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Development of Toolkits under the "Sustainable Urban Transport Project"

Urban Freight Transport Planning and Management

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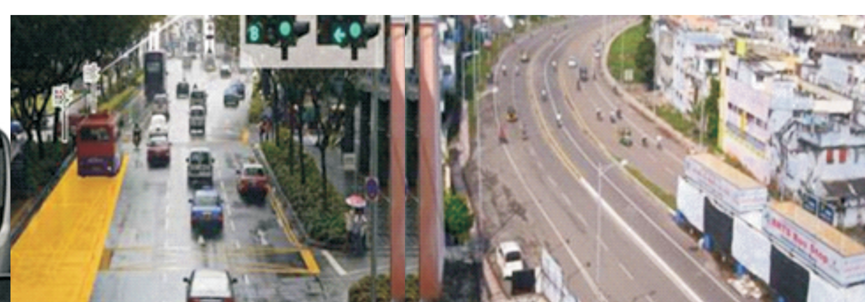

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Executive Summary

A review of urban freight logistics research efforts indicate that while a lot of good practices have emerged during last decade or so in improving the understanding of freight issues and their possible solutions in developed countries, much remains to be desired in cities of developing countries like India possibly owing to lack of empirical evidence from such countries.

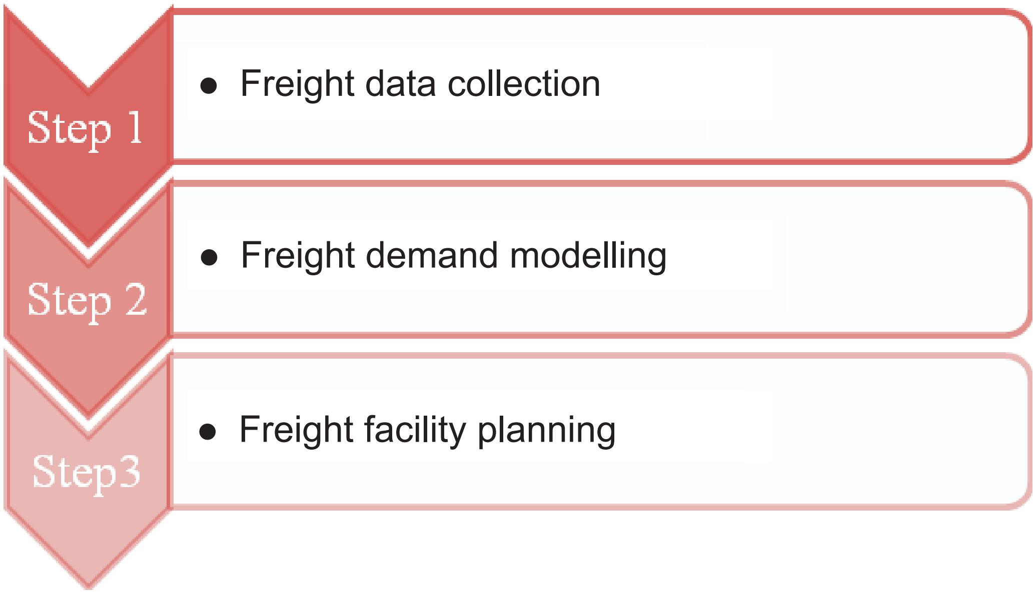
This toolkit provides an understanding of important aspects of Urban Freight Transport Planning and Management. It aims to provide guidance to city officials, planners and consultants involved in urban freight related strategic planning and management. It also aims to facilitate decision makers in assessing the importance of urban freight in making rational and informed policy decision for transport infrastructure related to freight activity.

Importance of Urban Freight Transport

The movement of goods within urban areas is vital since cities are the centre of economic and social life. The sustainability of cities cannot be viewed without considering the role of goods transport. Freight traffic in cities is a function based on city size and its economic activities. While macro level freight traffic data is generated from comprehensive transport plan preparation exercise, the freight logistics aspects related to supply chain linkages, storage, handling, distribution aspects including the modes used are not given enough importance. The current state of practice of urban freight reveals that there is an absence of a comprehensive understanding of supply chain and freight logistics in urban area not only among public but also among city planners and decision makers resulting in to transport-related policies and facilities being planned merely from the passenger transport perspective, without adequate consideration to the needs of freight transport. Even whatever freight facilities planning are carried out it is intuitively based in nature rather than based on a scientific perspective.

Urban Freight Planning Process

Urban freight planning process involves stages of data collection, freight demand forecast and freight facility planning.



Step 1: Freight data collection

The data required for urban freight include information on truck fleet, truck flows, commodity flows, major freight generators and major freight corridors. These are collected from various primary surveys such as roadside interview survey, traffic count, establishment survey, parking survey, truck driver survey, activity pattern survey and freight operator survey. A check list of urban freight data base to be complied at city level has been provided in the toolkit which would enhance the data base or information system on urban freight for rational planning in cities. In addition various survey proformas have been included in the toolkit which would facilitate rationale collection of freight data for planning and management of freight transport.

Step 2: Freight Demand Estimation

Freight demand forecast is an important stage in freight planning. A four step modelling approach comprising of trip generation, trip distribution, modal split and trip assignment is usually adopted for this purpose. The urban freight models are categorized as commodity based models or truck trip based models wherein the process generally remains the same, except for the input in terms of either commodity or truck trips. There have been some efforts carried out for Indian cities to develop freight generation models based on population which could be useful starting point for those cities which do not have any data base to model freight demand.

Step 3: Freight Facilities Planning

Freight facilities planning usually comprise of planning various facilities such as truck terminals, integrated freight complexes, warehouses or godowns and freight consolidation centres which are an emerging city logistics concept


for sustainable freight distribution. Freight facilities planning involved a rational assessment of freight demand & assessment of land requirement for various activities based on norms/standards for developing layout plan for proposed facilities. Broad planning guidelines for land assessment of various facilities have been provided in the toolkit along with typical design configurations for parking and truck parking lots.

Urban Freight Management Measures

Urban freight management is usually adopted for streamlining & regulating the movement of freight traffic in urban area. There are various measures for goods vehicles access and loading/unloading operations described in the toolkit have immense potential in management of urban freight. These include truck routes, signage system, time regulations, access and loading/unloading regulations, on street loading bays, night deliveries, nearby deliveries, low emission zones and urban freight information maps. In addition there are route bans and local area bans which are applicable at local site level. Further the ITS has a very important role in improving the efficiency in urban freight operation. Various supporting technologies for ITS, including vehicle telematics (on-board units), global positioning systems (GPS), smart cards, and video messaging signs can also be used to improve route and trip planning of freight transport as well as services provided to customers in urban areas.

Urban Freight Policy Measures

The toolkit highlights various policy objectives and measures for improving sustainability of urban freight transport. Various urban freight policy measures related to planning such as land use policies, zoning and building regulations for delivery activities; Parking policies, provision of delivery spaces; Consultation policies, private/public partnerships; Environmental zones, mixed use buildings, multi-story urban logistic buildings; and innovative policies low emission zones, unattended delivery systems (locker banks), etc. have been discussed . In addition various urban freight management policies such as vehicle access restrictions, space management, pricing etc. have been presented in the toolkit for adoption in context of developing countries. A policy evaluation framework has also been evolved for the benefit of decision makers.

Case Studies of Best Practices

The tookit presents an overview of some of best practices of urban freight all over the world. These case studies relate to various planning policy areas such as freight consolidation centres (Bristol, Heathrow airport), urban logistics space (Paris), freight quality partnerships (U.K), cargo cycles (Paris), nearby deliveries areas (France), off peak delivery or out of hour delivery (New York, London) and Last mile delivery solution such as locker banks (Germany). Some of the best practices in Indian context such as Mumbai Dabbawala (Mumbai) and Urban Delivery Van Network (Jaipur) have also been highlighted.

Chapter 1:

Introduction

1.1 Background

Freight movement in cities of India varies by size and function of the cities. While macro level freight traffic data base is generated as part of comprehensive transport plan preparation exercise undertaken from time to time, the freight logistics aspects related to supply chain linkages, storage, handling, distribution aspects including the modes used etc. is not given enough importance. With the growing economy cities are focusing on building their infrastructure development plans to cater to the urban sprawl and governance mechanism to handle the same. As part of this effort it is imperative to understand the vital role of urban freight transport which is often neglected in our planning and policy making process.

The freight sector is also faced with a number of challenges such as congestion, parking for deliveries and reverse logistics (e.g. recycling and garbage collection). Some of the factors which act as barriers to sustainable urban goods movement are the lack of awareness, understanding and overall vision to urban goods movement. In addition lack of information about flow of urban goods movement, fragmentation in nature of stakeholders and gaps in skills and knowledge are also contributory factors leading to neglect of urban freight sector. There is also an absence of coordinated urban freight policy involving various stakeholders such as transport operators, planners, decision makers, local authorities etc. Besides there is also an absence of integration between urban freight in town planning and land use/infrastructure planning leading to logistics sprawl.

Fig. 1.1 shows the relevance of urban freight transport.

Figure 1.1 Relevance of Urban Freight Transport

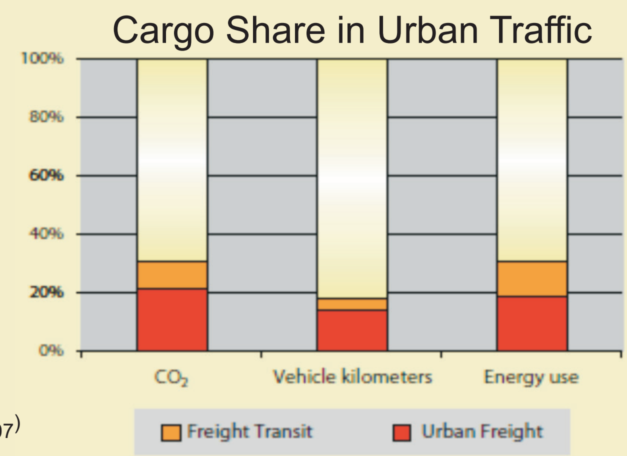
Urban goods transport (including transiting heavy Goods vehicles) accounts for :

- – 18% of the vehicle kilometres
- – 31% of the energy use
- – 31% of the CO_2 emissions

In urban areas.
It also contributes significanctly to No_x, SO_2 and particle emissions, accounting for almost 50% of the latter.

(Source: Dablanc, 2006)

(Graphic by Dominik Schmid, based on Data from European Union, 2007)



Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

A review of urban freight logistics research efforts indicate that while a lot of good practices have emerged during the last decade or so in improving the understanding of freight issues and their possible solutions in developed countries, much remains to be desired in cities of developing countries like India possibly owing to lack of empirical evidence from such countries. Emerging trends such as changes in mix of manufactured products, improvement in information and communication system (ICT), spatial shifts in location of manufacturing centres, Just-in-time (JIT) practices, changes in retail structures (e–tailing), emerging needs for direct deliveries etc. in cities of developing countries in India are likely to affect the pattern of freight movement to and from cities and also within cities as a result of urban sprawl phenomena. Moreover in the present state-of-the art of city planning in developing countries like India very little importance is given to understanding the characteristics, problems and potentials of goods movement to, from and within urban areas both by planners as well as decision makers. Further the approach for freight infrastructure planning is generally insensitive to the diverse nature of goods movement and there is an absence of appropriate capacities to adequately address the issues emanating out of need for freight movement.

