Urban Landuse and Transportation Planning
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Lecture - 51
Urban Freight Planning: Theory

Welcome back. Module 11 deals with urban freight, and this particular lecture covers urban freight planning theory.

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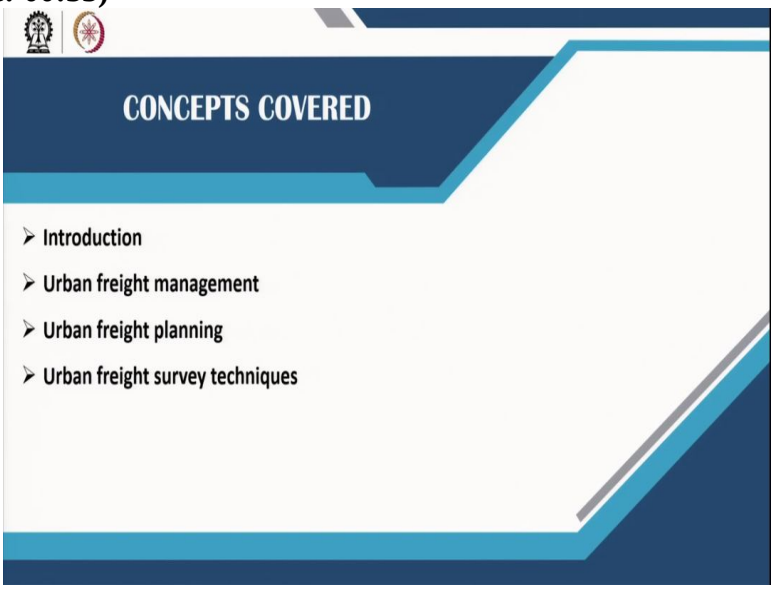

The different concepts that will be covered in this particular lecture are the introduction to urban freight planning, urban freight management, urban freight planning, and urban freight survey techniques.

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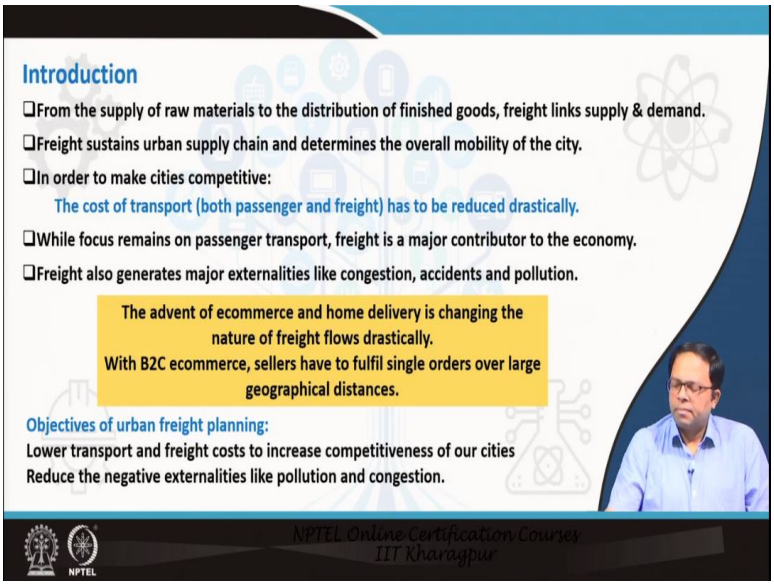

Introduction

This module will cover freight planning in an urban area. Freight keeps the city going by linking supply and demand. For example, freight supplies raw materials to the different industries, markets, and retail stores. If something is produced in the city, it will be distributed via freight. Therefore, freight is the main link between supply and demand. And, without freight one cannot have supply satisfying demand. So, it is very important to plan freight for the urban areas. Freight not only sustains urban supply chains but also determines overall mobility of the city. This is because freight movement takes place along with passenger movement. So there is a need to improve the efficiency of freight movement within an urban area. In order to make our cities competitive, the cost of not only passenger but also freight transport has to be reduced drastically. Compact cities can lead to the reduction in transport costs because people will have to travel for lesser distances. The same holds true for freight as well.

