Urban Transportation Planning
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Lecture No. # 38
Urban Structure Contd.

This is lecture thirty-eight on urban transportation planning. We will continue our discussion on urban structure in this class. You may recall we discussed, basically about the urban activity hierarchy and urban highway hierarchy in the previous class. There are hierarchies fixed from the, starting from community centre, district centre, regional centre, etcetera in respect of urban activities and in respect of urban transportation system with specific reference to road network.

We know now, now, that we have classified the roads into four categories, starting from expressways or freeways, arterials, collector streets and local streets and with this background information we are going to study and understand the three different types of urban structures that I just showed you in the previous class.

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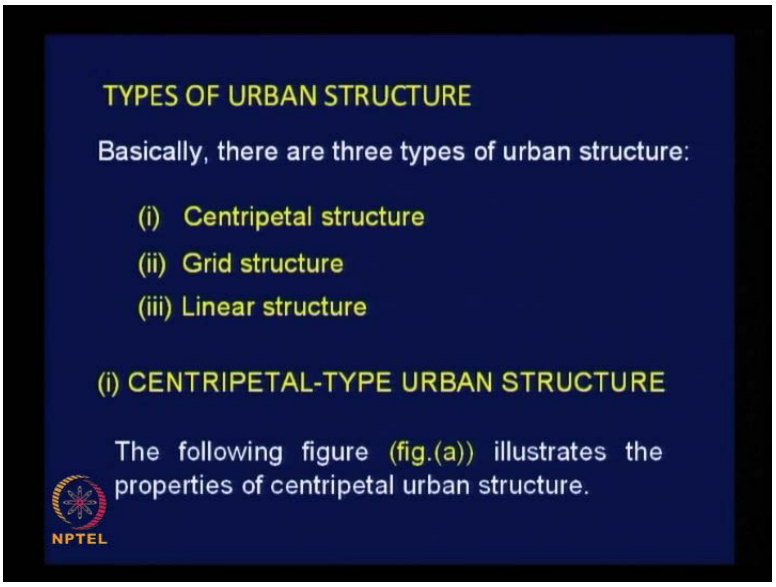

The three types of urban structure are: number one, centripetal structure; grid structure and then linear structure. We will first discuss about centripetal type of urban structure, centripetal type urban structure, right. Of course, we can study the structural features with the aid of a sketch.

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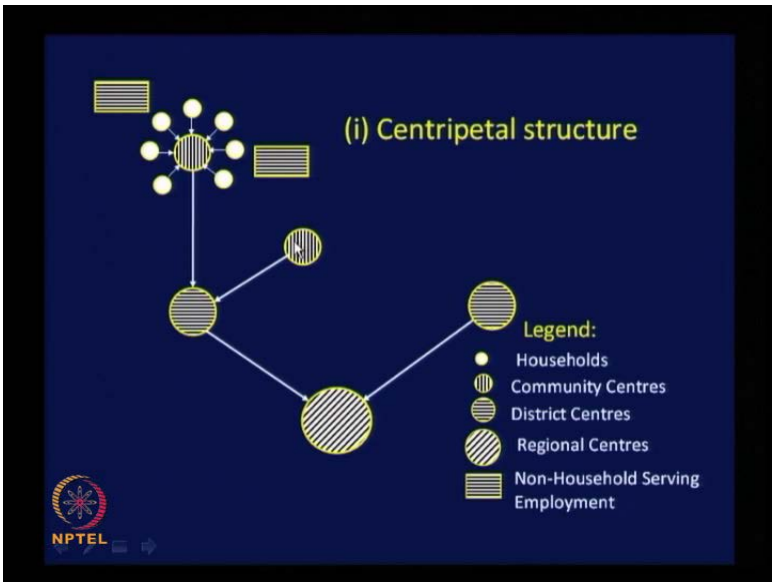

This is the centripetal type of urban structure and legend shows you the details of various activity centres, including the households. You can see households are shown as a cluster around a community centre.

This is just to illustrate the concept that households immediately focus on community centre for their day-to-day activity needs, right; that is how this has to be understood. Then, you can see several community centres, one here, another here; these community centres and there could be several more around the other paths. These are focusing on this circle, which is nothing, but district centre. So, several community centres are focusing on district centre. This implies that all the households around the community centres are indirectly focused towards district centre through the community centre, is not it, that is, implication. Then, these are district centres; several district centres focus on the regional centre. So, there is a strict hierarchy maintained, clear.

And to have an idea about the location of non-household serving employment, the location of these facilities is indicated here. They are outside the hierarchy of connection between the activity centres, they are independent of this hierarchy, so that there is direct access from household to this non-household serving employment centres, clear.

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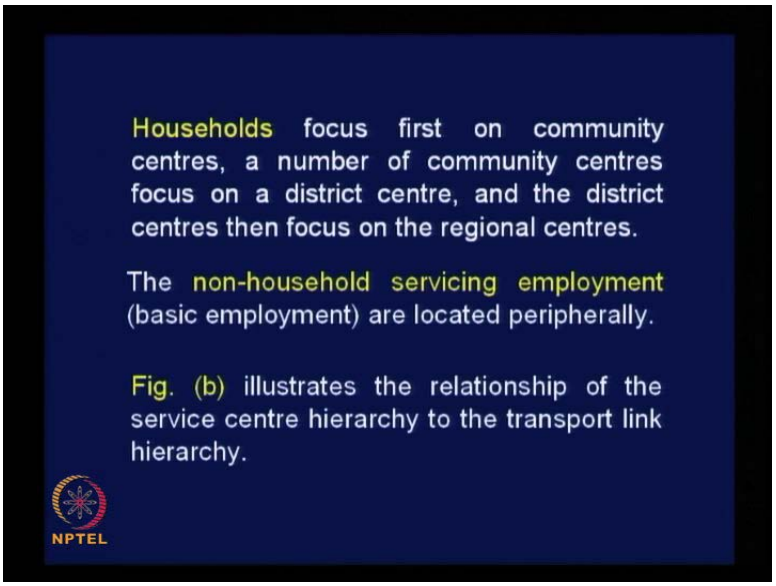

Let us list the same information in a systematic way. Here, households focus first on community centres, a number of community centres focus on a district centre, and the district centres then focus on regional centres, so that is to be understood very clearly as far as this particular structure is concerned. Then, the non household serving employment are basic employment are located peripherally with facility for direct access from households.

And how do we fit the transport system hierarchy with the community or the activity centre's hierarchy is the question. Unless you fit both this hierarchies, we will not be able to understand the benefit or disbenefit of a particular structure. So, we must see how these two hierarchies fit with one another.

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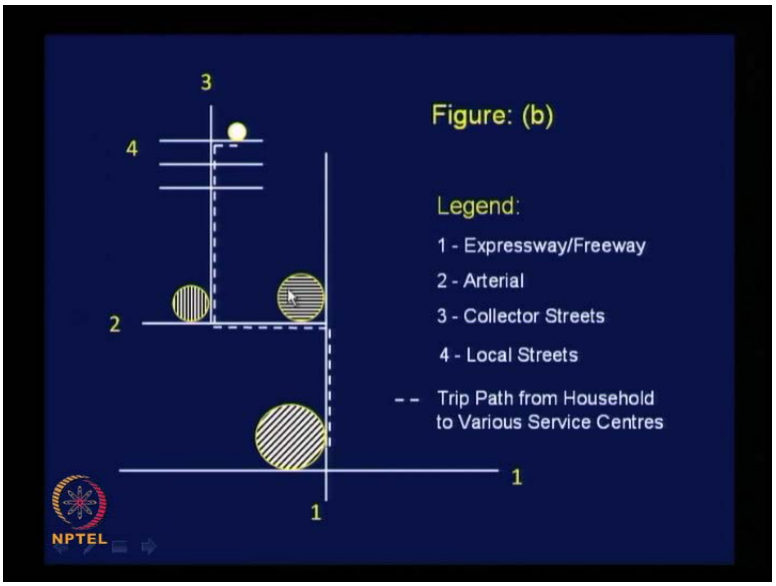

This is the fitness of transport system hierarchy with the activity centre hierarchy. You can see the four categories of roads indicated with their respective numbers. Of course, legends can be seen here, number 1 is nothing, but expressway; number 2, arterial; number 3, collector streets; number 4, local streets and the dotted line indicates trip part, from household to various service centres.

And you can see households are located along class 4 roads, which are local streets and the community centres are located at the intersection of class 2 and class 3 routes, namely collector streets and arterials.