1.2 Objectives of the toolkit

The purpose of the toolkit is to provide an understanding of various aspects of urban freight transport planning and management. The toolkit aims to serve as a guide to effectively plan, design, and manage urban freight transport system and its facilities which can improve the overall urban freight operational efficiency.

1.3 Users of the toolkit

The target users for toolkit are key stakeholders including city level officials, planning authorities, consultants, enforcement agencies such as traffic police , transport departments and other stakeholders who are associated with the planning, designing and management of freight transport operations. In addition the toolkit would be

useful for students, researchers and policy /advocacy groups related to the field of urban freight transport.

1.4 Scope of the toolkit

This toolkit would provide guidance to city officials, planners and consultants involved in preparation of urban freight related strategic planning and management plans. This toolkit has been developed taking into account principle of urban freight transport planning & management besides an in depth understanding of best practices across various cities of the world.

1.5 Structure of the toolkit

Chapter 1 deals with the background of the toolkit, need for urban freight planning its objectives and target users

Chapter 2 highlights the importance of urban freight transport, its various components and stakeholders. It further presents the current state of freight trends in Indian cities and the issues emerging in the urban freight sector

Chapter 3 presents the urban freight planning process including the type and method of data, freight demand models and planning norms for various types of freight facilities

Chapter 4 presents various approaches of urban freight management related to freight vehicle access and loading /unloading operations in urban areas

Chapter 5 discusses various policy measures for sustainable urban freight planning and its management

Chapter 6 presents various case studies of urban freight best practices based on international experiences from Bristol, Heathrow Airport, Paris, London, New York , Utrecht besides Mumbai and Jaipur

Chapter 2:

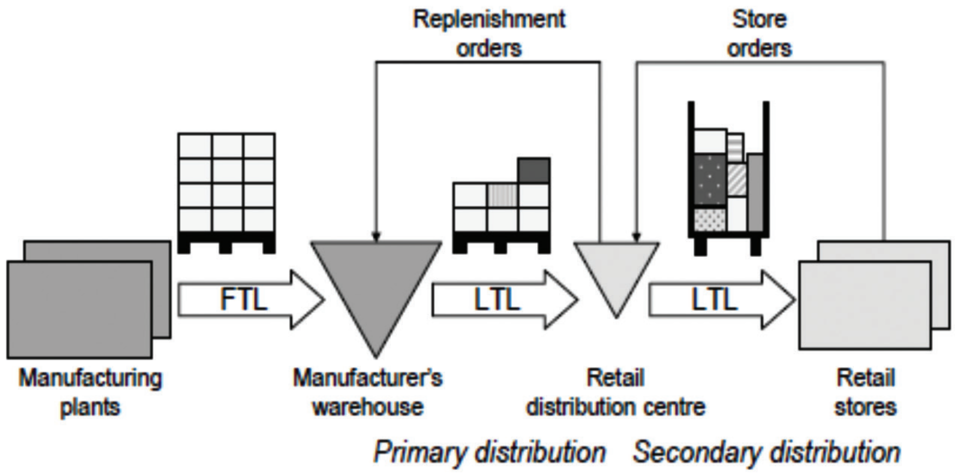
Urban Freight Transport

2.1 Introduction

Freight transport is the main element supporting global supply and commodity chains, from the transformation of raw materials to market distribution and after-market services. An efficient and effective logistics sector is vital to the economy because of its enabling effect. As economic activities in cities expand and city population grows, a substantial amount of freight traffic would be generated. The timely and smooth movement of such freight is crucial to the well-being of the people and the viability of the economic activities they undertake. Freight traffic and movement of goods within the city and 'passing through' the city affects overall city mobility.

Urban goods transport is concerned with establishing an effective interface between the regional or global realms of freight transport and the last mile of urban freight distribution. It concerns a vast range of activities insuring an adequate level of service for a variety of urban supply chains. A typical retail supply chain is shown below in Figure 2.1

Figure 2.1: The retail supply chain



Source: Hans Quak et. al.
FTL: Full Truck Load
LTL: Less than Full truck Load

2.2 Why urban freight transport is important

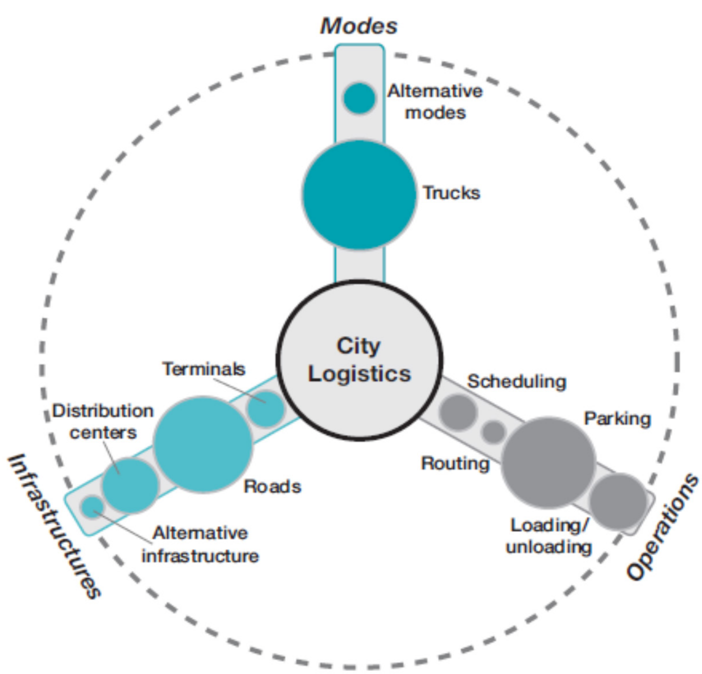
The movement of goods within urban areas is vital since cities are the centre of economic and social life. The sustainability of cities cannot be viewed without giving considering the role of goods transport. While a city can be perceived as an economic, social, political and cultural entity, urban freight distribution underlines the physical and managerial activities necessary to support all of the above. According to UNHABITAT (2013) report depending on the context, goods transport accounts for 10 to 15 percent of vehicle equivalent kilometres travelled in urban areas, 2 to 5 per cent of the employed urban workforce, and 3 to 5 per cent of urban land use. A city not only receives goods but also ships them: some 20 to 25 per cent of truck-kilometres in urban areas are outgoing freight, 40 to 50 per cent are incoming freight, and the rest is comprised of both originated as well as delivered within the city.

Goods Transport is a fundamental component of urban environment. It is concerned with establishing an effective interface between the regional realms of freight transport and last mile of urban freight distribution. It is vital for social and economic viability of urban areas and has immense implications in the environment landscapes in cities. The objectives of city planning, in particular, and city transport system planning, in particular, is to enable goods movement at desired levels of efficiency of goods movement.

2.3 What are key components and actors of urban freight transport

There are three main components of city logistics: the modes that carry the freight, the infrastructure supporting freight flows and the operations related to their organization and management (Fig. 2.2). Each component has

Figure 2.2 : Components of city logistics and their relative importance



Source: UNHABITAT (2013)

subcomponents with their own characteristics and constraints. City logistics, as a last mile distribution strategy, can take many forms depending on the concerned supply chains as well as the urban settings in which it take place.

There are four general stakeholders groups that are shaping urban freight distribution: cargo owners (e.g. retailers, manufacturers, wholesalers); residents; distributors (mostly carriers, third party logistics companies and freight forwarders); and planners and regulators. Planners and regulators try to set rules under which urban freight distribution takes place, aiming to satisfy their constituents as well as commercial, transport and distribution interests.

Table 2.1 shows the type of stakeholders and their interests.

Table 2.1 Major stakeholders in urban freight transport and their interests

Stakeholders	Objectives/Interests
Residents (consumers/workers/ visitors)	Good living environment, minimum hindrance caused by freight vehicles and negative environmental impacts
	Timely availability of goods
	Attractiveness, good shopping atmosphere
	Accessibility and parking spaces
Retailers/receivers	Good shopping ambience
	Competitiveness and profitability
Transport operators	Attractive working environment
	Adequate freight transport infrastructure
	Cost efficiency and profitability
	Accessibility
Government authorities (local, state and national)	To manage quality of the city centre to attract shoppers, tourists, workers and residents
	Effective and efficient transport operation
	To resolve the conflict between stakeholders
	Economic growth

Source: UNHABITAT (2013)

The land used for freight infrastructure can be particularly extensive in metropolitan areas that are points of convergence for regional material flows, and involve several stakeholders. Table 2.2 shows the major stakeholders in urban freight distribution with their land use handhold.

Table 2.2 Major Stakeholders in urban freight distribution

Transport Sector	Function	Land-use handhold
Maritime shipping companies	Key actors in global trade, owning fleet assets that are capital intensive. Establish shipping networks composed of a sequence of ports of call.	Limited. Often through parent companies (e.g. terminal operators, third-party logistics providers),
Port terminal operators	Operate major port terminal facilities, mostly through concession agreements. Interface between maritime and inland transport systems.	Mostly lease terminal facilities with long-term bails.
Port authorities	Manage the port's land and its development, such as leasing terminal facilities. Interact with maritime and inland stakeholders.	Landlords controlling significant parcels of centrally located waterfront real estate.
Real estate promoters	Development freight-related activities on their real estate, such as logistics. Lease for distribution facilities.	Various private commercial real estate holdings depending on local regulations. Lease the facilities to private companies such as freight forwarders.
Rail and rail terminal operators	Responsible for moving freight	Significant handhold in central areas, including terminals and rights of way.
Trucking industry	Carry freight over short to medium distances. Provide and organize road transport services between terminals, distribution centres and final customers (last mile).	Limited holdings (warehouses) but heavy users of road and terminal facilities.
Third-party logistics providers	Organize transport on behalf of their customers. Contract transport and distribution activities, sometimes with their own assets (e.g. trucking companies, air cargo, distribution centres).	Various, but mostly limited (some an own distribution centres)
Air freight transport companies	Provide air transport services for high-value and time-sensitive cargo.	Significant holdings (e.g. distribution centres) near airport facilities.
Freight forwarders	Provide services to cargo such as packaging as well as load consolidation (different small loads into one large load). Organize regional and international freight deliveries, either by contracting to transport operators (truck, maritime, rail) or third-party logistics providers.	Significant holdings in logistics zones. Many rent the facilities they use.

Source: UNHABITAT (2013)

2.4 What are the current urban freight trends in Indian cities

2.4.1 Daily Goods Flow

Goods vehicle constitute an important component of the traffic flow on the road system in urban areas. While macro level freight traffic data base is generated as part of comprehensive transport plan preparation exercise undertaken from time to time, the freight logistics aspects related to supply chain linkages, storage, handling, distribution including the modes used etc. is not given enough importance. Very limited studies have been carried out in India which are focussed on urban freight movement aspects. According to one of such study carried out by CRRI in 1998, it is observed that goods traffic generally tends to vary consistently with respect to city size, its economic base and its location (Table 2.3).