The main focus of urban planners and policymakers has been passenger transport, though freight is a major contributor not only to the economy but to the negative externalities as well. The negative externalities generated include congestion, emissions, accidents, etc. Thus, there is a need to integrate freight planning into the four stage travel demand modeling process. Also, there is a need to regulate freight. For example, vehicle overloading, off-street loading and unloading, etc. can be hazardous to urban dwellers.

Traditional freight involved large vehicles bringing in goods to the urban distribution centers and smaller vehicles distributing it to the retailers from here on. The final part of this supply chain is referred to as the last mile logistics. But the advent of e-commerce and home delivery has been

changing the nature of freight flows drastically. Goods are being directly shipped to consumers from distribution centers and sellers have to fulfill single orders over large geographical distances. This is increasing the total vehicle-kilometres travelled. So the two primary objectives of freight planning are to lower freight costs and to mitigate the negative externalities like pollution and congestion.

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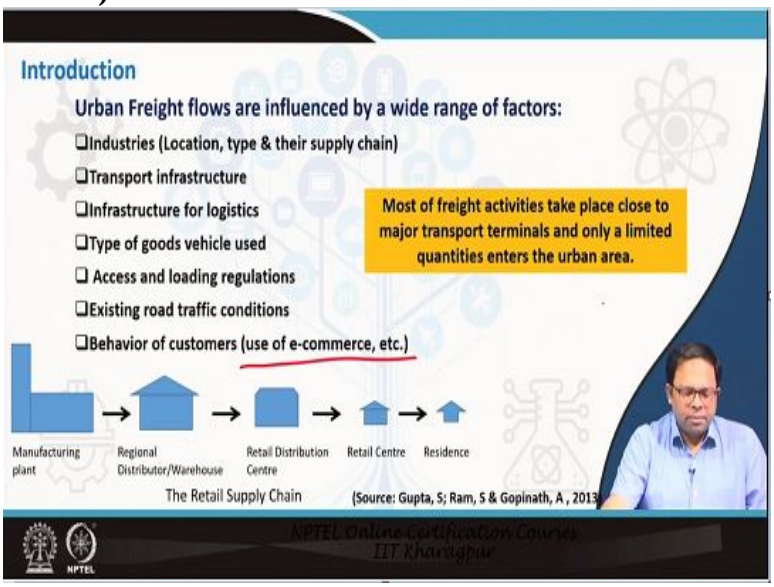

Freight flows are influenced by many factors, like, the location of the industry, the type of the industry, and the supply chain. For example, in a bottling plant for soft drinks the delivery vehicle drops consignment at multiple retail outlets, replenishing their supplies. Another form of supply chain may involve the transfer of goods to a warehouse from the manufacturing plant and to multiple retailers from the warehouse. Thus, the type of industry determines the freight flows.

Transport infrastructure forms the next set of influencing factors. Poor infrastructure negatively affects freight much more than passenger transport.

In developing countries, most of the freight is done through informal carriers, who individually send their consignments. That is, there is limited third party logistics involved, which consolidate freight from different sources and thus help in achieving efficiency. Third party logistics move goods originating at different locations and thus also help in reducing empty trips. These services help in making the supply chains more competitive. The kind of goods vehicle used also determines freight flows.

The next influencing factor concerns access and loading regulations, which vary from one city to another. These regulations may concern the entry and exit time of goods vehicle, the vehicle size, and allowance for off-street parking for loading and unloading, etc. The existing traffic conditions like road congestion also play a major role in determining freight flow.

And finally, customer behavior, like the use and extent of e-commerce services also determine freight flows. For example, different socio-demographic groups have different rates of e-commerce adoption. So, all this plays a role in determining what kind of freight flows will be generated in a particular urban area.

Most of the freight activities take place close to major transport terminals, like ports, logistics hubs, and railway terminals, which are often not within city limits. So, a major part of the inter-urban freight flows do not enter the urban area. From these points intra-urban trans-shipments takes place, bringing in goods via smaller vehicles into the city. Thus, the freight planning process for a city should carefully delineate the geographic boundary of the planning zone, which otherwise would result in a fragmented picture.