District centres are located at the intersection of arterials and the expressways and regional centres are located at the intersection of the high speed facility, namely the expressways because people should be able to reach from far-off places to this particular location and trip part from household to these centres are shown by the dotted line. You can see, that a strict hierarchy of movement is followed; one should first come to the community centre and then go to district centre, then only they can reach out to the regional centre.

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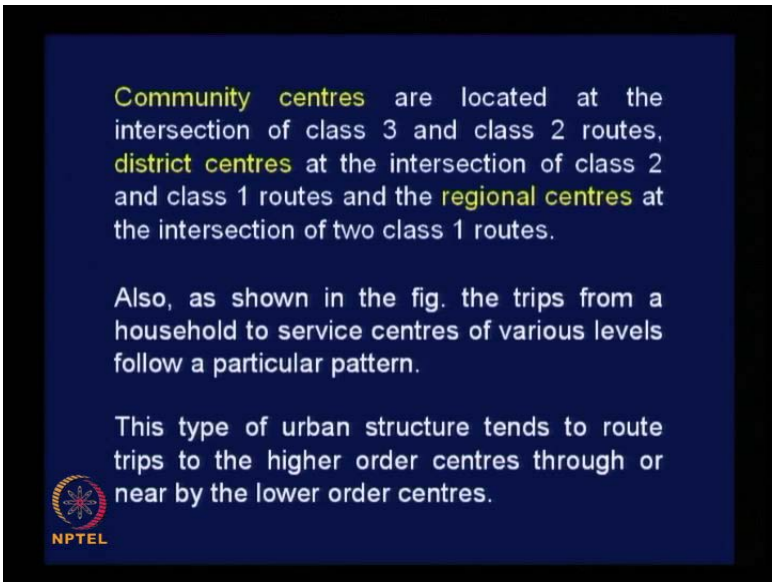

Let us just understand the same points in a systematic way. The community centres are located at the intersection of class 3 and class 2 routes; class 3 and class 2 routes. District centres at the intersection of class 2 and class 1 routes and the regional centres at the intersection of two class 1 routes, clear

The trip from the household to service centres of various levels follows a particular pattern. The pattern is very clear; as we saw, this type of urban structure tends to route trips to the higher order centres through or nearby the lower order centres, strict hierarchy is maintained, clear.

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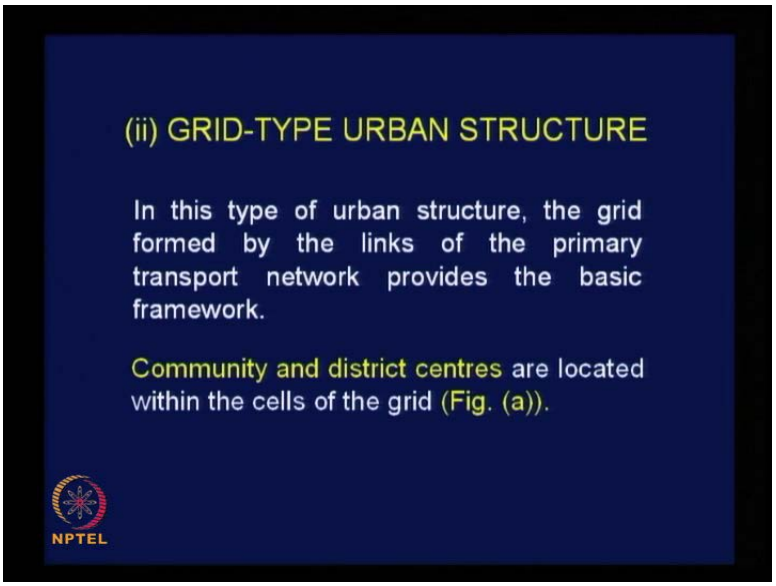

Then, the next type of urban structure namely, grid type of urban structure. As the name implies, the gird formed by the links of the primary transport network, links of the primary transport network, provides a basic frame work for the grid. You can understand the primary transport network as the links of type 1 category roads in our hierarchy, namely expressways, clear.

And of course, community district centres are located within the cells of the grid. Once you make a grid, will have a number of cells and within each cell you are locating two centres of the hierarchical level, namely community centres, as well as, district centres, both are inside each of the cells. Let us see how exactly these centres are located in the cells.

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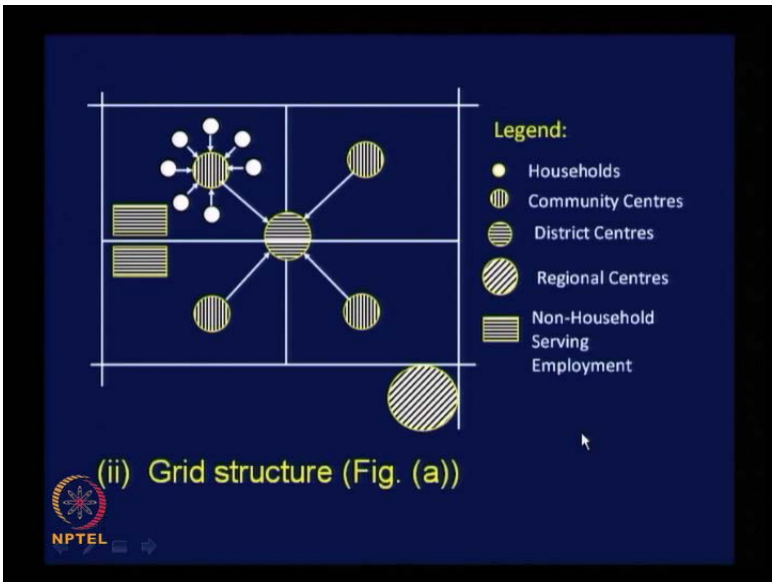

This is how they are located. First note, that this is a grid, this is the grid, and I have shown you just only one grid, right, there could be several grids in an urban area, just for understanding we have taken up only one grid. This is the primary road network link, links of a primary road network or class 1 road, clear. And the whole thing is a cell and within that there are subdivisions and you can see the district centre is located at the centre of the cell and the community centres are located at the centre of the sub-cells.

Once you divide the cell into smaller parts, you fix the community centres at the centroid of these smaller parts. And the non-household serving employment, as we have seen in the previous case, are located as close to the main arterial or expressway route as possible, but without any connection to the hierarchy of the service centres, clear. Of course, the legends are same, as we have seen earlier, nothing different from the, same legends are used here.

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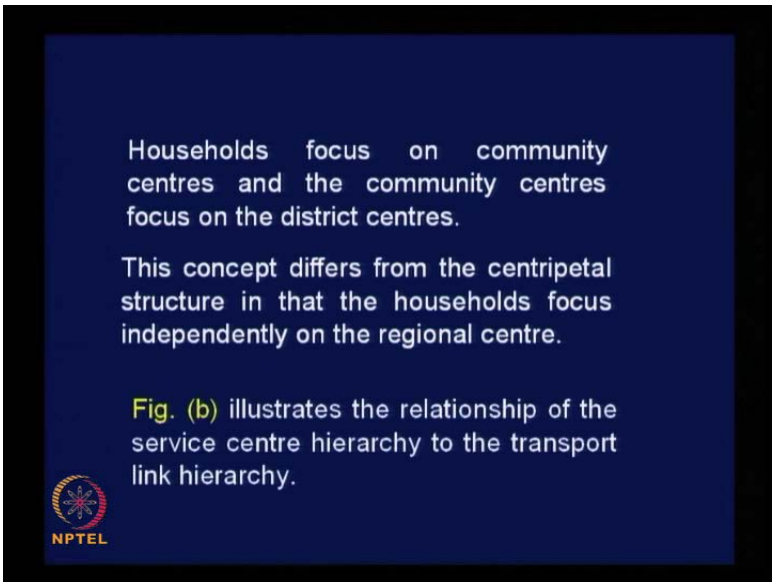

And let us summarize the same points in a systematic way. What is happening here is this, households focus on community centres and the community centres focus on district centres, is not it.

This concept differs from the centripetal structure, the previous structure. In that, the households focus independently on regional centres, one need not have to go through the hierarchy quickly; throughout the stretch there is a bifurcation at some stage facilitating direct reach to regional centres without passing through the district centre that is the difference between the previous one and this type of structure.

Of course, we can look at a figure, which shows the fitness of the road system hierarchy with the activity centres hierarchy.