Table 2.3 Daily goods flow in selected cities in India

Cities	Population (Lakhs)	Intercity Inbound		Intercity Outbound		Intra-city flow	
		Vehicles	Tonnes	Vehicles	Tonnes	Vehicles	Tonne
Ahmedabad	32.97	7060	42994	2087	12811	7019	13996
Nagpur	16.61	2754	18556	1112	6501	8517	8234
Indore	11.04	3699	23236	1183	11988	1863	4237
Vishakhapatnam	10.52	2604	18026	267	829	1244	645
Agra	9.56	2934	17103	1551	5873	3185	2888
Asanol	7.64	798	4115	423	143	1677	556
Nashik	7.22	2731	16558	348	1854	879	1715
Bhubaneswar	4.16	2206	15494	118	660	185	215
Ajmer	4.02	1469	7618	4	51	1534	1413
Yamunanagar	2.20	2648	14956	1294	10805	210	1567
Adoni	1.36	642	2884	517	2329	501	528
Darjeeling	0.73	140	557	39	66	524	326
Samastipur	0.58	1650	6319	134	237	242	302
Chickballapur	0.47	210	943	79	154	27	43

Source: CRRI study (1998)

2.4.2 Freight Traffic Generation

According to study carried out by RITES for 21 cities in the year 1998 the freight traffic generated across cities of various typologies is presented in Table 2.4. It can be observed that the freight traffic generation is a function of city size and its economic activities and tends to increase with city size.

Table 2.4 Freight traffic generated (in tonnes)

Sl. No	City	Estimated Population - 1994 (in Lakhs)	Generated Freight Traffic (originating and destined in tonnes)
1	Shimla	1.16	2,172
2	Agartala	1.66	4,637
3	Udaipur	3.36	24,631
4	Rourkela	4.28	10,219
5	Guwahati	6.38	25,023
6	Vijayawada	9.1	81,952
7	Varanasi	11.13	24,704
8	Vadodara	12.11	78,002
9	Ludhiana	11.21	65,493
10	Bhopal	12.2	31,876
11	Kanpur	21.74	91,442
12	Ahmedabad	35.83	65,755
13	Kolkata	116.4	56,546
14	Guruvayur	1.22	10,728
15	Panipat	2.11	67,254
16	Tiruppur	3.24	95,017
17	Hubli-Dharwad	6.92	46,232
18	Dhanbad	8.56	54,166
19	Vishakhapatnam	11.2	52,920
20	Nagpur	17.65	60,168
21	Pune	26.46	68,999

Source: RITES study

2.5 What are the issues associated with urban freight and policy initiatives in Indian cities

2.5.1 Issues

While Indian cities have adopted common strategies to cater to its urban freight such as day restriction for trucks and trailers, development of freight handling facilities outside the urban limits and so on, there are still a number of issues affecting urban freight logistics which need to be addressed in the city planning efforts and urban transport policy formulation process.

i. There is an absence of a comprehensive understanding of supply chain and freight logistics in urban area among city planners and decision makers resulting in to transport-related policies and facilities

being planned merely from the passenger transport perspective, without giving adequate consideration to the needs of freight transport.

ii. The existing development controls norms on freight activity generators such as warehouses, logistic parks, inland container depots; SEZs, logistics hubs, etc. are almost non- existent. Also there are no statutory planning norms for transport nagars, truck terminals, integrated freight complexes etc. which has resulted in irrational space provisions for such facilities in various cities (Fig. 2.3 and Fig. 2.4).

Figure 2.3 : Lorry blocking the road Visakhapatnam

Figure 2.4 Haphazard parking of trucks at Sanjay Gandhi Transport Nagar Delhi

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

iii. There is a significant disconnect observed between industry and the government bodies who handle city transport network operations. The entire supply chain is predominantly a private operation, own or hired. Most of the warehousing setups are also in private ownership, dealing with own or third party cargo.

iv. Many logistic operators including trucking companies have a business model of buying land for developing warehouses or logistic parks in India. Based on city master plan planning restrictions, such developments are at outskirts or city periphery based on availability and size of land resulting in logistics sprawl. This leads to non-unified planning and design of warehousing facilities besides sub -optimal logistics operations.

v. The data regarding urban freight is scarce and scattered. To draw solutions for urban freight issues, it is crucial to accurately monitor the same. Truck movement today can be captured at octroi posts however there is none or inaccurate information on storage, dwell time, routes, operators and so on. There is also a very major issue of informal market existing in Indian cities whose cargo movement, though extremely vital for servicing city dwellers needs, becomes difficult to assess for rational urban distribution.

vi. There is an absence of effective scientific based traffic management strategies which will take into account the rapid emergence of smaller size vehicles and flexible goods activity schedules for distribution in future.

vii. There is non-standardization of goods delivery vehicles which range from a mix of various sizes of trucks to non-motorized transport (including hand or animal pulled carts). Further very little emphasis is given to identify the desirable modal mix for urban freight operation and explore the potential of alternate modes such as urban rail or IWT for freight deliveries.

2.5.2 Recent Policy Initiatives

The National Urban Transport Policy (2006) for India notes that 'cities would be encouraged to build by-passes, through innovative and viable public – private partnerships. Similarly, facilities for the parking of freight vehicles outside city limits, such as truck terminals, would also be encouraged through public-private partnerships'.

According to Working Group Recommendations on Urban Transport for 12th Five Year Plan (2012) it is noted that there needs to be a much greater focus on planning for movement of goods overall, since it is almost universally recognized that transport of goods is important and will grow with economic growth. The subject needs to be studied in depth to evolve planning norms that permit goods movement without affecting passenger movement.

In the light of above mentioned issues and growing importance of urban freight transport there is a need for its rational planning and management.

Chapter 3:

Urban Freight Planning Process

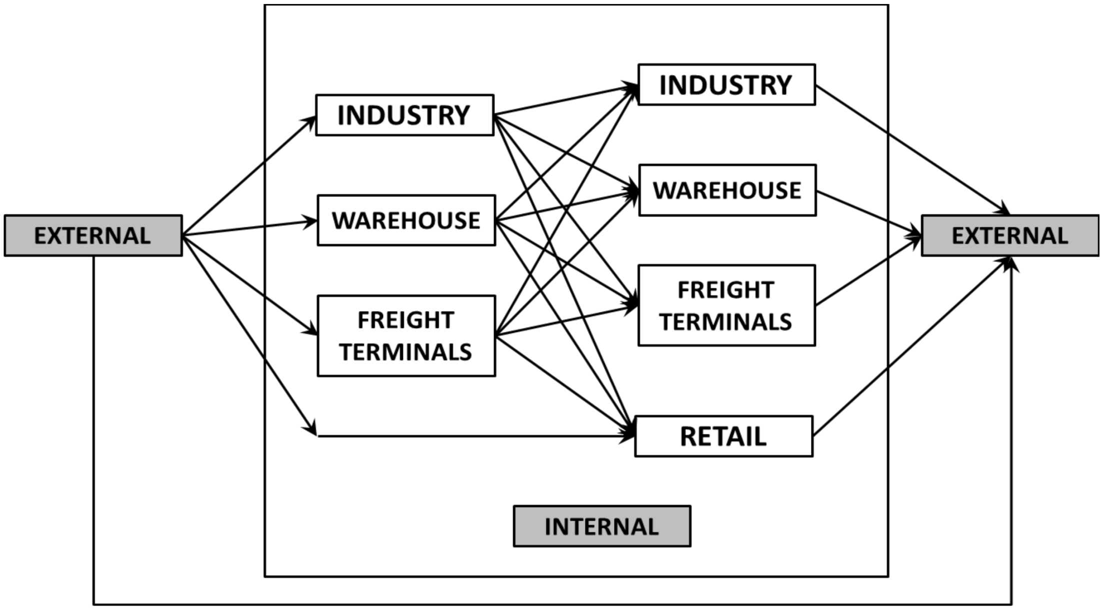
3.1 Introduction

Urban freight planning process encompasses primarily the activities related to freight data collection and its analysis, freight demand assessment and planning for freight handling and parking facilities including its land area assessment, site selection and layout planning. In addition freight traffic management and policies are required to ensure an overall efficient and sustainable movement of freight traffic in urban areas.

The goods flows are broadly be of three types as shown in Figure 3.1, namely:

- Intra-city flows – Flows whose origin and destination are within the city.
- Inter-city flows – Flows whose one end (origin or destination) is within the city and other outside the city.
- Regional flows – Flows whose both ends (origin and destination) are outside the city.

Figure 3.1 : Patterns of freight flows



The types and patterns of freight transport movement within an urban area will depend on a wide range of factors including:

- Location and type of industries present
- Supply chain structures of the companies in these industries
- Existing transport infrastructure
- Location and extent of warehousing facilities
- Size and weights of goods vehicle permitted to operate in the urban area
- Access and loading regulations applied in the urban area
- Existing road traffic conditions
- Behavior of customers (use of e-commerce, etc.)

3.2 Freight data collection

3.2.1 Background

Any form of planning or policy about freight system would require information system about the freight and the likely consequences of planning or policy action. The data needs would vary with the issuers concerned, the planning and policy framework within which the issue arises, the data collection practice and the availability of past data. Broadly two types of urban freight data would be required which are potentially useful in planning or policy context:

Transport systems data which may be either site specific or city/region specific. The site specific data would relate to applications such as inventories of loading facilities, parking and traffic management techniques provisions, site based trip generation, dwell times, loading facility usage etc. It may be cross classified by such variables as time of day, truck type etc. The site specific data may be analysed to produce site specific forecasts. These are limited in scope and directed at estimating future levels of activity at the site so that adequate access and loading/unloading provision can be made. The city/region specific data is useful in city wide/metropolitan wide or corridor transport infrastructure planning. The data in this case include truck traffic counts, truck trip generation and travel patterns classified by timer of day, type of vehicle, owner type etc. Other data useful in this category are link travel times, truck accident data, truck noise etc. hazardous vehicle routing.

Regional economic data which may include information on regional profiles such as income, population, economic base, employment, turnover, potential key industries, industrial growth, inter industry linkages etc.

3.2.2 What type of data needs to be collected

The urban freight data needs in context of city wide/metropolitan wide or corridor transport planning and policy broadly fall into five areas:

i. **Truck fleet:** It would include information related to size of vehicles (light, medium and heavy), Type of vehicles, based on configuration attributes (rigid, tractor semi- trailer etc.) or body type (van, refrigerated,

tanker, etc.), ownership (hire operations, owners drivers, non-freight etc.), sector operations (intra-urban, intra- state, inter- state etc.)

ii. **Truck flows:** Information related to truck flow intensities, variations by time of day, direction of flow, type of vehicle, traffic desire pattern (O/D), tonnage handled etc.

iii. **Commodity flows:** information of each consignment such as origin and destination location and land use, commodity classification, commodity type, consignment size, truck load, type of packaging, type of handling, ownership of goods, method of dispatch etc.

iv. **Major freight generators:** Information about freight generators (origin and destination of freight movements) at two levels, namely freight data such as mass of freight generated, with type of freight generated, truck trips generated and economic data such as employment (by category), population, jobs in relevant category, site area in categories etc. In addition specific data would also include tonnage by commodity by origin/destination, type of freight (general, containerised, bulk etc.), mode of transport etc.

v. **Major freight corridors:** planning and policy need to identify major corridors of goods movement which would follow from analysis of truck and commodity flows. The information needed for corridor would include commodity types moving along corridors, truck types using them and freight type (intra urban, intra state and interstate). For each corridor details pertaining to road network bottlenecks, network deficiencies, parking or access conditions, specific site deficiencies, black spots etc.