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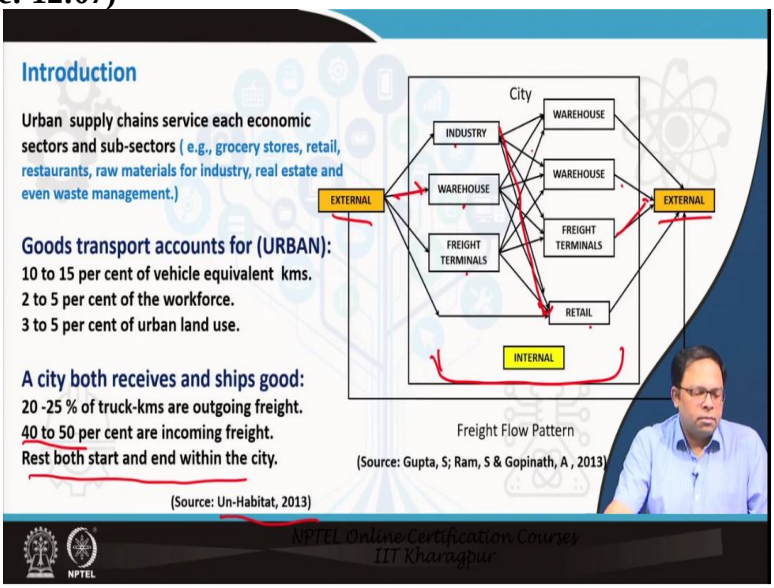

The supply chains for waste management, real estate, restaurants and grocery are all different from each other. Thus, the supply chains for different industries need to be investigated separately. The figure shows both intra-urban and inter-urban freight flows. Intra-urban freight flows involve movement of goods within the city, whereas inter-urban flows involve goods movement between different cities. From an industry within the city goods could go to

warehouses from where it can be exported or it can go to another warehouse or freight terminal or it could go directly to the retail stores inside the city. So, different connections are possible. According to the UN-Habitat report of 2013, goods transport accounts for about 10-15% of vehicle equivalent kilometers, 2-5% of the workforce and 3-5% of the landuse in an urban area. A city both receives and ships goods. Around 20 to 25% of the truck kilometers are outgoing freight and 40 to 50% comprise incoming freight. And the rest both start and end within the city limits, i.e. intra-urban freight. Freight flows can be measured both in terms of vehicles as well as commodities. This will be dealt with in the next lecture.

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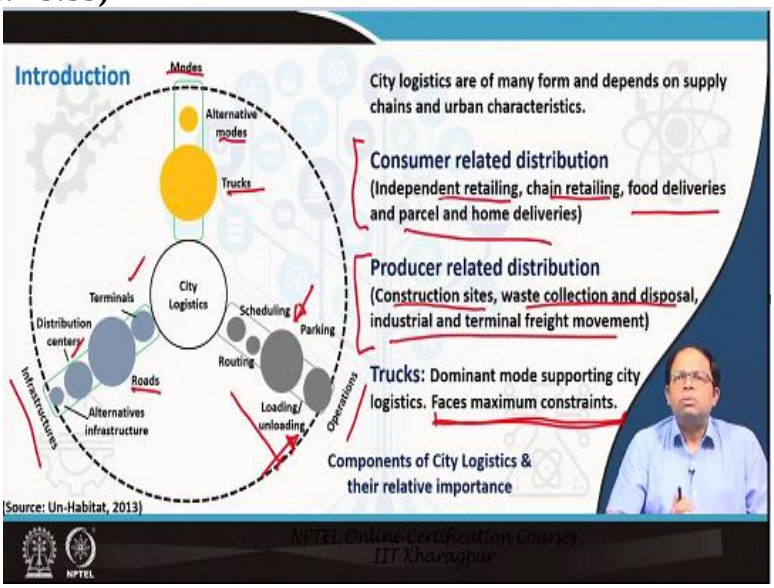

This above image from the UN-Habitat report identifies three primary components of the urban freight planning process. These are operations, mode and infrastructure. Within modes, trucks are the biggest contributor. Operations include scheduling, routing, parking and loading unloading. Here parking and loading-unloading are the biggest cycles. Adequate space for trucks to park is a real challenge faced by all urban areas. This is evident from the fact that, when trucks are allowed to enter the city at night, it results in huge traffic congestion. Thus, proper provisioning is needed for wide roads, parking and loading-unloading in a city. Terminals and distribution centers form the second order infrastructure that are required to support freight operations. So planning for location of terminals and distribution centers are required. Terminals primarily serve as the waiting area for trucks, whereas distribution centers primarily cater to goods.