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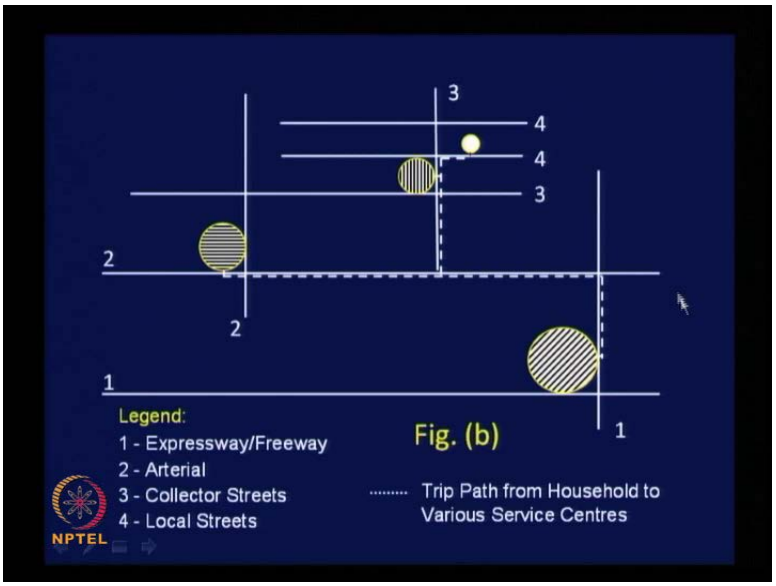

This is how the system works of course, the legends are the same, as we have seen earlier, number 1 expressway, number 2 arterial, number 3 collector streets, number 4 local streets and dotted line indicates a trip path from household to various service centres.

Where are the households located? As usual, they are located along class 4 category routes, class 4 roads. And you can see the community centres are located at the intersection of two class 3 roads, same class of roads, whereas in the previous case, we had two different classes intersecting and the centres are located at those intersections, whereas here, the same class of roads is intersecting and we are providing the centres at the point of intersection.

And the district centres are located at the intersection of class 2 roads here and regional centres are located at the intersection of two class 1 roads. If you look at the trip path from household to various centres, the trip path first goes to community centre and then to district centre, of course one has to go through the community centre to reach out the other hierarchical levels. After crossing the community centre, there is a possibility of bifurcation, one need not have to go through the district centre to reach out to regional centre, there is a direct route. That way, this will be little better than the previous case.

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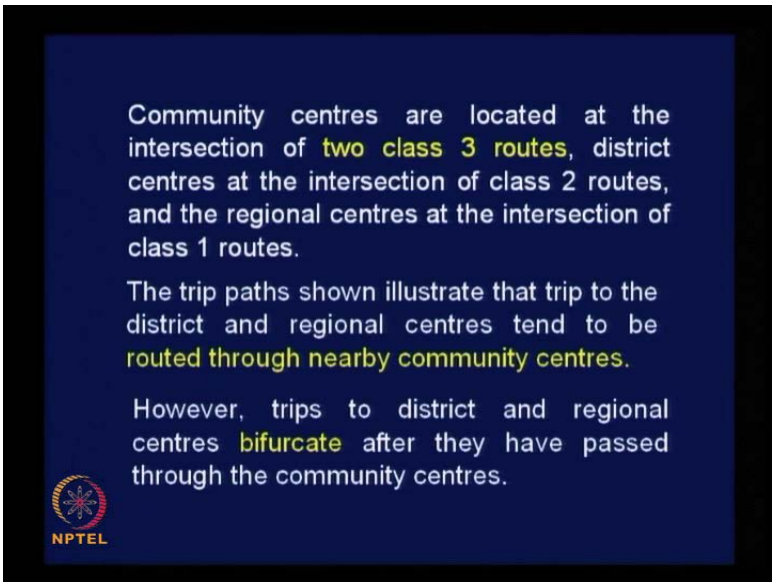

This is the summary; community centres are located at the intersection of two class 3 routes, district centres at the intersection of class 2 routes and the regional centres at the intersection of class 1 routes.

The trip paths to the district and regional centres tend to be routed through nearby community centres, obviously, whereas trip to district and regional centres bifurcate after they have passed through the community centres, clear. So, this the basic structural features of gird type of urban structure.

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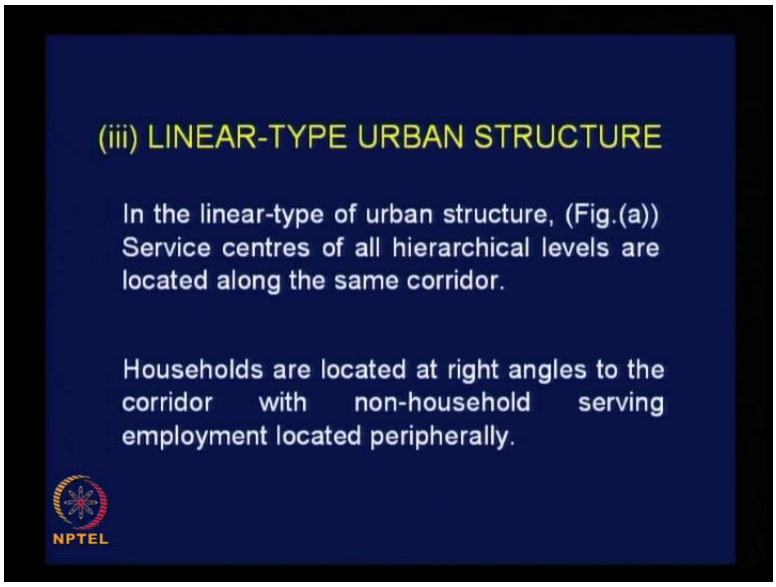

Then, the third category of urban structure namely, linear-type urban structure. In this type of course, as shown in figure, the service centres of all hierarchical levels are located along the same corridor because we have given a linear strip of land that is why, we are proposing this kind of urban structure. We cannot just have these service centres of hierarchies spread out; they have to be located along the same corridor.

Households are located at right angles to the corridor, little away on both sides with non-household serving employment located peripherally with direct access from household.

Let us look at the figure and try to understand the concept better.

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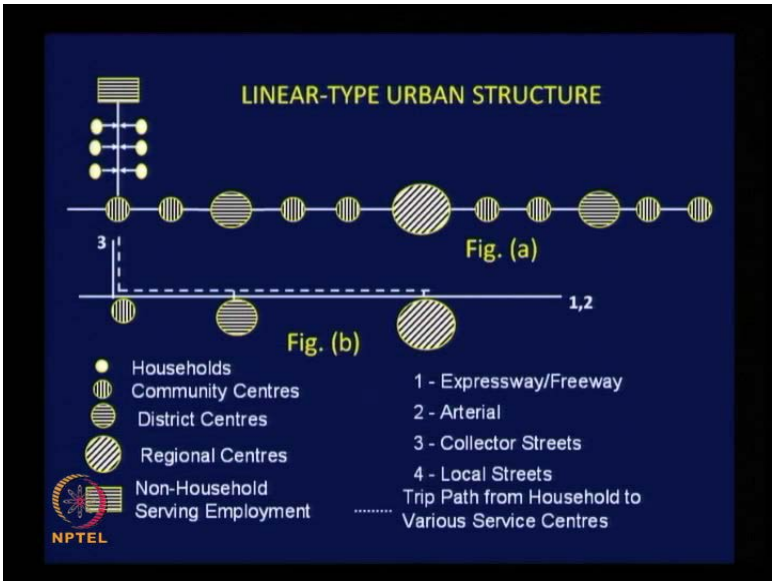

So, this is the linear type of urban structure. You can see all these activity centres of different hierarchical levels are fixed on the same traffic corridor, clear. Here, you have the regional centre and you have community centres, district centre, again community centres. And here you have community centres, district centre, community centres, households are located here and non-household serving employment centres are located separately with direct access from households.

Please understand, these are not exact layouts of urban structure, these are schematic diagrams illustrating the principle involved in location of activity centres and how do we access these activity centres? Through roads of different hierarchical levels, and the legends are same, as we have seen in the previous cases. And let us see the connection or

connectivity between the hierarchy of road system and these centres that is shown in figure b, this is the connectivity.

The dotted line indicates the trip path and one has to take this route from households to come to a community centre, then reach out to a district centre, then from district centre to a regional centre.