3.2.3 What are the surveys required

In order to collect the required information as stated in the earlier section following surveys are necessary to be conducted in urban freight planning and policy effort:

i. Road side interview survey

It normally involves working with the police or suitable law enforcement agency to stop vehicles on a sample basis and interview drivers at the roadside about their current trip. It is typically used to capture data about origin/destination, trip purpose, goods carried, and vehicle type. It is usually carried out carefully so as not to disrupt drivers and avoid causing unnecessary traffic congestion. It produces goods vehicle trip matrices for traffic modelling purposes. This survey is usually carried out for 16 hours within city limits near freight generation areas and for 24 hours at city limit boundary (Annexure A2.1)

ii. Vehicle traffic count survey

In this survey the goods vehicle traffic is counted and disaggregated by vehicle type. This can provide details of the types of goods vehicles on selected roads or routes, or crossing specified cordons by time of day and day of the week. It can include all vehicles so as to be provided, data on goods vehicles as a proportion of all traffic. This survey is usually carried out for 16 hours within city limits near freight generation areas and for 24 hours at city limit boundary (Annexure A2.2).

iii. Establishment survey

It is used to collect data about total goods vehicle trips to/from surveyed establishments, and variation by time, day and month. Details of establishments in terms of area, facilities such as godown and its location, employment, turnover besides parking space for loading/unloading are also collected. It can also be used to capture data about type and quantity of goods delivered/collected by various types of freight modes and freight trip generation rates for various commodities are usually obtained. It also allows collection of information about the delivery/collection process including vehicle types, time taken to load/unload, where vehicles stop, method of goods movement from the vehicle, and origin of vehicle/goods trips based on response from establishment owners. The survey provides both goods flow and vehicle activity data besides linking goods flow and vehicle activity to business sector/ land use/supply chain. The survey is carried out during the operational timings of the establishment (Annexure A 2.3)

iv. Parking survey

It is used to capture information about parking activity of goods vehicles in terms of accumulation, duration etc. both at off- street and on- street parking areas. It can assist in identifying the parking space requirements of goods vehicles both near establishments as well as off street idle parking lots. The survey provides a detailed insight into the use of kerb-space by goods vehicles and other road users. It also provides detailed data about goods vehicle type, loading/unloading locations and times and can be used to assess the suitability of parking/loading infrastructure. The survey carried out for at least 12 hours covering both morning and evening peak periods beside off peak period (Annexure A2.4).

v. Truck driver survey

It is used to gather detailed data about the driver's overall trip pattern on that vehicle round, as well as information about the loading/unloading/servicing activity in the specific street (including time taken, collection/delivery sequence, loading/parking locations, methods of moving goods from vehicle, etc.). It is usually conducted near establishments/idle parking lots with drivers being intercepted after carrying out their work. The survey can be used to obtain drivers' views on problems encountered in delivering to a particular area. The survey can be carried out on sample basis (Annexure A2.5).

Activities of a single vehicle over a single day or a few days could also be ascertained by recording driver's trips and activity data over the duration of the activities. Conducting this survey using GPS equipment can provide data on vehicle location at frequent intervals (thereby providing route information), as well as vehicle speed besides it can also be used to record stops for loading/unloading/ parking

vi. Truck operator survey

It provides the opportunity to collect wide ranging data about the pattern of freight operator's goods vehicle activities in the urban area. The data can be obtained on the entire vehicle fleet rather than just a single vehicle or round (as in a vehicle trip diary, the two types of survey can be used in conjunction).


It also provides the opportunity to obtain qualitative information about problems encountered by the company in urban freight operations. The survey provides data about an entire goods vehicle fleet and its activities and can be especially useful if studying fleet productivity or fuel efficiency. The survey can be carried out on sample basis (Annexure A 2.6).

vii. Truck terminal survey

In this survey the enumerators are positioned within the truck terminals to record data about the total area of the terminal, built-up area, parking area, number of truck operators located, operators using truck terminal, capacity of the terminal, parking fee, entry-exit truck flows along with their timings, convenience in parking trucks, convenience in loading and unloading of goods. It also captures information about vehicle type, how long they park the truck at the terminal and other facilities provided at the terminal. The survey is expected to provide answers to the existing capacity utilisation of truck terminal complex, pattern of inter and intra freight movement, shortfalls in terms of facilities and enable to scientifically provide for such facilities at other locations depending on the intensity of goods traffic.

3.2.4 What is the information system structure for urban freight in cities

There is a need to collect, collate and analyse urban freight information system for cities in India which will help decision makers and policy planners in taking informed decisions regarding urban freight planning and its management. Annexure A.1 shows a check list of information which needs to be periodically collected by city authorities.

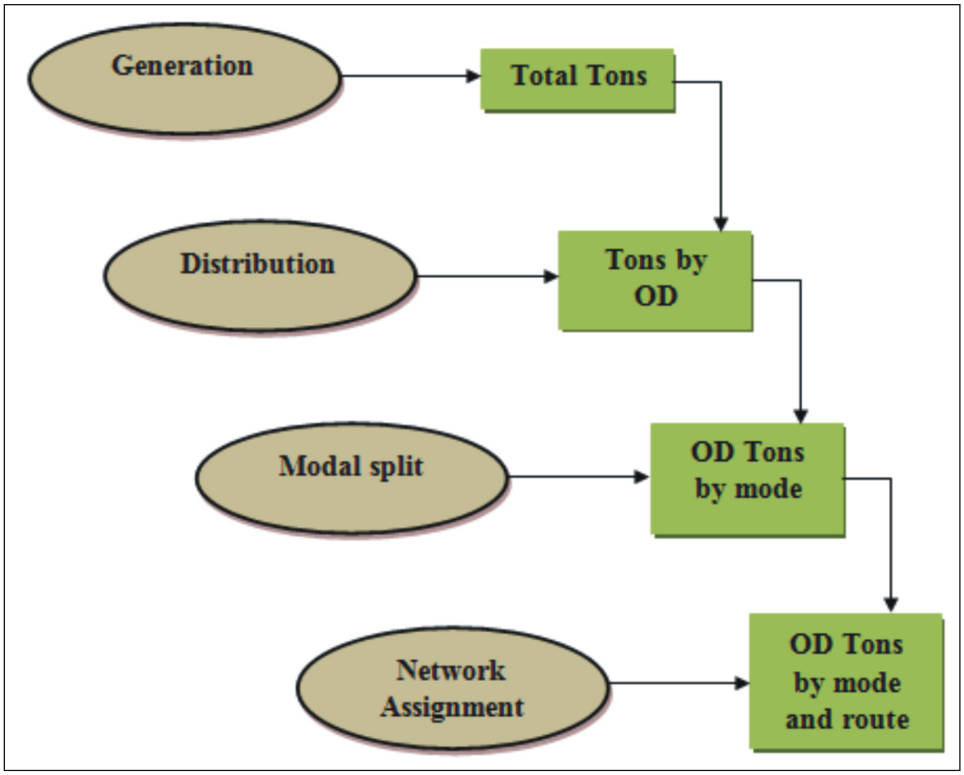
3.3 Freight demand modelling

Forecasting of freight transport activity is essential for taking informed policy decision about investment in increasing the capacity. The decision making process particularly in the public sector, requires a long lead time for planning and funding. Hence it is critical to match the future supply of freight infrastructure with future demand of freight traffic. Availability of forecasting models gives both public and private sectors decision makers' confidence to make long-term investment decision.

3.3.1 What is a four step freight travel demand model

This approach adopts a four steps travel forecasting stages include trip generation, trip distribution, mode choice, and trip assignment. Four step process of freight forecasting is shown in Figure 3.2

Figure 3.2: Four-Step Process of Freight Forecasting



i. Trip Generation (How Much Freight?)

Trip generation uses economic variables to forecast freight flows/vehicle flows to and from a geographic area using equations. The outcome of trip generation is the amount of a commodity and/or the number of vehicles that comes into or goes from a particular geographic unit in a specified unit of time. Trip generation models used in freight forecasting include a set of daily trip generation rates or equations by commodity. These rates or equations are used to determine the daily commodity flows originating or terminating in geographic zones as a function of zonal population and/or industry sector employment data. In other words, employment and/or population data are the essential input data required for computing freight trip generation.

The independent variables, such as employment and population, usually dictate the level of detail the freight flows can be generated using a trip generation model. This may be a traffic analysis zone (TAZ), which could be a ward within a city (internal zones) and a district/taluka outside city in the region (external zones) to capture inter -city trips. Appropriate aggregation of external zones could be done at analysis stage .The travel demand models can be developed at a TAZ level as long as the base and forecast year data at the required level of input detail is available at that geographic unit. Normally, one set of regression equations for the productions and one set of regression equations for attractions are estimated. These regression equations are either developed for each commodity group or truck type.


ii. Trip Distribution (Where does freight go?)

In trip distribution, the flow linkages between origin and destination for commodity tons/truck trips that were developed in trip generation are estimated. A gravity model can be constructed and calibrated at a pre-specified geographic detail. The considerations are the total trips that begin in the first zone, the trips ending in the second zone, and the impedance or difficulty to travel (such as cost or time) between them. The average trip lengths needed to obtain trip-length frequency distributions and friction factors which represent degree of difficulty are normally obtained from surveys.

The degree of difficulty of travel, usually a function of some impedance variable used in the distribution model needs to match the survey data (free flow time, congested travel time). The friction-factors are usually calculated as a negative exponential function of the average trip time from origin TAZ to destination TAZ. The parameters in the exponential function are calculated from the trip length frequency distribution, which describes the shape of the curve that is summarized by the average trip length.

iii. Modal Split (What mode does the freight use?)

Mode choice modelling is used if multimodal trip tables need to be prepared. The four major categories in which various factors that affect mode choice decision-making process fall into are:

1. **Goods Characteristics –** These include physical characteristics of goods such as the type of commodity, the size of the shipments, and the value of the goods;
2. **Modal Characteristics –** Speed of the mode, mode reliability, and the capacity;
3. **Total Logistics Cost –** Inventory costs, loss and damage costs, and service reliability costs; and
4. **Overall Logistics Characteristics** – Length of haul and the shipment frequency.

Choice Method

These methods are the most comprehensive as they examine the characteristics of each individual shipment and the available modes. The most common type of choice methods is the discrete choice logit model which shows the choices for individual shipments as a function of the utility that each mode provides to the shipper. The logit model actually calculates the probability that each shipment will use a particular mode. Summing the probabilities across all of the shipments provides the overall mode share. The coefficients in the utility function measure the relative importance of each factor in determining mode choice. The greater the utility that any alternative has, the higher the probability that this alternative will be selected. While logit models can be applied to a wider range of policy and investment studies they are complex to build and are very data intensive. The truck surveys are helpful for estimating the choice parameters, but these surveys are expensive and time-consuming to conduct.

