commercial institutions. So it is a question of identifying the right source and getting information about different activities in each of the traffic zones, with regard to the type of land use and its intensity.

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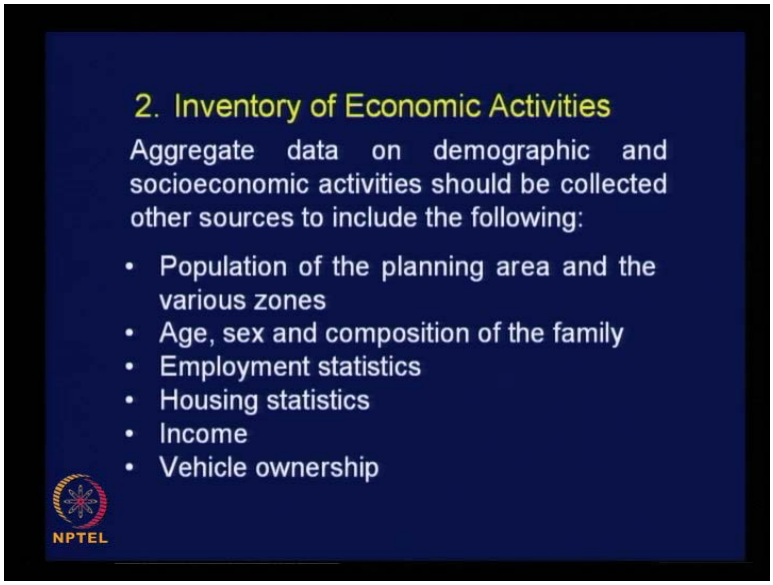

Then inventory of economic activities, its only to cross check your home into data, so it is better or it is enough if you get some aggregate data on socio economic as well as demographic aspects related to the urban area. The information to be collected are with regard to population of the planning area, and the various zones for the whole area as well as zone wise information; age, sex, composition of the family. You may recollect the same information is collected through home inter survey; this is just for cross checking.

Employment statistics, you may wonder why cross checking, we are actually collecting data ourselves and so on. You see you are doing sampling and then you're going to extrapolate or just expand your data base to cover the whole of the urban area.

Within a zone you would have collect the data from hundred households then you will assume that rest of the households which may workout to nine hundred to have similar characteristics. So, in such a case the possible errors in expansion can be identified using this as the secondary source of information, housing statistics, income statistics at the aggregate level, vehicle ownership and so on.

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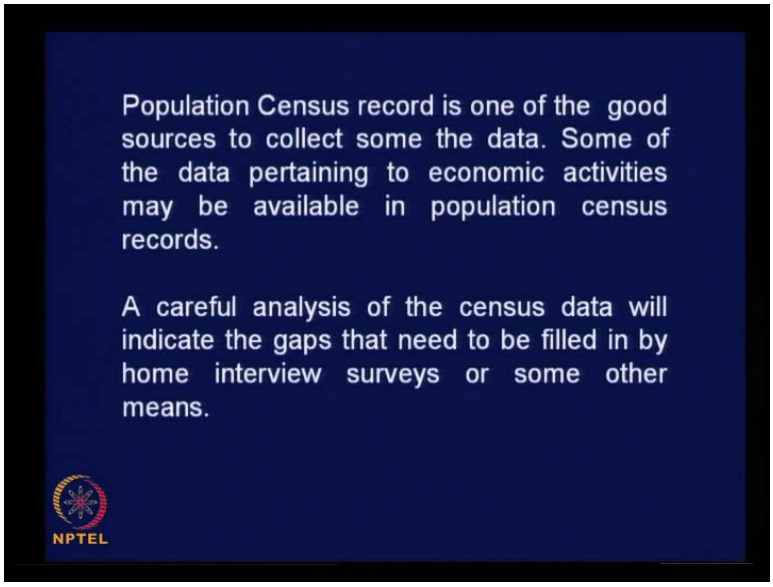

One important source to get this information is population census record, one of the good sources to collect some of the data, some of the data pertaining to economic activities, may be available in population census records. Please remember population censes record apart from demography information, provides good amount of data related to economic background of individuals as well as families. So, that can be made use of to cross check your information. A careful analysis of the census data will indicate the gaps, that need to be filled, filled in by the home interview surveys or some other means. This implies what; you must collect this data before you go in for home interview survey. So, that you know what is available at the aggregate level. If, something is missing that aspect can be given more importance in your home interview survey.

And to summarize what we have seen today, we started our discussion on two aspects of home interview survey; namely the type of information to be collected, with regard to the basic socio economic characteristics of household, and then the trip information of household members. Then we discussed about the different types of surveys starting

from the commercial vehicle survey, IPT survey, public transport survey, and different other cordon line survey starting from road side interview surveys, registration number survey, tag on vehicle survey and so on, and then finally, discussed about the methodologies available for collection of aggregate information on socio economic characteristics for the whole of the urban area as well as for each of the traffic zones.

So, this completes our discussion on transportation surveys. In, the next class we will start our discussion on another topic related to prediction of future land use in urban areas.