City logistics are of many forms, depending on the supply chain and urban characteristics. There can be either consumer related distribution or producer related distribution. In producer related distribution there is no final end consumer involved and is related to the intermediate goods moving from one industry to another. Food deliveries in the city, or personal and home deliveries, retailing, and chain retailing are examples of consumer related distribution. Both are managed by different authorities, using different sets of guidelines. But in both cases trucks form the dominant mode of city logistics, and because of unplanned freight movement face the maximum number of constraints. So to make our cities competitive freight needs to be planned.

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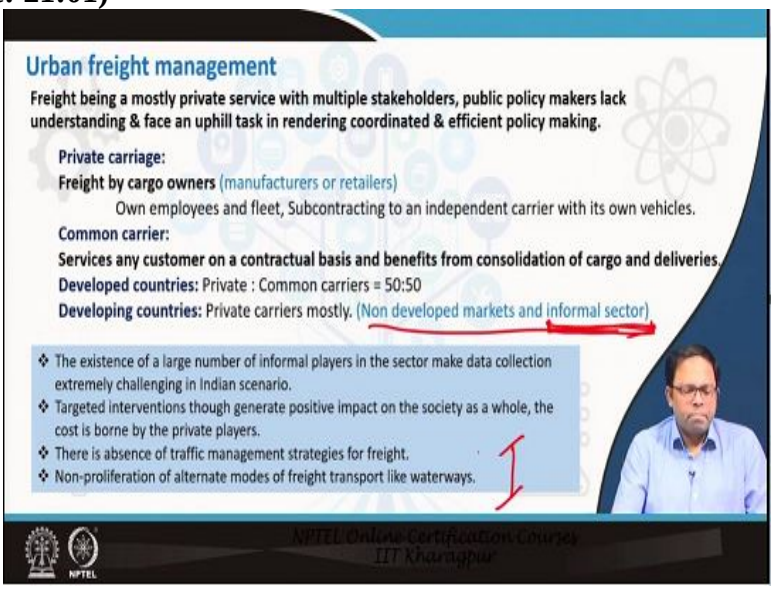

Urban freight management

The main challenge for urban freight management is the fact that freight services are provided by private operators involving multiple stakeholders. As private operators are apprehensive about sharing data, it becomes difficult to comprehend a city wide freight plan. This private freight involves two kinds of operations. One is organized by the cargo owners themselves, i.e. the manufacturers and retailers. The other involves common carriers, who are open to service any customer on a contractual basis and benefits from consolidation of cargo and deliveries. In developed countries, private and common carriers have almost equal market share. But in developing economies private carriers dominate. The private carriers also involve a large informal sector with smaller vans and non-motorized means of transport.

The presence of a large informal sector hinders data collection. Moreover, regulations in the form of designated parking areas, loading and unloading areas are also difficult to implement. This is because regulation increases the cost of operation of these small and informal carrier services, though it benefits society at large. Private carriers also do not benefit from shipment consolidation and are mostly forced to undertake empty return trips. In addition, cheaper alternatives for freight transport like waterways and railways are also lagging in developing countries. All this increases the cost of freight transport in a developing economy.