Truck Conversion into Trucks

The freight trip tables after the mode split step are multimodal commodity flow tables in tons on which payload factors (average weight of cargo carried) are used to convert tons to trucks. The various sources of payload factors are 1) Truck drivers surveys that provide information about the tonnage and commodity being carried; 2) weigh stations that typically have weight information by truck type;

Network Assignment (How many freight trucks on network)

The process of allocating truck trip tables or freight-related vehicular flows to a predefined roadway network is known as the traffic assignment or network assignment. In developing a truck trip assignment methodology, some of the key issues and model components that need to be addressed and evaluated are:

- Time-of-Day Factors
- Roadway Capacity and Congested Speeds
- Volume-Delay Functions.
- Truck Prohibitions

Model Validation

Model validation involves testing the model's capability to predict current travel demand so that it can be used effectively to predict future travel demand. In this process the model predictions is compared with information other than that used in estimating the model.

3.3.2 What are types of freight demand models

The urban freight models are primarily of the following types:

i. **Commodity based models -** These are based upon the notion that since the freight system is basically concerned with the movement of commodities, the movement of these should be modelled directly. The state of the art for urban freight models of this type is primarily based upon a sequential modelling approach (generation, distribution, modal split, assignment) as described in earlier section.

ii. **Truck trip based models -** These models estimate truck trip activity directly. Three sub categories may be identified: a sequential, modelling approach and a direct estimation approach, similar to those described above for commodity based models, and a 'truck traffic generation' approach which estimates the number of truck trips generated by a site or area.

iii. **Other approaches –** These simpler methods area based on time series or cross-sectional data on urban freight, population and economic activities both at macro level and micro level.

3.3.2.1 What are commodity based models

i. **Commodity Generation**

This stage involves developing a series of models for the mass of commodity groups attracted to or produced by a zone, in terms of zonal land use variables using zonal regression analysis approach. While the freight activity would be represented by total tonnage generated, the explanatory measures representing economic activity could include employment size (blue collar, white collar, manufacturing etc.) besides population, zonal income, land use type, establishment type etc.

ii. **Commodity Distribution**

A commodity distribution model would take the commodity attraction and production estimates


produced in the commodity generation phase and link origins to destinations. A typical model formulation would be:

Where;

$Q_{ijk} = (O_{ik} D_{jk} d_{ij}^{-b}) / \Sigma (O_{ik} d_i j^{-b})$

Q_{ijk} = tonnes of commodity k moved from origin zone i to destination zone j

O_{ik} = total production of commodity k in zone i (tonnes)

D_{jk} = total attraction of commodity k to zone j (tonnes)

d_{ij} = distance (time) between zone i and zone j

b = calibration constant

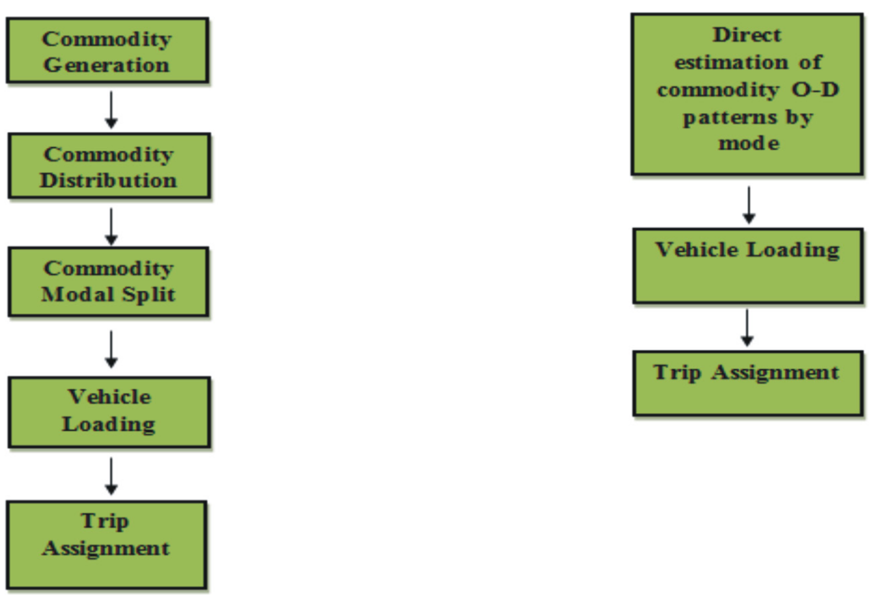
iii. **Commodity modal split**

With the help of this sub-model the goods volumes transported between certain origins and destinations, in number of tons, per mode of transport and per transport system, are converted into number of-movements by type of transportation mode with a given loading capacity.

iv. **Trip assignment**

The assignment of truck trips (based upon origin-destination truck trip matrices) involve feedback between assigned volumes on a link and the travel 'cost' (e.g. travel time) on that link. The truck trip assignment needs to be done in conjunction with the assignment of passenger trips. It is relevant to note that the networks available for passenger motorized vehicles and trucks may not be identical, due to restrictions on truck usage of some links which should be reflected in the modelling procedures. Figure 3.3 shows the various stages in commodity based models.

Figure 3.3: Stages in commodity based models

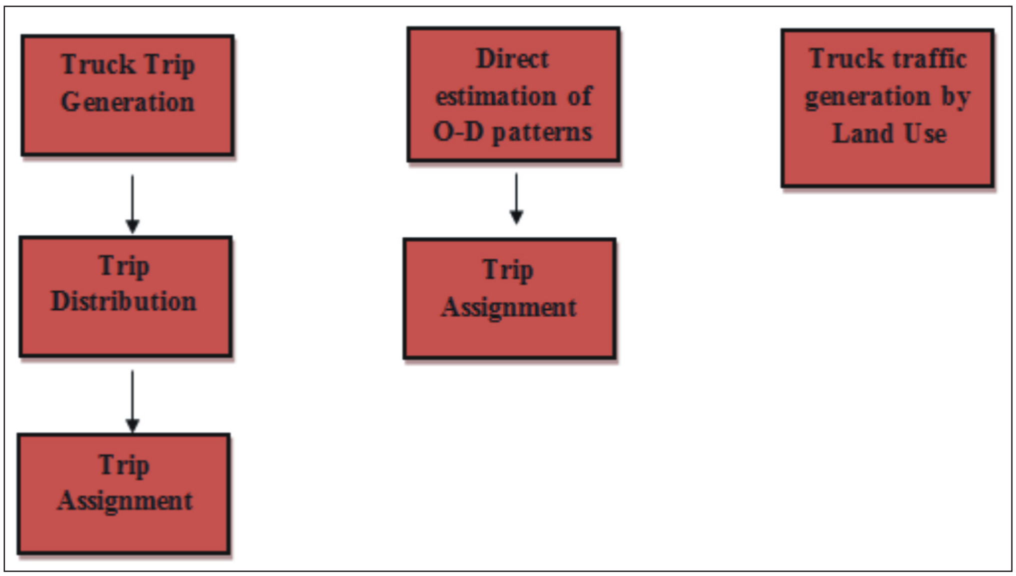


3.3.2.2 What are truck trip-based models

Truck trip generation

Truck trip generation models are those which use independent variables aggregated to a zonal level, and which give output as the number of truck trips attracted or produced for that zone. Conventionally urban truck trip generation has been found to be related to aggregate variables such as total employment, area under different land uses etc. Another type of truck trip generation model could be for estimating the number of truck trips associated with a specific site or area level which is useful in planning site access, determining the number of loading docks or bays, and generally providing facilities for trucks at new industrial, commercial or retail sites. It is often based upon an assumption about the number of truck trips generated per unit site or floor area or employment levels. Figure 3.4 shows stages in truck based models.

Figure 3.4: Various stages in truck based models



3.3.3 What are other approaches of freight forecasting

In addition to the above mentioned approaches freight demand could also be forecasted using growth factor methods and regression analysis using either time series data or cross sectional data. A description of these methods is briefly described as under:

i. **Simple Growth Factor Methods**

This procedure involves applying growth factors to baseline freight traffic data or economic variables in order to project the future freight travel demands. The growth factor approach is classified into two types – the more commonly used method of forecasting future activity based on historical traffic trends, and the less commonly used method based on forecasts of economic activity. The first approach involves the direct application of a growth factor, to the baseline traffic data. Alternatively a trend line could be fitted to the historical time series

data of freight traffic using various methods such as linear, geometric or exponential method. The second approach recognizes that demand for freight transportation is derived from underlying economic activities (e.g., employment, population, income, etc.). With this assumption, growth factors for economic indicator variables, which represent the ratios of their forecast year values to base year values, can then be used as the growth factors for freight traffic. This procedure requires data or estimates of freight traffic by category/commodity type for a base year, as well as base and forecast year values for the corresponding economic indicator variables.

ii. **Regression Analysis Method**

Regression analysis involves identifying one or more independent variables (the explanatory variables) which are believed to influence or determine the value of the dependent variable (the variable to be explained), and then calculating a set of parameters which characterize the relationship between the independent and dependent variables. For freight planning purposes, the dependent variable normally would be some measure of freight activity and the independent variables usually would include one or more measures of economic activity (e.g., employment, population, income).

CRRI in its study carried out in 1998 for selected cities in India developed regression equations correlating freight traffic (both vehicular trips as well as tonnage) with population for destined inter- city as well as intra- city freight flows .These equations are as follows:

i) Intercity Inbound Flows

$IIV = 33.1 (P)^{0.63}$

$IIT = 91.2 (P)^{0.75}$

ii) Intercity Outbound Flows

$IOV = -333.4 + 1.3613 (P)$

$IOT = -2683 + 9.01 (P)$

iii) Intra-city Flows

$IV = 1.32 P^{1.08}$

$IT = 1.62 P^{1.08}$

Where,

IIV = Intercity inbound vehicular trips

IIT = Intercity inbound tonnage

IOV = Intercity outbound vehicular trips

IOT = Intercity outbound tonnage

IV = Intracity vehicular trips

IT = Intracity tonnage

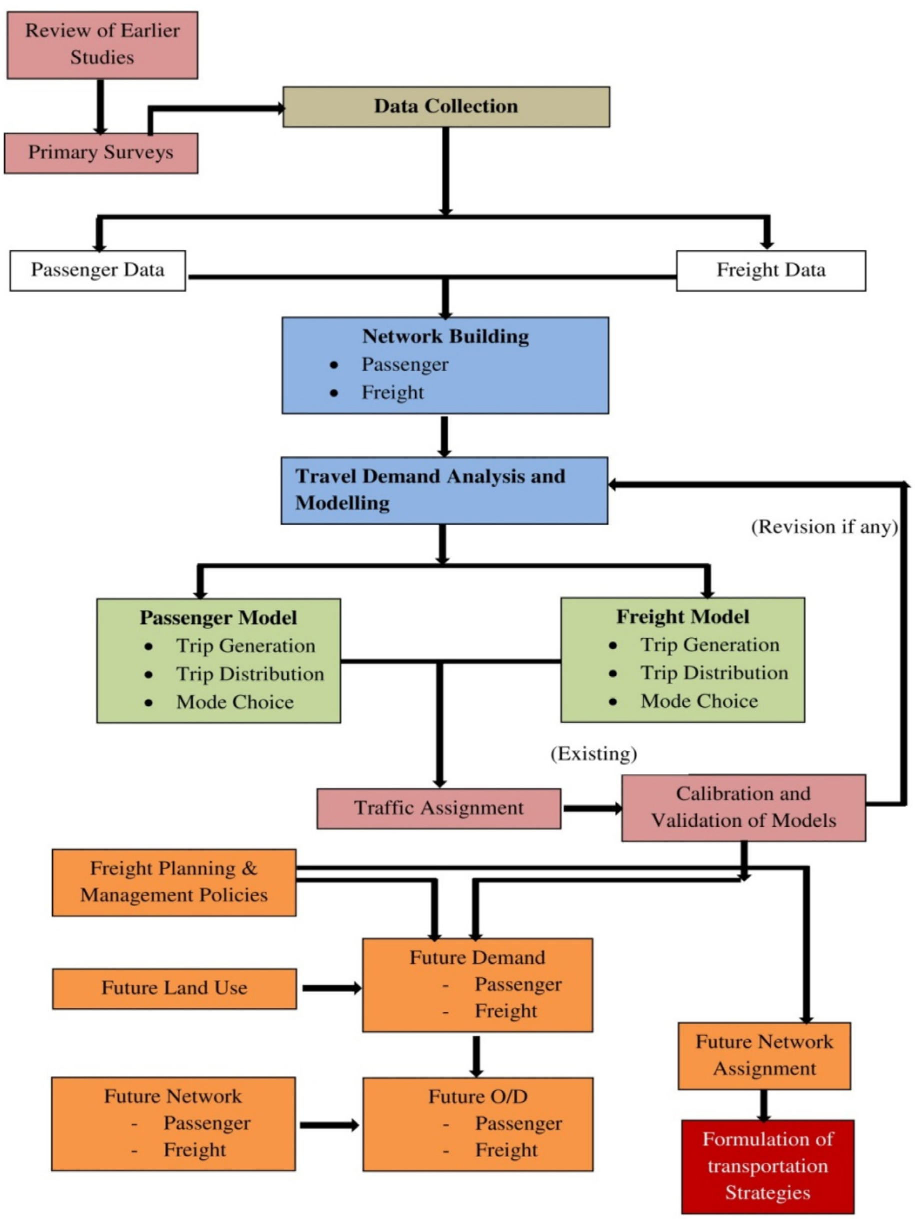
P = Population (‘000)

The above mentioned equations in the absence of a freight demand model owing to non-availability of requisite data, could be used for a rapid assessment of inter and intra-city freight flows in Indian cities.

3.3.4 Integrated Passenger and goods transport demand modelling framework

In the current state of practice the conventional four stage demand model is largely for passenger movement and does not explicitly account for goods traffic. In order to obtain a realistic assessment of travel demand in urban areas on various road network links, it is imperative that the goods traffic is also modelled along with passenger traffic as part of the overall transport demand model. As part of this approach various policy planning and management issues effecting freight movement need to be incorporated in the modelling framework to come out with the likely freight demand. A broad conceptual modelling framework incorporating passenger and goods movement in urban transport planning process is shown in Fig. 3.5 below

Figure 3.5 : Broad Transport Demand Model Framework incorporating Passenger and Goods Traffic

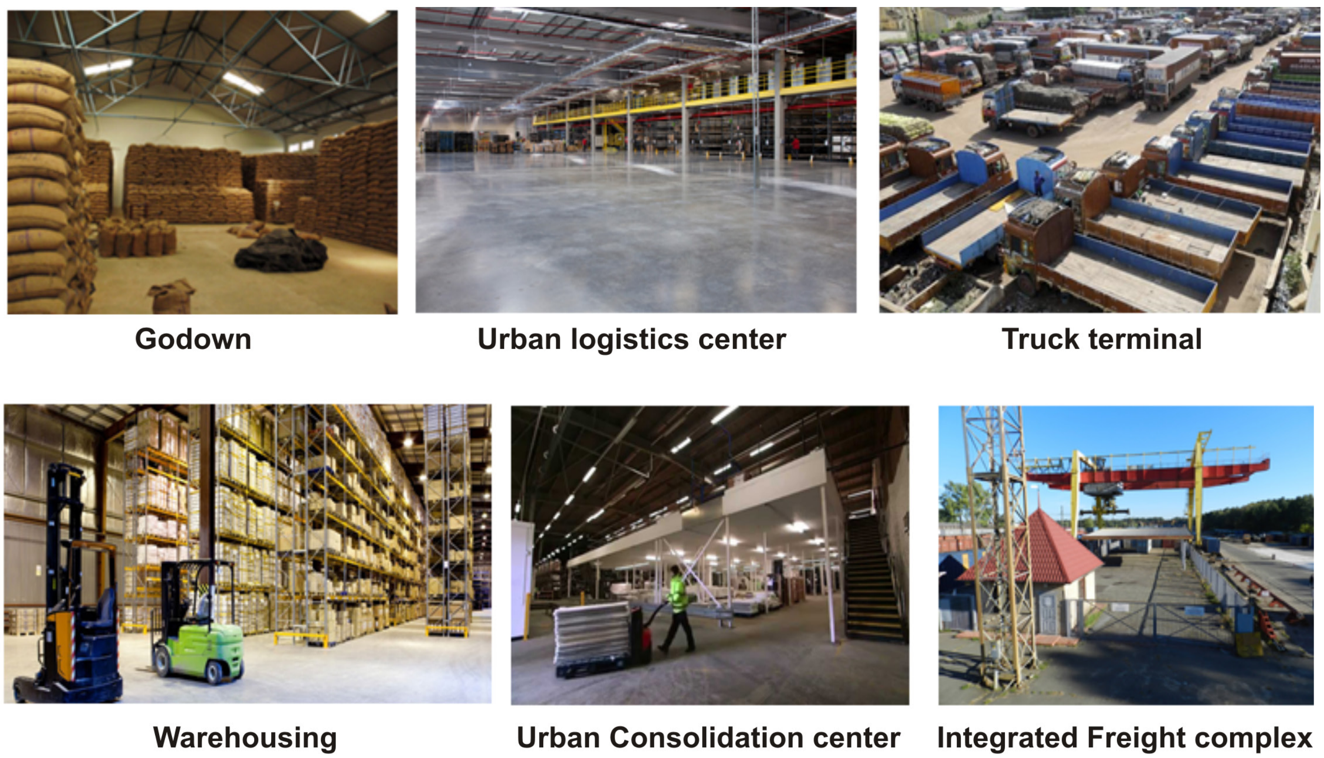


3.4 Freight Facility Planning

3.4.1 What are various types of freight facilities

There are varieties of freight facilities needed to facilitate logistics activities with location, space and transport facilities and to consolidate goods flow. These freight facilities are intended to improve urban goods traffic, boost the regional economy and enhance international trade. The main function of the terminal-type freight center is the distribution of freight from long- distance trucks to small city delivery trucks. Some of the important freight facilities are Integrated Freight Complex, Truck Terminal, Urban Consolidation Centre (UCC), urban logistics spaces and godowns or warehouses (Figure 3.6).

Figure 3.6: Various types of Freight handling facilities.



3.4.1.1 Integrated Freight Complex

Integrated Freight Complex (IFC) is a complex which enables an efficient freight trading, handling and distribution environment in the city within one integrated complex. It provide facilities for regional and intra-urban freight movement, warehousing and storage facilities and inter-link these sites with specialized markets, provide servicing, lodging and boarding, idle parking, restaurants and other related functions within the complex. It includes all the commodities markets and facilitates trading needs of any retailer.

The important and critical component of an IFC is the transport component. The IFC is connected to other parts of the city, including the central area, and the city regions, with a good transport network and service system. Transport terminal both of truck and rail terminals are integral parts of an IFC. Adequate parking for all modes is important in this complex. According to UDPFI (1996) guidelines about 1 hectares of land for IFC is required for about 400 tonnes of goods inflow movement in the city. Table 3.1 shows the broad break up of the land use pattern with an IFC.

Table 3.1: Broad land use breakup of an IFC

Use Type	Percentage of Area
Wholesale Market	35
Warehousing	8
Booking Agencies	2
Commercial & Public/Semi-Public	5
Utilities & Services	3
Service Industry	4
Parking	12
Circulation	25
Others	6
Total	**100**

Source: UDPFI Guidelines (1996), URDPFI Guidelines (2014)

IFC's in urban area are usually located on the periphery of its city limits closer to the National Highways closer. For example in Delhi Master Plan at Gazipur (NH-24), Narela (NH-1), Dwarka (NH-8) and Nadanpur Khadar (NH-2) respectively. Usually such facilities are to be provided in large metropolitan areas.

3.4.1.2 Inland Container Depot

The primary functions of an Inland Container Deport (ICD) or Dry Port and Container Freight Station (CFS) may be summed up as under:

a. Receipt and dispatch/delivery of cargo.

b. Stuffing and stripping of containers.

c. Transit operations by rail/road to and from serving ports.

d. Customs clearance.

e. Consolidation and desegregation of LCL cargo.

f. Temporary storage of cargo and containers.

g. Reworking of containers.

h. Maintenance and repair of container units.


Functionally there is no distinction between an ICD/CFS as both are transit facilities, which offer services for containerization of break bulk cargo and vice-versa. These could be served by rail and/ or road transport. An ICD is generally located in the interiors (outside the port towns) of the country away from the servicing ports. CFS, on the other hand, is an off dock facility located near the servicing ports which helps in decongesting the port by shifting cargo and Customs related activities outside the port area. CFSs are largely expected to deal with break-bulk cargo originating/terminating in the immediate hinterland of a port and may also deal with rail borne traffic to and from inland locations.

The operations of the ICDs/CFSs revolve around the following activities :

i. **Rail Siding (in case of a rail based terminal)**

The place where container trains are received dispatched and handled in a terminal. Similarly, the containers are loaded on and unloaded from rail wagons at the siding through overhead cranes and/ or other lifting equipment's.

ii. **Container Yard**

Container yard occupies the largest area in the ICD.CFS. It is stacking area where the export containers are aggregated prior to dispatch to port; import containers are stored till Customs clearance and where empties await onward movement. Likewise, some stacking areas are earmarked for keeping special containers such as refrigerated, hazardous, overweight/over-length, etc.

iii. **Warehouse**

A covered space/shed where export cargo is received and import cargo stored/delivered; containers are stuffed/stripped or reworked; LCL exports are consolidated and import LCLs are unpacked; and cargo is physically examined by Customs. Export and import consignments are generally handled either at separate areas in a warehouse or in different nominated warehouses/sheds.

iv. **Gate Complex**

The gate complex regulates the entry and exists of road vehicles carrying cargo and containers through the terminal. It is place where documentation, security and container inspection procedures are undertaken.

The main benefits from ICDs/CFSs are :

i. Concentration points for long distance cargoes and its unitization.

ii. Service as a transit facility.

iii. Customs clearance facility available near the centers of production and consumption

iv. Reduced level of demurrage and pilferage.

v. No Customs required at gateway ports.

vi. Issuance of through bill of lading by shipping lines, hereby resuming full liability of shipments.

vii. Reduced overall level of empty container movement.