And please note, routes 1 and 2 or category 1 and 2 roads are shown on the same line, and 3 is shown here and 4, obviously it is not distinctly shown because wherever there is space, you will have the 4th category, otherwise households will be located here due to space constraints with direct access to category 3 roads, namely collector streets. There will be some narrow lanes and by-lanes connecting the adjoining households which lead the traffic to the connected streets, there may not be an exclusive system of category 4 roads in such cases, clear.

Now, how do we provide type 1 and type 2 roads along the same corridor because this is going to be a major traffic corridor, everybody will be moving only along this particular narrow stretch? How do we manage the traffic situation under this case, any suggestion? Providing type 1 and type 2 roads corridor means, you are going to provide a high speed facility as well as arterial type of road side-by-side on the same corridor, is it possible?

It should be made possible, right. If the space is very narrow just provide an elevated facility for, as an expressway above the ground and at the ground level you can have the arterial same corridor and great, separate the two facilities; that is one way. If there is some space available, then you can have the expressway at the middle and two arterials can be have on both sides of the expressway, right, all these things are going to be laid side-by-side. And if you are planning for a rail system, have that system also, either at the ground or above ground or underground, again on the same corridor.

So, that is how we can achieve provision of this kind of facilities on the same alignment, is the question of proper planning of the system, clear. And it is assumed, in these cases mostly people reach out to type 3 routes, even by walk or bicycle, not using motorized vehicles, most of the cases. And this is one type of structure, where there is a clear advantage of providing public transit system because it is easily accessible and the access to the corridor is not a problem, in, you can operate very efficient public transit systems in this type of urban structure; that is the advantage.

Disadvantage is, you will not be able to spread out and locate these centres. If hierarchical levels in a very convenient place, you have to put them along the traffic corridor. It is possible, you take Singapore, they have provided all these activity centres oriented towards the main MRTS, mass rapid transit system at every 3rd or 4th station. In the station building itself you will have a big shopping mall equivalent to a district centre that we are talking about. You can access any kind of service in those station areas and every station will have a small shopping mall equivalent to their community centre. So, transit stations and the activity centres are integrated, clear. There is no need to travel separately to access these services, these services are brought to your transport corridor and they are available at the railway station; that is what you want. And probably, you may have to divert from the transit road only to reach out the regional centre, which might be located in 1 or 2 central places, right. So, that is the advantage of providing a good mass transit system and integrating these centres along with the network of such systems.

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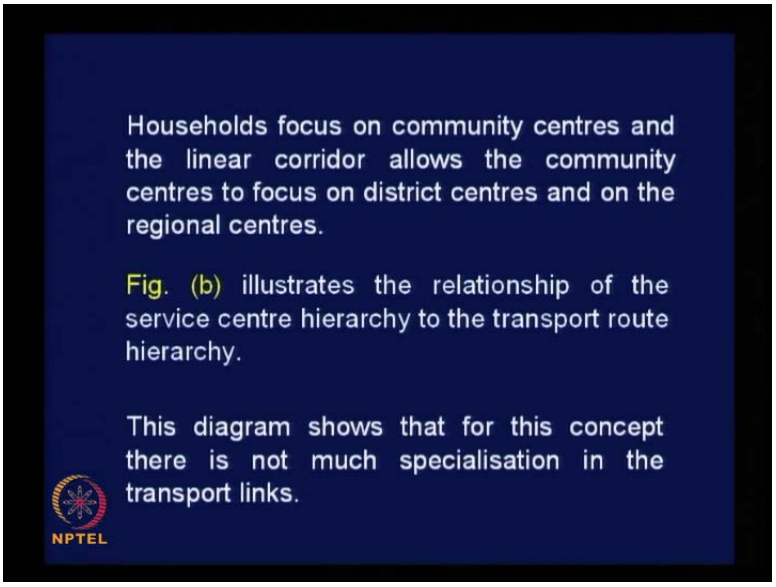

So, to summarize what we have discussed. Households focus on community centres here also and the linear corridor allows community centres to focus on district centres and on the regional centres on the same corridor.

Figure b, which we have already seen, illustrates the relationship between the two hierarchies and this figure shows that for this concept, there is no specialization in the

transport links. 1 and 2 are together and 3 alone is shown and 4 is not shown, that is what is meant by this particular statement.

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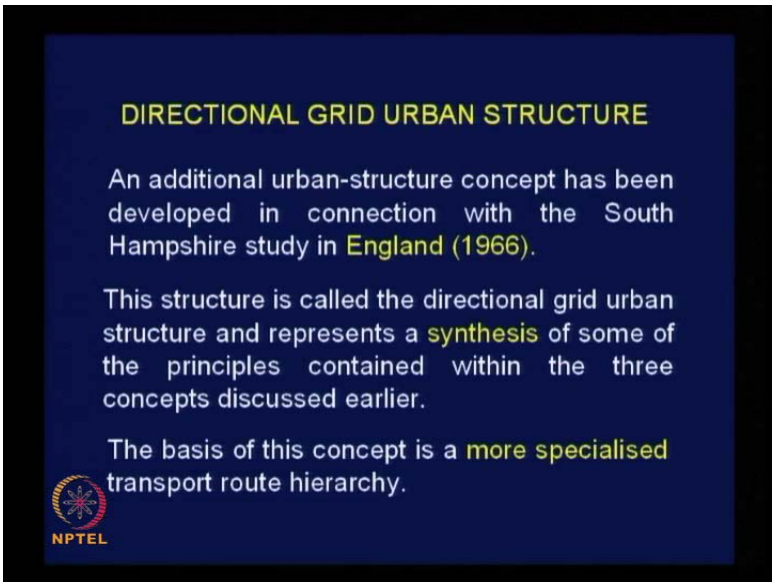

Another type of urban structure, namely directional grid urban-structure was also tried. Before we discuss about directional grid urban structure, let us try to find the answer for the questions, that we post to our self in the previous class.

I asked you one question, why not have a standard format of urban structure? Adopt the same pattern everywhere, why should we have these types of urban structure, different types? Do we have the answer now? How is the growth of urban areas controlled?

The most important controlling factor is the topography. So, the shape of urban areas is very much governed by the topography of that location. And another important factor is the growth of activities in an urban area is very much related to major economic activities of that area, particularly the basic industries. If there is a coastal town with all its economic activities related to fishing and waterway transportation, then that will be the focal point of most of the socio-economic activities and when the city grows, the city will grow keeping that as a centroid. If there is another urban area where mining is a major source of economic activity, you can see, the mine controls the developmental pattern of such cities. I hope you would have heard about these things. And if there is purely a kind of city with lot of religious shrines only, then the location of these shrines will govern the spread of the city, the growth of the city itself.

So, historic, socioeconomic and topographic features will fix the shape of development of urban areas, so we cannot standardize the shape and impose on every location, it is not possible. We must understand and appreciate the history of the development, topography of an area and then adopt any one of these basic urban structures. If we have an urban area at the foot of a hill range, along a sea coast, then the space available for development is the area between the water line of the sea coast and the foot of the hill, it is a narrow strip. There are areas like that, maybe some areas in Kerala and so on and we have to adopt a linear structure, or in certain cases, the urban area might have developed around the bank of a river, then again we end up with a linear structure.

And if the whole of the activities are entered towards one major socioeconomic centre, then we will end up with centripetal type of urban structure because everything is focused on one area, and if there is freedom to spread out as we like, then maybe we can think of a grid structure, we can go an adding grids around the whole space and develop a nice grid to cover the urban area as it grows, clear. So, that is why, we cannot have a single formula to fix a structure for urban areas, we need to have different concepts and apply the concepts based on the field conditions, clear.

And this directional grid urban structure, as indicated here, has been developed in connection with south Hampshire study in England, in the year 1966. At the planning stage itself they thought of introducing this new concept. It is not totally new, it is a synthesis of the ideas, that as we discussed already in the three previous structures, this structure is called the directional grid urban structure and represents a synthesis of some of the principles, contained within the three concepts discussed earlier. This concept has picked the most important points of all the three, put them together and developed a new concept.

The basis of this concept is a more specialized transport route hierarchy. What you understand by more specialized transport route hierarchy? They have just accepted the service centre hierarchy as available in the previous structures. They have made changes only in transport route hierarchy. We have basically had 4 categories of roads in all the previous cases, all the 3 cases, type 1, type 2, type 3 and type 4 also and each of these roads had a specific objective.