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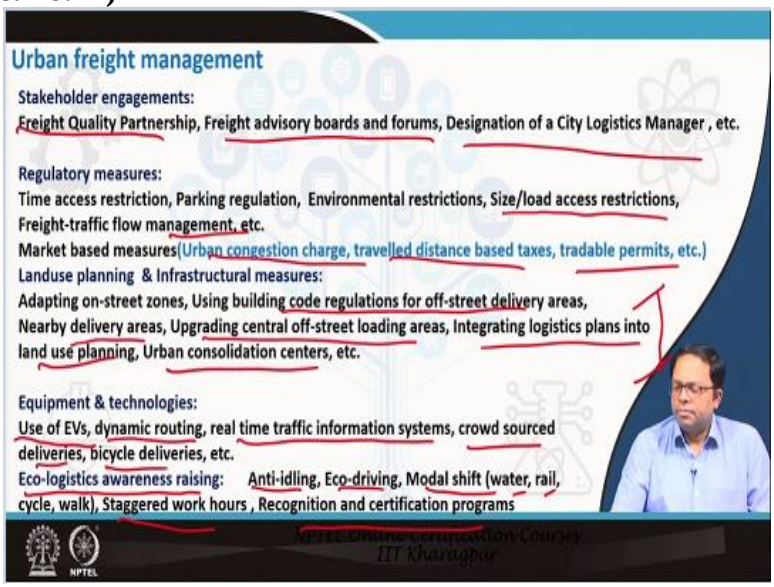

Urban freight management measures

Freight management measures include stakeholder engagement, regulatory measures, market based measures, landuse and infrastructural intervention, awareness programs and technology adoption.

Stakeholder engagement in the form of freight quality partnerships, freight advisory boards, and appointment of city logistics managers can help policymakers in addressing the issues related to urban freight management.

Some of the regulatory measures that are undertaken in urban areas are time access restriction, parking regulation, environmental restrictions, size/load access restrictions, etc.

Market based measures involve urban congestion charges, travel distance based taxes, tradable permits, etc. These are charged from the shippers or vehicles that enter into the urban area.

Land use planning and infrastructure measures involve adopting of on-street zones for loading unloading, building code regulations for off-street delivery areas, nearby delivery areas for neighborhoods, upgrading central upstate loading areas, integrating logistic plans in the landuse plan and urban consolidation centers.

Adoption of new equipment and technologies can also be part of freight management measures. This may include the use of EVs, dynamic routing software, real time traffic information systems, crowd sourced deliveries, bicycle deliveries, etc. In this regard it is noteworthy that private entities, like food delivery companies, are already adopting bicycle deliveries to reduce operating costs.

Raising awareness about eco-friendly behavior can also be a viable freight management measure. This may include promoting anti-idling, eco-mode driving, bicycle adoption, walking, etc.

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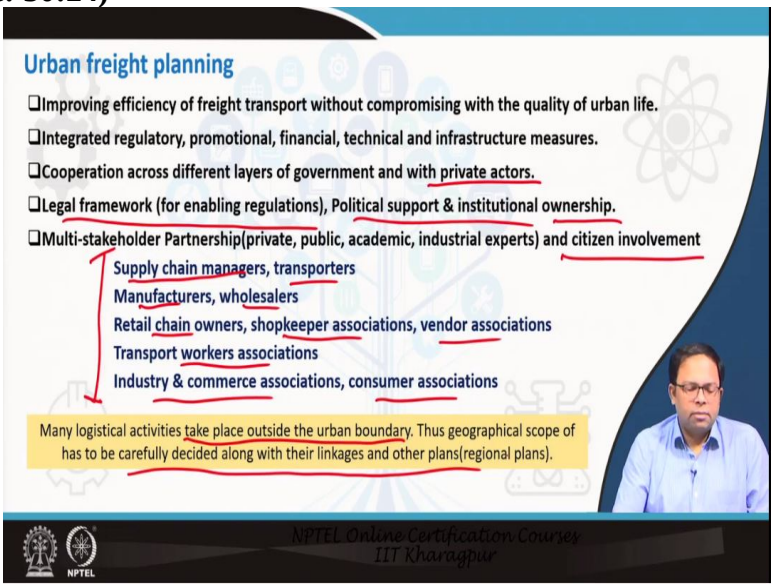

Urban freight planning

Urban freight planning is necessary to improve the efficiency of freight transport without compromising with the quality of urban life. This requires integrated regulatory, promotional, financial, technical and infrastructure measures. The geographical scope of the planning process needs to be carefully decided, since many logistical activities take place outside the boundaries of the urban areas. To make the planning process viable cooperation across different layers of government and private stakeholders are required. The stakeholders include supply chain managers, transporters, manufacturers, wholesalers, retail chain owners, shopkeeper associations,

vendor associations, transport workers associations, industry & commerce associations, and consumer associations. In addition to stakeholder involvement, a legal framework for enabling regulations, along with political support & institutional ownership is indispensible for the success of the freight planning process.