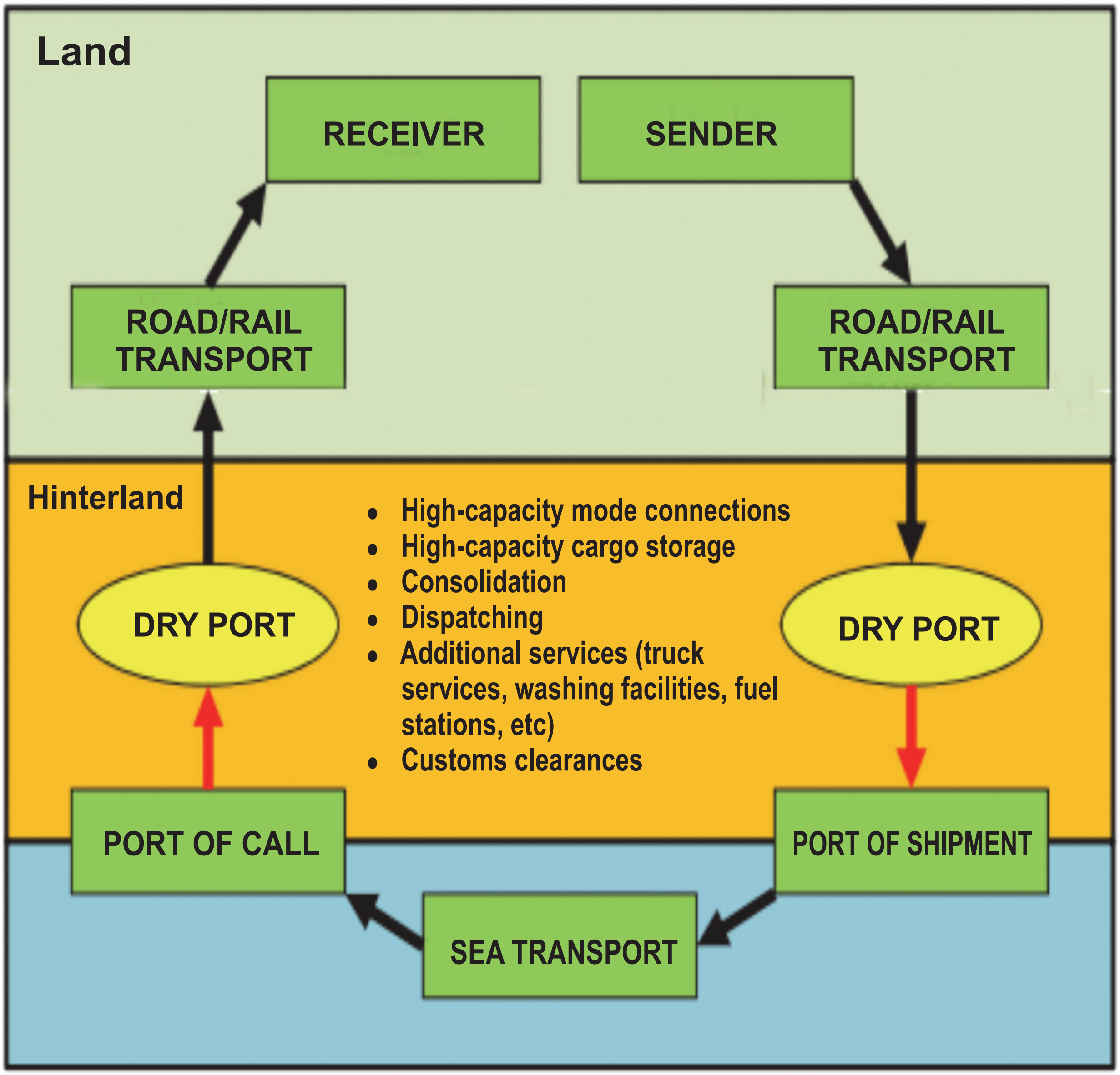
viii. Competitive transport cost.

ix. Reduced inventory cost.

x. Increased trade flows.

Fig. 3.7 below shows the product flow through different types of facilities.

Figure 3.7: Product Flow Diagram



Source: Inland intermodal terminals and freight logistics hubs, Gerard de Villiers, James Mackay, Luigi S – 2013

Land requirements

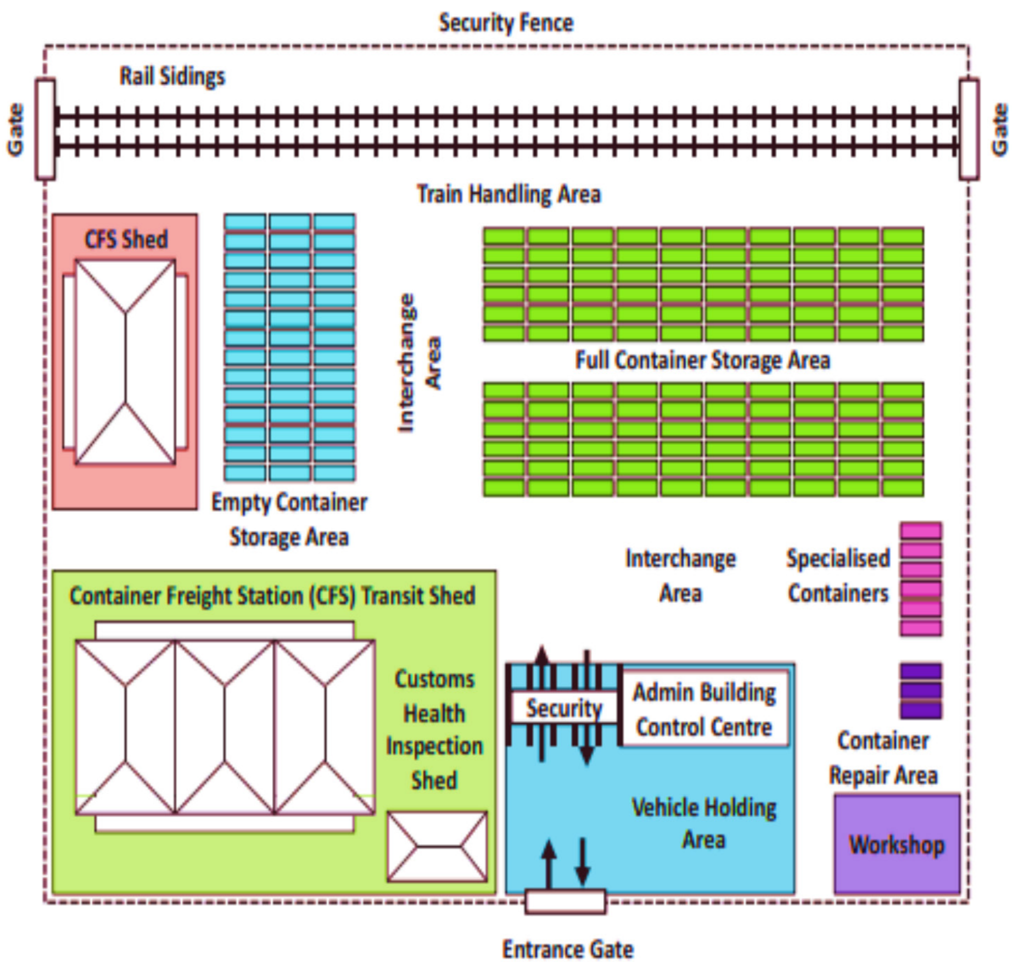
The minimum area requirement for a CFS is 1 ha. while it is minimum 4 hectares for an ICD as per Ministry of Commerce, GOI guidelines.

Design and lay-out of ICD/CFS

The design and layout should be the most modern state-of-art equipped with mechanical/electrical facilities of international standards and should take into account initial volume of business, estimated volume in 10 years' horizon and the type of facilities exporters would require. The design broadly should encompass features like (rail) siding, container yard, gate house and security features, boundary wall (fencing), roads, pavements, office building and public amenities. The track length and number of tracks should be adequate to handle rakes and for stabling trains where relevant.

Fig. 3.8 shows a typical layout of an ICD or Dry Port.

Figure 3.8 : Typical layout of a dry port



Source: Inland intermodal terminals and freight logistics hubs, Gerard de Villiers, James Mackay, Luigi S – 2013

According to Ministry of Commerce, Govt. of India guidelines the following Infrastructure elements should be available at the ICDs/CFSs:

- Provision of standard pavement for heavy duty equipment for use in the operational and stacking area of the terminal. In cases where only chassis operation is to be performed, the pavement standard could be limited to that of a highway.
- Office building for ICD, Customs office and a separate block for user agencies equipped with basic facilities.
- Warehousing facility, separately for exports and imports and long term storage of bonded cargo.
- Gate Complex with separate entry and exit.
- Adequate parking space for vehicles awaiting entry to the terminal.
- Boundary wall according to standards specified by Customs.
- Internal roads for service and circulating areas.
- Electronic weighbridge.
- Computerized processing of documents with capability of being linked to EDI.

3.4.1.3 Truck Terminal

A truck terminal is a highly specialised facility, designed for a specific function and operating plan in terms of the service standards it must meet, the area it serves and the volumes to be handled. It provides interface between intercity and local transportation facilities which handle the distribution and collection of goods within the city (UDPFI, 1998).

i. To reorganise office and godown space of transport companies.
ii. To provide for expansion of companies.
iii. To reduce parking, loading/unloading instances in CBD.
iv. To locate the facilities for vehicle repairs, servicing, rest places, shops
v. To cater to intercity movements destined to operator's godown and provide for idle parking for trucks waiting for return load.

The main facilities for which area allocation needs to be made are:

- Transport Agencies
- Circulation
- Parking
- Open Space
- Petrol Pump
- Service Centre
- Godowns
- Weigh Bridge
- Administrative Offices
- Fire Station, Post office, Dispensary

- Bank, Bus Station, Electric Sub-station
- Cold Storage
- Spare Parts Shops.

According to UDPFI Guidelines (1996) approximately 1 hectare of land is need for every 300 tonnes of inflow in the city. Table 3.2 shows the broad land use break up in a truck terminal

Table 3.2: Broad land use break up of Truck terminal

Sl. No.	Use	Percentage of Area
1.	Transport Operations (Office, Godown, Loading/Unloading)	30
2.	Service Industry (Petrol Pump, Service Area, weigh bridge, Bridge etc.)	6
3.	Public/Semi-public (Post Office, Police Post etc.)	3
4.	Commercial	3
5.	Parking	18
6.	Open Spaces	10
7.	Circulation	28
8.	Others	2
Total		100

Source: UDPFI Guidelines (1996), URDPFI Guidelines (2014)

Annexure A3 and A 4 shows a typical layout of truck terminal and transit terminal respectively while Annexure A.5, A.6 and A.7 show the approaches for planning of truck terminals, estimation of go-down space for transport operators and parking space in a truck terminal respectively.

Figure 3.9 shows a typical loading bay dimension of a truck.