Type 1 means, emphasis only on speed and no emphasis on land access; type 4 means, full emphasis only on integration of road with land and no emphasis on speed. All these people wondered why not create roads in each category with emphasis both on speed, as well as, land access. They thought of type 1 category of roads within type 1, two types: one, with emphasis on speed, of course with high volume and the other one with emphasis on land access, again with high volume. So, they ended up with eight different types of roads: type 1 through route, type 1 access route. Type 1 through means, emphasis to speed; type 1 access route means, emphasis on land access; that is what they tried.

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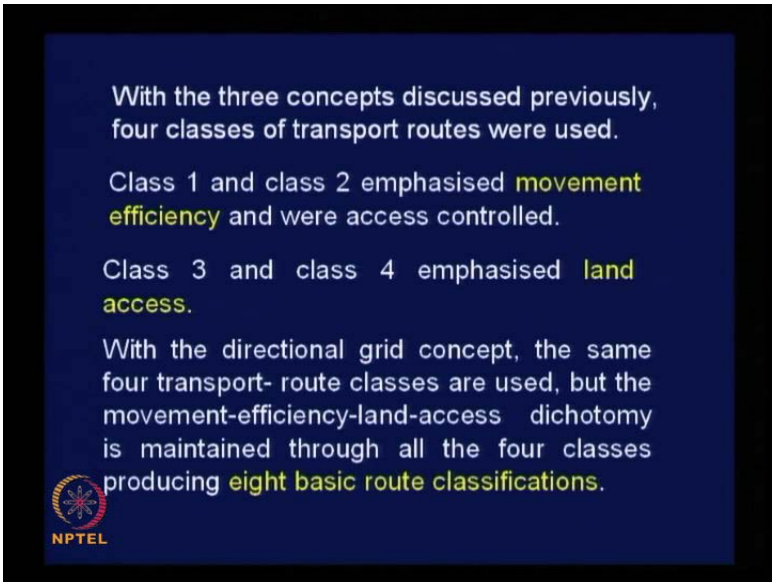

With the three concepts discussed previously, four classes of transport routes were used as well, as we know. Class 1 and class 2 emphasized movement efficiency and were access controlled, just to recapitulate what we did earlier, and class 3 and class 4 emphasized land access, as we understand clearly.

With the directional grid concept, the same four transport-route classes are used without change, but the movement-efficiency-land-access by dichotomy, which are opposing in nature, conflicting objectives dichotomy is maintained through all the four classes producing eight basic route classification; 8 basic route classification, clear.

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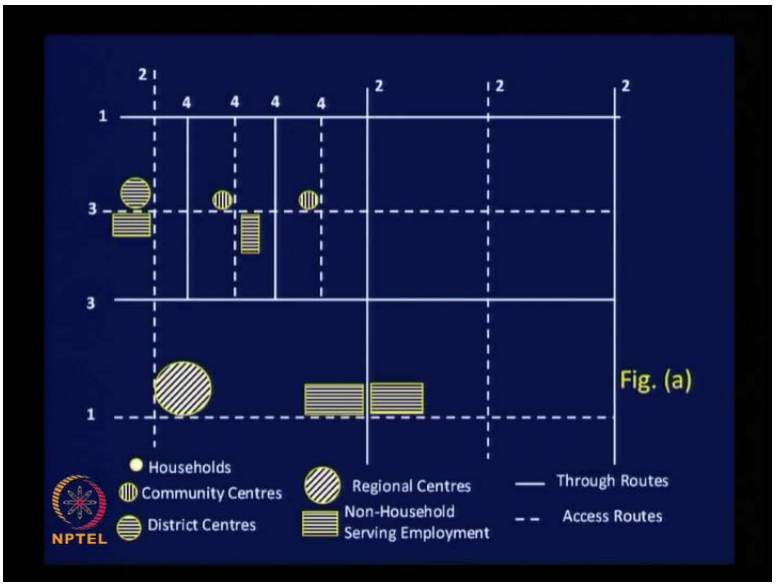

This is the structure and please study the structure carefully; look for type 1 category of roads. We have shown one continuous line on top with number 1, this is type 1 category of road. There is another type 1 category shown with dotted line 1, right, so this is type 1 through route with emphasis on speed. If one wants to go faster, take this route, of course the traffic volume will be heavy, both here as well as here, whereas in this route you cannot move faster, but you can access all the road side land uses; two categories in type 1 itself.

Look at type 2 category of roads, you have a dotted line, this is type 2 access route, this is type 2 through route; type 2 access route, type 2 through route.

What do we do here? We are placing a route, which are in the next level in the hierarchy, at right angles to the adjoining road in the hierarchy. So, type 2 routes are at right angles to type 1 routes, that is one point. And then, through and access routes are placed alternately, you provide one access route, then next, on the same type of route will be through route, then access route and then through route, so that speed, as well as accessibility is available alternatively, clear.

And look at type 3 routes; this is type 3 access route. Here, we have type 3 through route, this is parallel to type 1, but at right angles to type 2. Again, we provide access and through routes, one after another. Interestingly, you can find that type 4 also has two categories. They have carried the emphasis on speed even to type 4 category of roads,

which are really basically intended for integration of land with road. They wanted to have even type 4 through routes, emphasis on speed only and as well as, type 4 roads with emphasis on access, land access. And again, you can see, the, the category, alternately through and access routes side-by-side and all the types. And type 4 is perpendicular to the next type, this perpendicular to type 3, is not it. Type 4 is in this direction, type 3 is in this direction and of course, parallel to type 2.

Now, you can see, all these activity centres are provided at the intersection of access routes of different categories, not through routes. And the community centres, as you could see here, are located at the intersection of type 4 and type 3 routes, both are access types, emphasis on land access. Similarly, here you can see, the community centres, district centres are located at the intersection of type 2 and type 3 categories of routes, both are again access type.

Even non-household serving employment of different sizes, smaller size non-household serving employment centres are located at the intersection of type 4 and type 3 access routes here and larger size non-household serving employment centres are located at the intersection of type 3 and type 2 access routes again, and still larger size non-household serving employment centres are located adjacent to type 1 access route. So, always they are adjoining to access routes.

Look at the location of the regional centre at the intersection of type 1 and type 2 access routes. So, that means, you can be very strict about accessibility. If it is a through route, whether it is 1, 2 or 3 or 4, it will be, it will be functioning only as through route without any land access and if it is an access route, there will be free access to road side land users irrespective of the category, that is the idea of this proposal, clear.

And of course, you must realize the complexity of this system; it is not that easy to introduce this system everywhere. Hampshire is almost another satellite town of London, newly developed area, so since there was flexibility in trying out new concept, they tried this concept there in that particular city.

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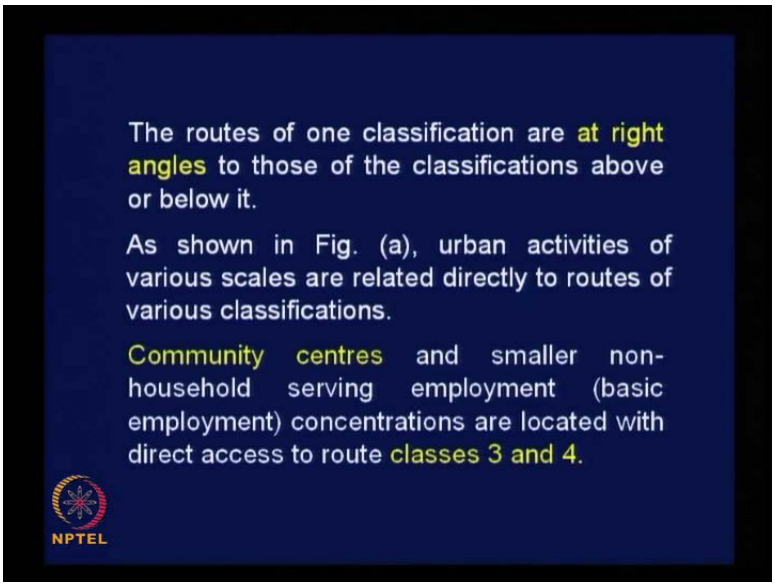

To summarize, we have to say, in this case the routes of one classification are at right angles to those of the classifications above or below it, that is what we have seen, right. Then, as we have seen in the figure, urban activities of various scales are related directly to routes of various classifications, there is no hierarchy in the access. Different activity centres, you can independently access each of activity centres from household.

Community centres and smaller non-household serving employment, namely basic employment concentrations, are located with direct access to route classes 3 and 4.