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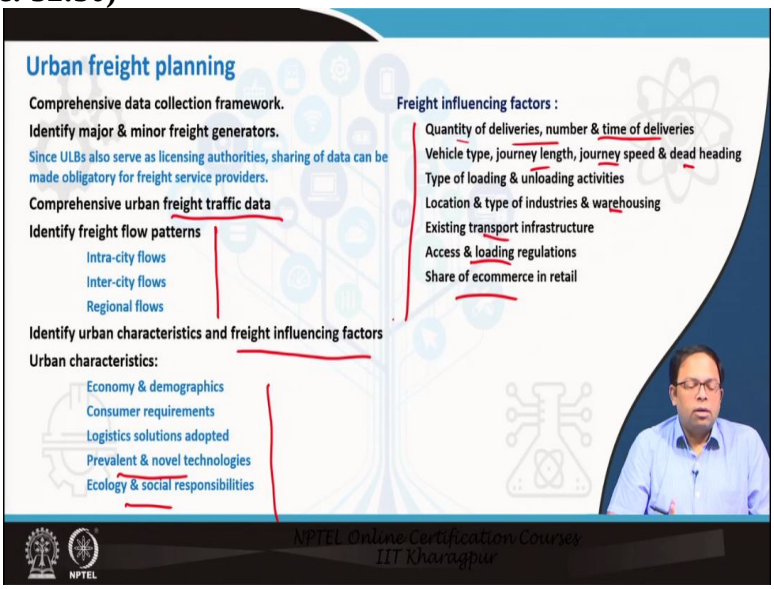

Data collection framework

Though freight service providers are reluctant to share data, urban local bodies can mandate the sharing of such data as part of their licensing requirement. A comprehensive data collection framework should identify major and minor freight generators, freight flow patterns, urban characteristics and freight influencing factors. Freight flows comprise of intra-city, inter-city and regional flows. Economy, demographics, consumer requirements, logistics solutions adopted, prevalent & novel technologies, ecology and social responsibilities are the major urban characteristics. And the freight influencing factors comprise of:

- Quantity of deliveries, number & time of deliveries
- Vehicle type, journey length, journey speed & dead heading
- Type of loading & unloading activities
- Location & type of industries & warehousing
- Existing transport infrastructure
- Access & loading regulations
- Share of ecommerce in retail

Deadheading is the case of a freight or passenger vehicle returning empty to its point of origin.

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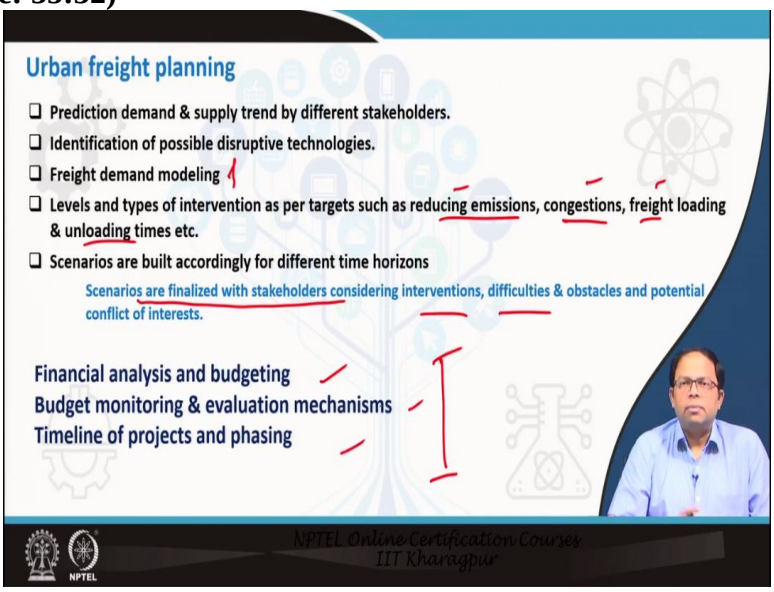

Objectives of urban freight planning

Freight plans can be developed to achieve the following objectives within different time horizons:

- Predicting demand & supply trend by different stakeholders
- Identifying possible disruptive technologies
- Freight demand modeling
- The effect of policy intervention to reduce emissions, congestions, etc.

Stakeholder consultations are an important part of the planning process. Scenarios are finalized with stakeholders considering interventions, difficulties & obstacles and potential conflict of interests.

Freight plans, like any other plan, consists of the following:

- Financial analysis and budgeting
- Budget monitoring & evaluation mechanisms and
- Timeline of projects and phasing

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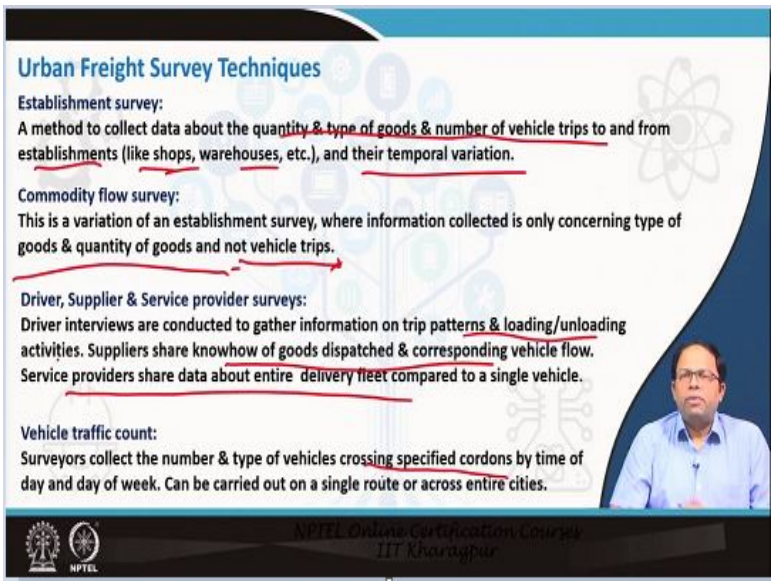

Urban Freight Survey Techniques

Following is a brief description of the different survey techniques undertaken for urban freight planning.

Establishment survey is a method to collect data about the quantity & type of goods & number of vehicle trips to and from establishments (like shops, warehouses, etc.), and their temporal variation.

Commodity flow survey is a variation of an establishment survey, where information collected is only concerning type of goods & quantity of goods and not vehicle trips.

Driver, Supplier & Service provider surveys are conducted to gather information on trip patterns and loading/unloading activities. Suppliers share knowhow of goods dispatched & corresponding vehicle flow. Service providers share data about the entire delivery fleet compared to a single vehicle.

In vehicle traffic count surveyors collect the number and type of vehicles crossing specified cordons by time of day and day of week. Depending on the geographic extent of the planning area, it can be carried out on a single route or across entire cities.

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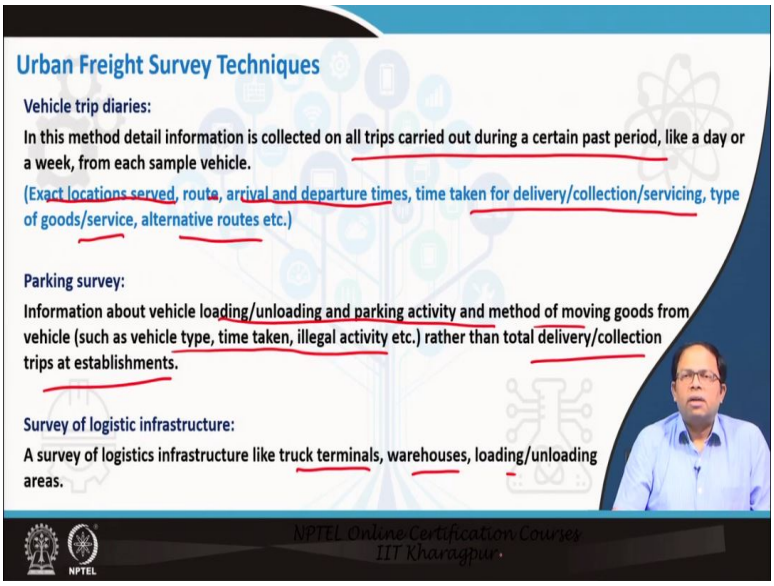

In vehicle trip diaries detail information is collected on all trips carried out during a certain past period, like a day or a week, from each sample vehicle. This involves interviews with the vehicle operators and the information collected include exact locations served, route, arrival and departure times, time taken for delivery/collection/servicing, type of goods/service, alternative routes etc.