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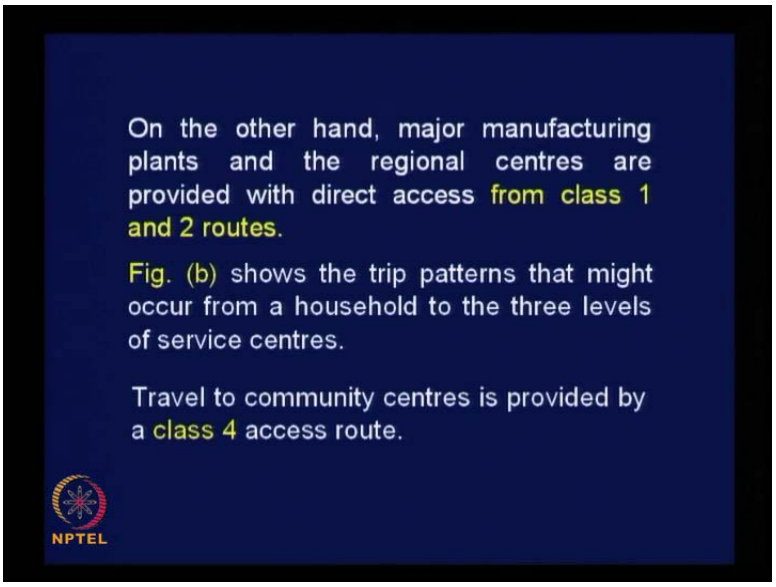

On the other hand, major manufacturing plants and the regional centres are provided with direct access from class 1 and 2 routes, that is what we have seen. At the intersection of class 1 and class 2 access routes, they are located the regional centres and by the side of the class 1 access route we located major employment centres.

And let us see the connectivity between activities and the hierarchy and transport to hierarchy, travel to community centre is provided by a class 4 access route. Maybe, we will look at figure b, then we will get a better understanding of the path from household to various activity centres.

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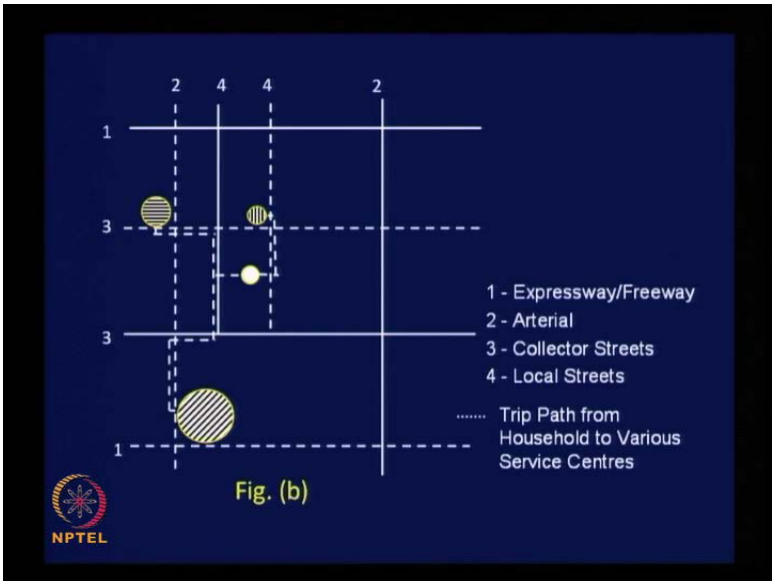

Households are located by the side of class 4 access route here. People travel to the adjoining community centre taking class 4 access route, where speed may not be that high. Since community centre is nearby area, they can afford to go slow and reach out to this place and district centres maybe little far off, so they just move through the lane and by-lanes, in between these roads and reach the class 4 through route because they have to move over longer distance. So, they have the possibility of taking this through route from this distance and then reach class 3 access route to reach a district centre.

See, the paths are totally independent from one another; there is no hierarchy maintained in the path row, household to community centre separate and household to district centre another independent path. Look at the path from household to the regional centre, they take class 4 through route and then still there is a possibility of moving faster by taking

class 3 through route and then, when they come closer to the regional centre, they get into class 2 access route and reach the regional centre.

The principle here is shorter the distance, slower is the movement, relatively longer is the distance. There is a possibility of moving faster to reach the centre, which is away from to the household. That, is the advantage claimed by the planners while recommending this kind of system, is that clear?

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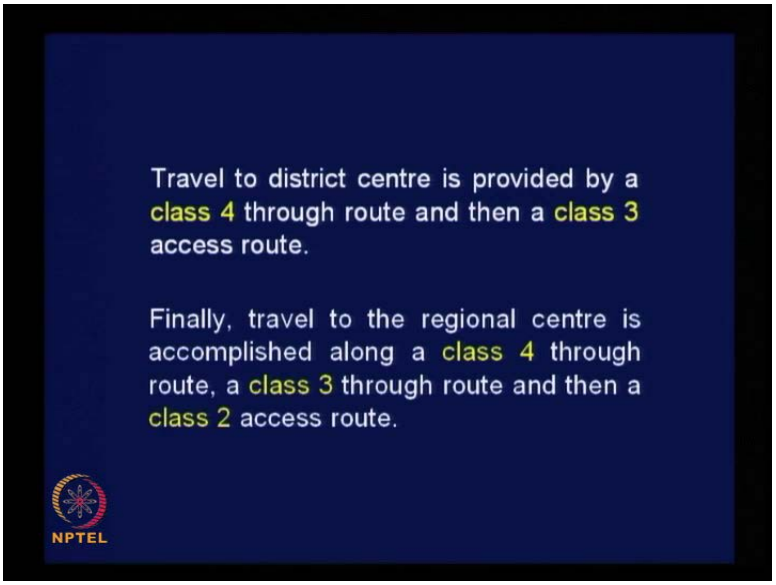

So, to summarize again the features in respect of mobility, travel to district centre is provided by a class 4 through route and then a class 3 access route. And travel to the regional centre is accomplished along a class 4 through route, then a class 3 through route again and then, a class 2 access route.

So, when there is a possibility of taking through route until they go closer to the activity centre, you can move faster when the distance increases, that is the advantage plan of this particular concept.

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So, these are the four different concepts tried out and of course, this particular concept was not used elsewhere, in any part of the world, except in Hampshire because of the complexity involved within each category. You to have a through route, as well as, access route, it was not possible to try out this kind of system anywhere else in the world. And you can see, this is the unique facility available only there and all other urban areas all over the world, if we look at carefully a system, it might follow any one of this three basic structures, either centripetal, or grid or linear structure, clear.

Now, let us try to summarize the whole concept and try to understand the important features of each type of structure and the related issues, that is very important. What are the issues related to each of the structures? Unless you are clear about the issues related to structures you will not be able to decide about the type of structures suited for a particular location.

What are the merits and demerits of each of these three basic structures, leaving apart the 4th one, which is quite complex. Let us look at each of these three basic types, one by one. First, we discussed about centripetal type of urban structure. So, with centripetal structure, as you may recollect, households focus on community centres, is not it. Community centres focus on district centres and the district centres focus on regional centres, strict hierarchy is followed.

This successive focusing of the trips is satisfactory if most of the travel takes place by public transport; that is our interest as transport system planner. How are we going to recommend the structure for a given urban area? Why the statement has been made, that say centripetal type of urban structure is suitable if you can operate the good transport public system, why? What is the reason? What will happen if the share by private transport mode is significant, say 80 percent of people move using their own personal vehicles, only 20 percent take public transport? What will happen, any response?

See, when we maintain the strict hierarchy, those who are interested to go direct to original centre, they have to unnecessarily pass through the community centre, district centre and then reach the regional centre. They may have no business at these two centres, the traffic is practically through traffic, but passing through these activity centres, where there will be congestion always, there will be lot of traffic around these two centres. If more people are using only personal vehicles, then you will find lot of traffic jam around the community centres as well as district centre and you cannot reach out to the regional centres that easily. There will be a real traffic congestion problem around these activity centres and if we have a good transit system, then this concept is very good.

If most of the travel is by private car, then the concentration of traffic will lead to congestion; concentration of traffic around the other centres will lead to unwarranted congestion.

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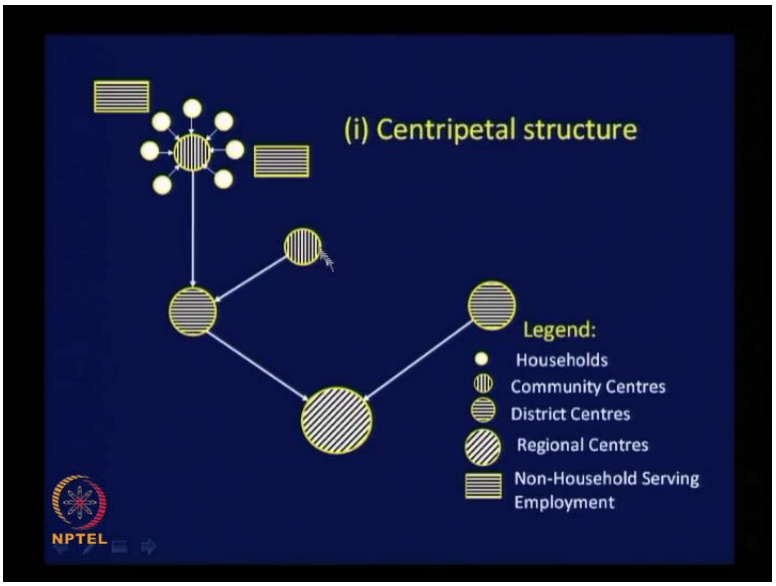

So, to visualize the congestion level, you can look at the figure again. When people move to regional centres through community centres, district centre, you can see, you can imagine the kind of traffic problems. Traffic from several community centres will converge at a district centre, so there will be a chaotic situation here and then they have to get diverted to the regional centre.

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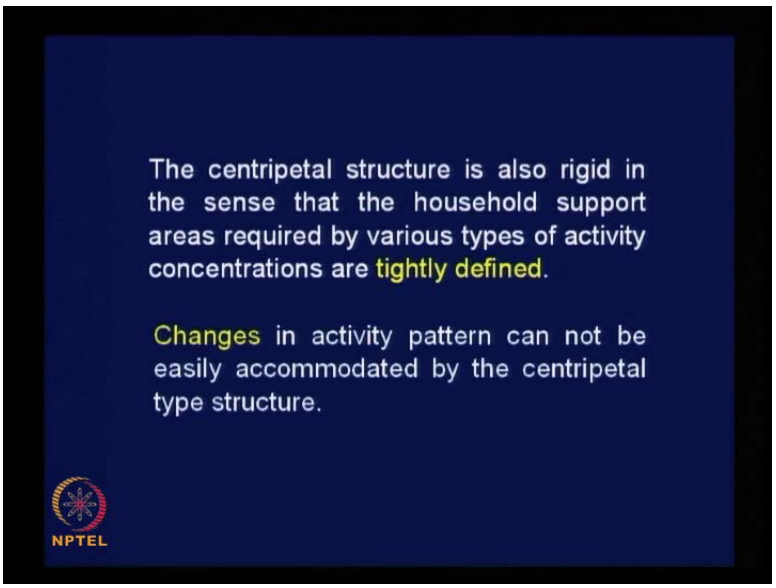

And another related point to be understood is the centripetal structure is also rigid, in the sense, that household support areas required by various types of activity concentrations

are tightly defined. You can see the households focusing on community centres. We are going to have several community centres focusing on a district centre. Once you fix these centres and make the households focus on community centres and then, in turn to district centres, it is almost rigidly fixed, tightly fitted and expansion is not possible, even minor modifications will be difficult. The household areas are already defined and fixed; you cannot make any modifications or provide for expansion, tightly defined.

Changes in activity pattern cannot be easily accommodated by the centripetal type of urban structure. So, that is the problem in practice about accommodating possible changes in the activity pattern of the urban dwellers.

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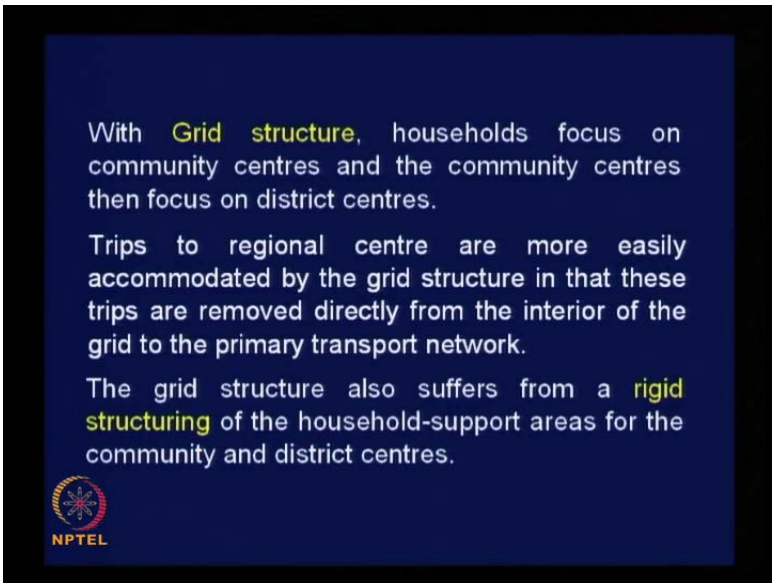

With the grid type of structure, as you may recall, households focus on community centres and the community centres then focus on district centres. Then on, there is bifurcation trips to regional centres are more easily accomplished or accommodated by the grid structure in, that these trips are removed directly from the interior of the grid to the primary transport network. That is the advantage you can think of, the figure that we have seen, that I show you, that figure again.

The grid structure also suffers from a rigid structuring of the household-support areas for the community and district centres.

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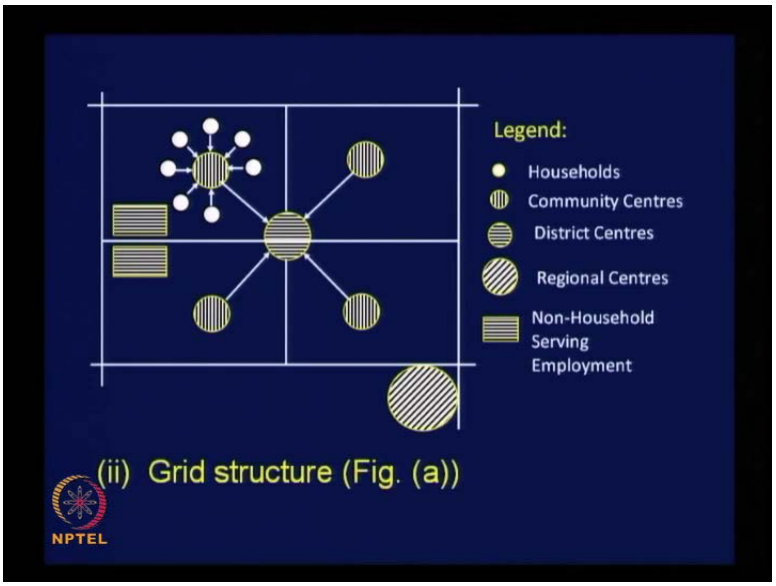

You look at the figure, and of course, one advantage here is reaching out to the regional centres is easy. You can directly access the type 1 route from any point and then take this faster route to come to the regional centre; that is the advantage. But since you are fitting these activity centres and the households within each of these cells where area is rigidly fixed, again modifications, changes, etcetera will be extremely difficult.

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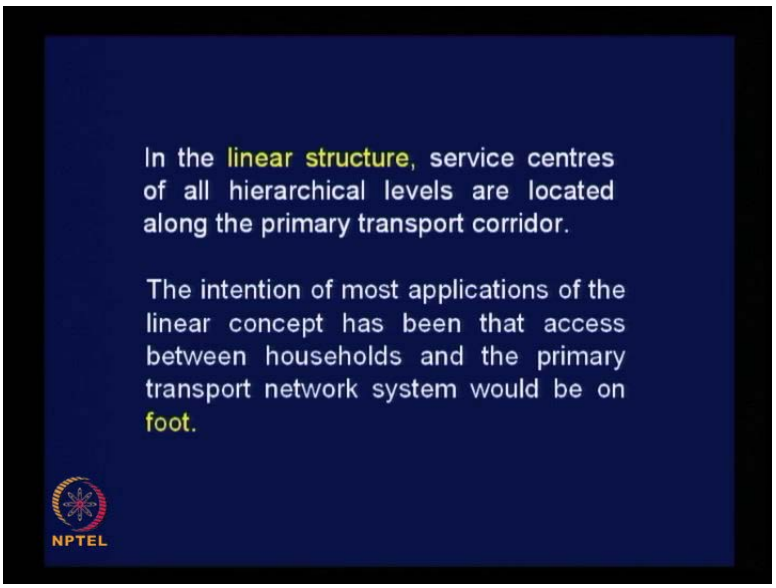

In the case of linear structure, service centres of all hierarchical levels, as all we have seen, are located along the primary transport corridor. The intention of most applications

of the liner concept has been that access between households and the primary transport network system would be on foot because it is linear. It is assumed, that people can just walk and reach out to the main corridor; that, was the understanding.