Parking survey involves collecting information about vehicle loading/unloading and parking activity and method of moving goods from vehicle (such as vehicle type, time taken, illegal activity etc.), rather than total delivery/collection trips at establishments.

A survey of logistics infrastructure involves collecting information about logistics infrastructure like truck terminals, warehouses, loading/unloading areas, etc.

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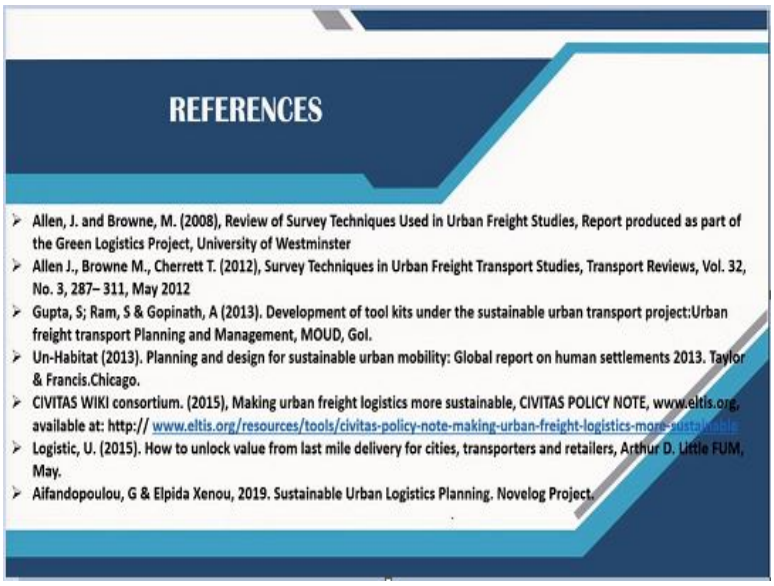

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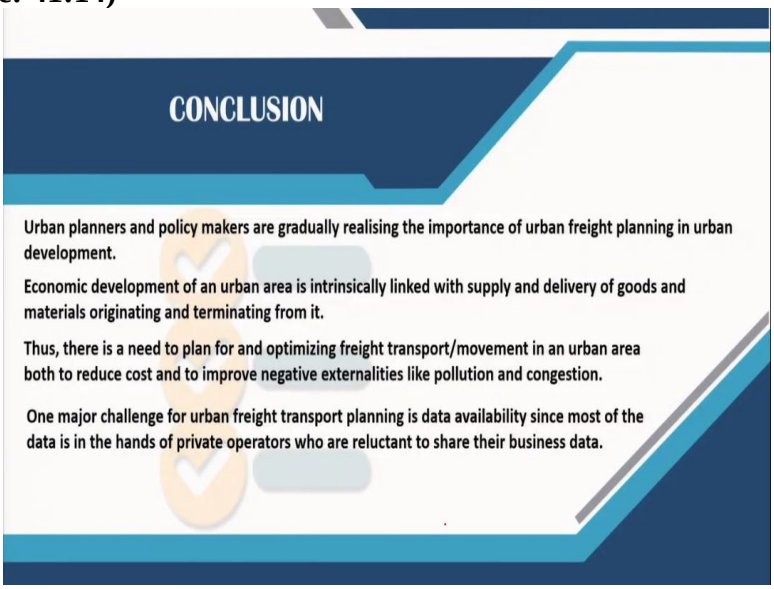

Conclusion

Urban planners and policymakers are gradually realizing the importance of urban freight planning in urban development. The economic development of an urban area is intrinsically linked with supply and delivery of goods and materials originating and terminating from it. So, there is a need to plan for optimizing freight transport movement in an urban area both to reduce cost and to improve negative externalities like pollution and congestion. Lastly, the major challenge for urban freight transport planning is data availability, since most of the data is in the hands of private operators, who are reluctant to share their business data.