Just have a look at the structure again, so it is a very short distance, it is not spreading out far away from the main corridor. People can even walk to the main traffic corridor and reach out to all this activity centres, clear.

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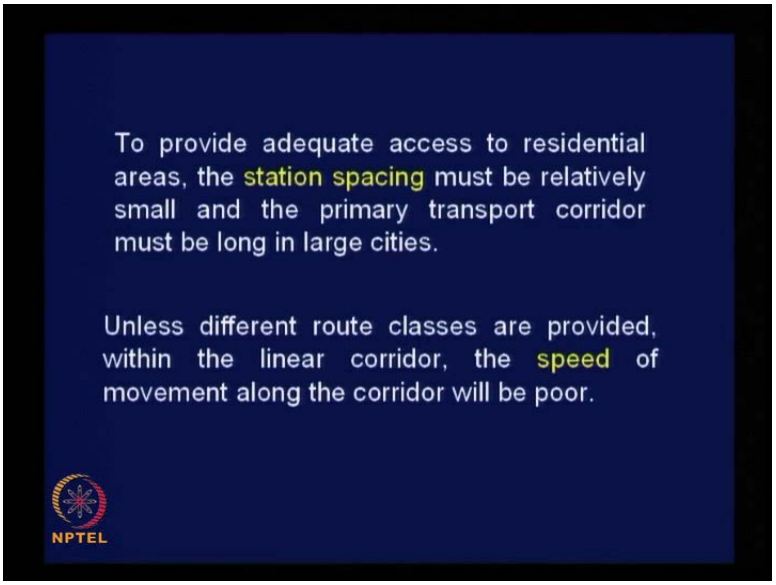

This is the related issue. To provide adequate access to residential areas, the station spacing must be relatively small and the primary transport corridor must be long in larger cities. Why station spacing has to be small? You must have stations, it could be rail system or bus system; station here means, either bus stops or railway stations. On the corridor you must have stations at frequent intervals, so that people can access main traffic corridor by foot easily. That is right because that is the only main mode of transportation available, so you must have the intake points at frequent intervals.

Unless different route classes are provided within the linear corridor, the speed of movement along the corridor will be poor, that is what I told you earlier. Within the corridor, for those who want to move faster, you provide a faster route and for those who want to access land at frequent intervals, provide another facility. Type 1 and type 2 side-by-side or a train system and faster bus system side-by-side and so on.

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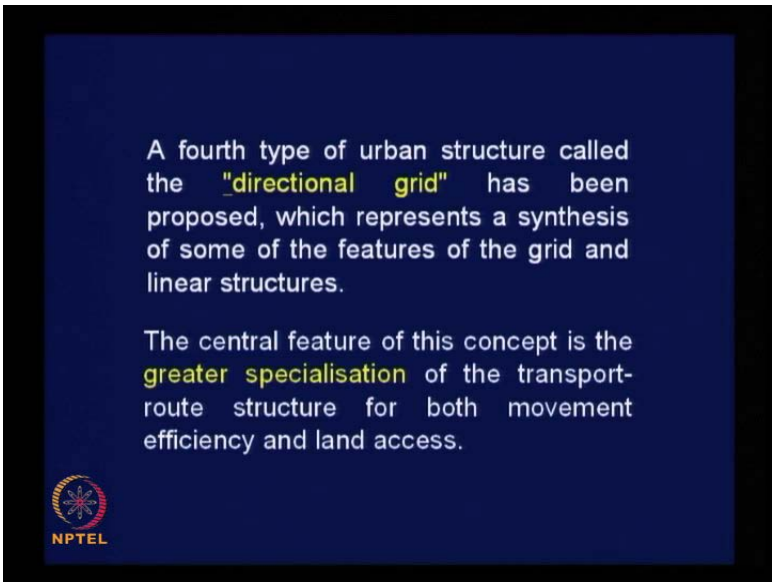

Of course, the 4th type of urban structure, called the directional grid has been proposed, which represents the synthesis of some of the features of the grid and linear structures, as we have seen earlier. And the central feature of this concept is the greater specialization of the transport route structure for both, movement efficiency and land access, as we have seen.

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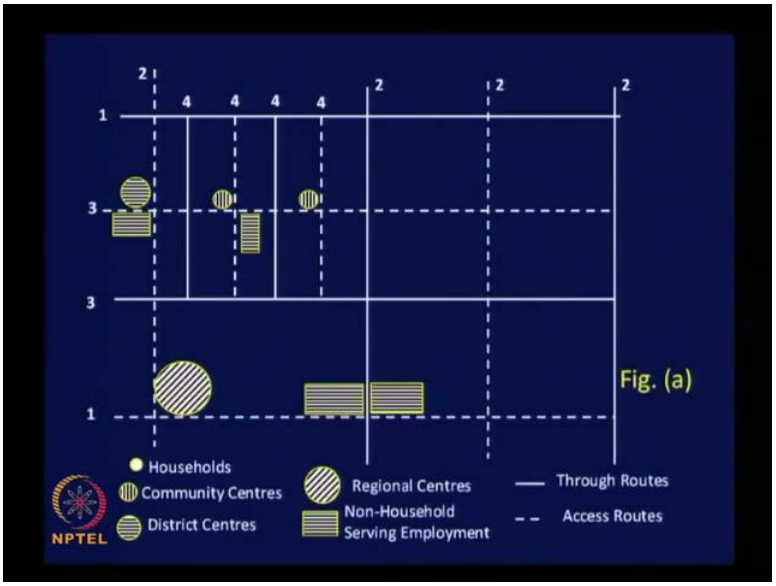

And this is the structure, which is relatively complicated.

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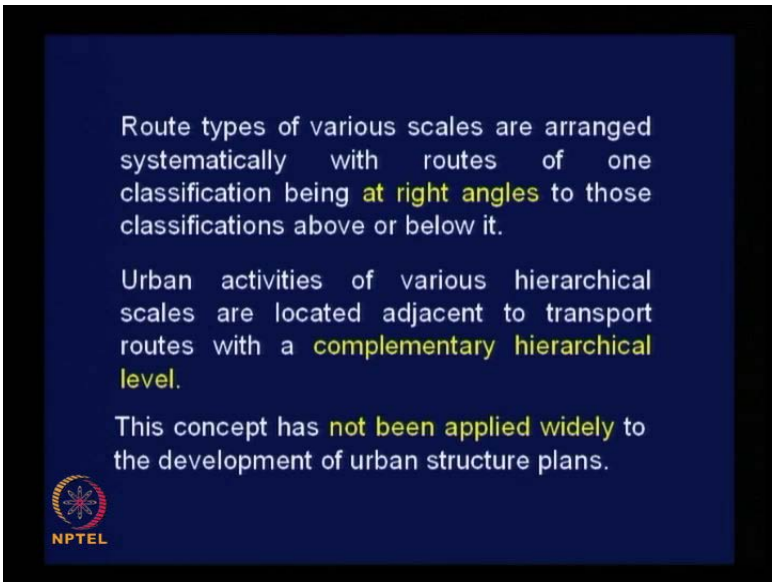

And therefore, route types of various scales are arranged systematically, right angles to the succeeding or preceding ones, with routes of one classification being at right angles to those classifications above or below it. Urban activities of various hierarchical scales are located adjacent to transport routes with a complementary hierarchical level. And this concept has not been applied widely to the development of urban structure plans. To put the fact, this was applied only to that city and no other city has adopted this concept, clear. So, this is the summary.

And to again summarize at the macro levels of what we have seen today, we basically discussed about three types of urban structure: centripetal type, grid type and linear type of urban structure.

Now, we are clear, that all these three types of urban structure have their own merits and demerits and there are certain issues related to each of these structures. Clear understanding of the merits and demerits and related issues are very important for transport system planners to identify the particular type of urban structure and then plan the transport system to suit a particular type.

The 4th type of urban structure that we discussed is a special type, but much complicated, that is why it was not adopted elsewhere, in any part of the world.

So, this completes our discussion on urban structure. In the next class we will discuss about urban goods movement. So, this is the end of lecture 38.