Figure 3.9: Typical loading bay dimension of a truck

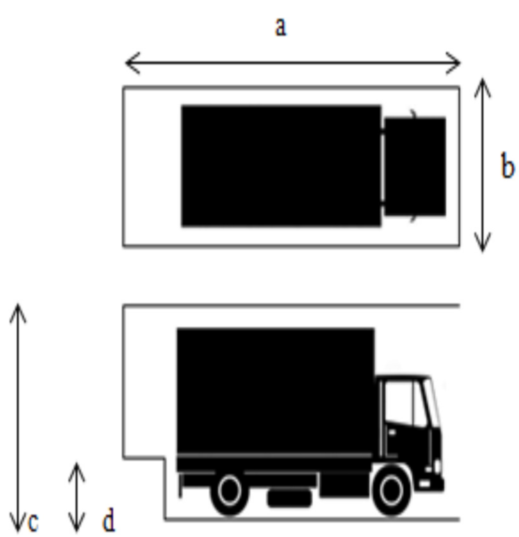


Table 3.3 shows dimensions for various types of trucks

Table 3.3: Recommended minimum dimensions of trucks

Truck Type	a		b		c		d	
	m	Ft.	m	Ft.	m	Ft.	m	Ft.
Light rigid	8.0	26.2	3.6	11.8	4.5	13.1	1.0	3.2
Heavy rigid	11.0	36.1	3.6	11.8	5.0	16.4	1.3	4.3
Articulated	17.0	55.8	3.6	11.8	5.0	16.4	1.3	4.3

Source: TTM Consulting (1989)

Table 3.4 shows the typical detailed area break ups for various components in a truck terminal as proposed by Indian Roads Congress (IRC)

Table 3.4: Area requirements for various components in a truck terminal

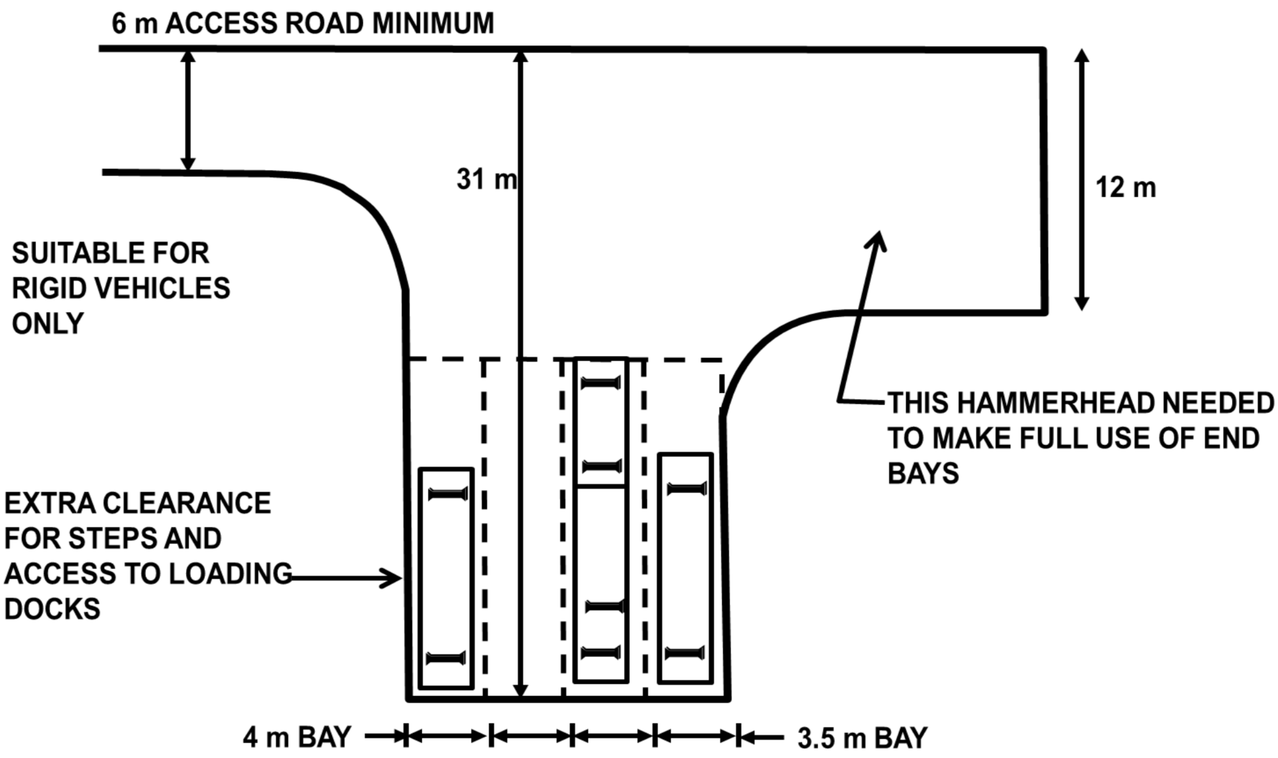
Sl. No.	Item Description	Area Requirement	Unit	Per
1.	**Parking Area**			
I)	**Excluding Circulation**			
a)	LCVs	30	Sq.m	One stall
b)	Rigid Truck	50	Sq.m	One stall
c)	Articulated	75	Sq.m	One stall
d)	Car	20	Sq.m	One stall
II)	**Including circulation area**			
a)	LCVs	60-90	Sq.m	One stall
b)	Rigid Truck	140-170	Sq.m	One stall
c)	Articulated	220-290	Sq.m	One stall
d)	Car	40	Sq m	One stall
2.	Eating Places	2.00	Sq.m	Cot
3.	Dormitory	10.0	Sq.m	One office
4.	Truck Operator's offices	500	Sq.m	One no.
5.	Filling station cum service station	1575	Sq.m	One no.
6.	Toilets and wash-rooms (4WCs. 1 bath & 3 basins)	200	Sq.m	One no.
7.	Urinals	100	Sq.m	One no.
8.	Telephone kiosk	1.65	Sq.m	One no
9.	Loading/unloading bays	50.0 (4m X l4m)	Sq.m	One no
	• Rigid truck	80.0 (4 m X 20 m)	Sq.m	One no.
	• Articulated			
10.	Fire Station	4125 (55 m X 75 m)	Sq.m	One no

11.	Police Station	375	Sq.m	One no
12.	Bank	130	Sq.m	One no.
13	Post Office	110	Sq.m	One no.
14.	Weigh Bridge	675	Sq.m	One no.
15.	Repair Shops (for trucks)	675 (45 m X 15 m)	Sq.m	One no.
16.	Washing Ramps	100 (5 m X 20 m)	Sq.m	One no.

Source: IRC Research Digest

Figure 3.10 shows the perpendicular loading bay arrangements for trucks.

Figure 3.10: Perpendicular Loading Bay



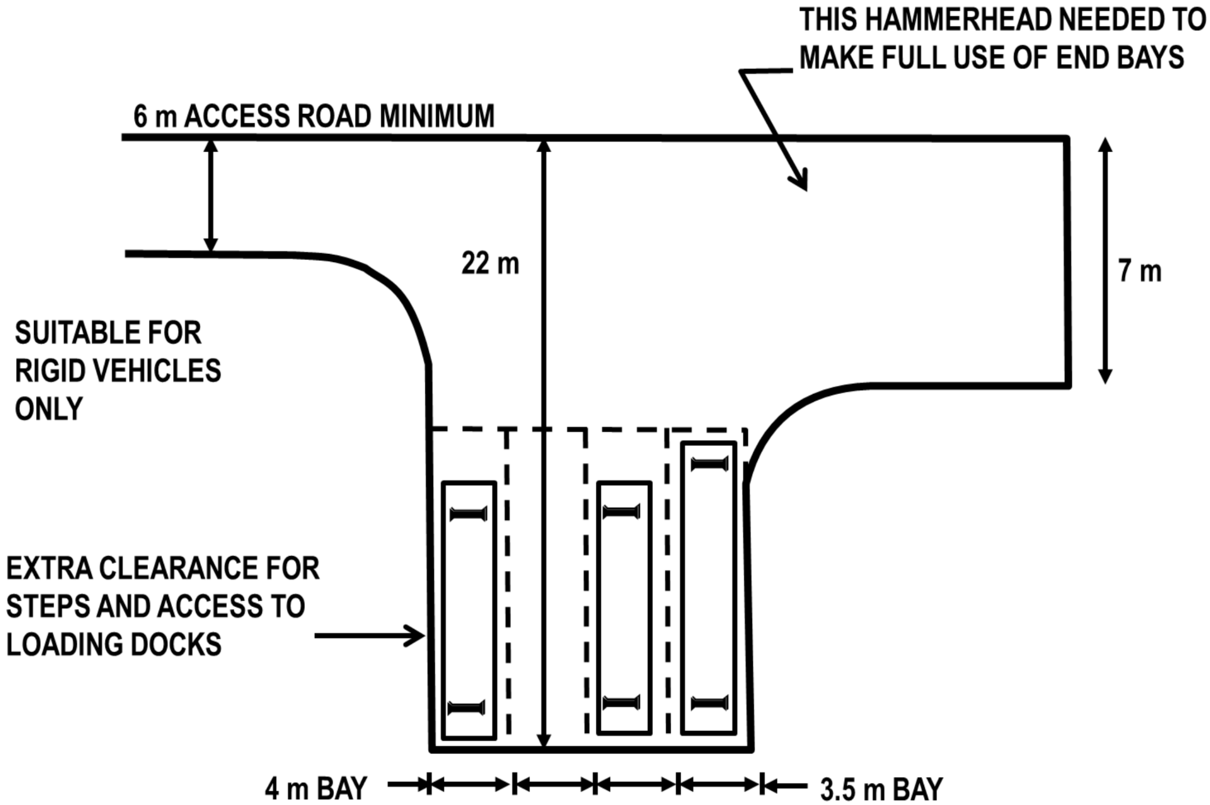


Figure 3.11 shows the angular loading bay arrangements of trucks

Figure 3.11: Angular Loading Bay

45o Loading Bay

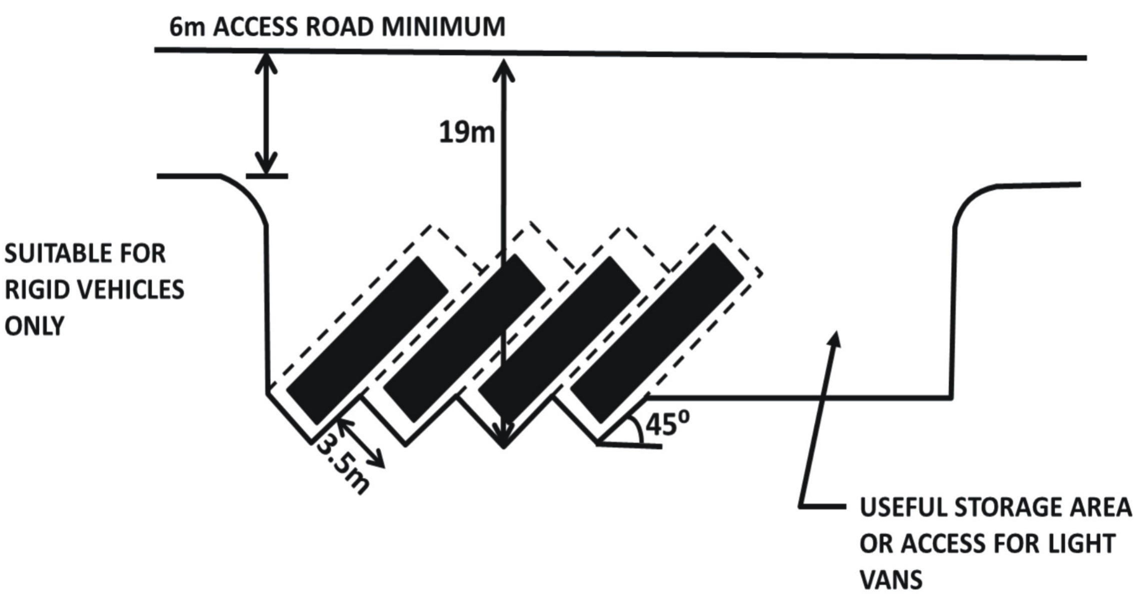
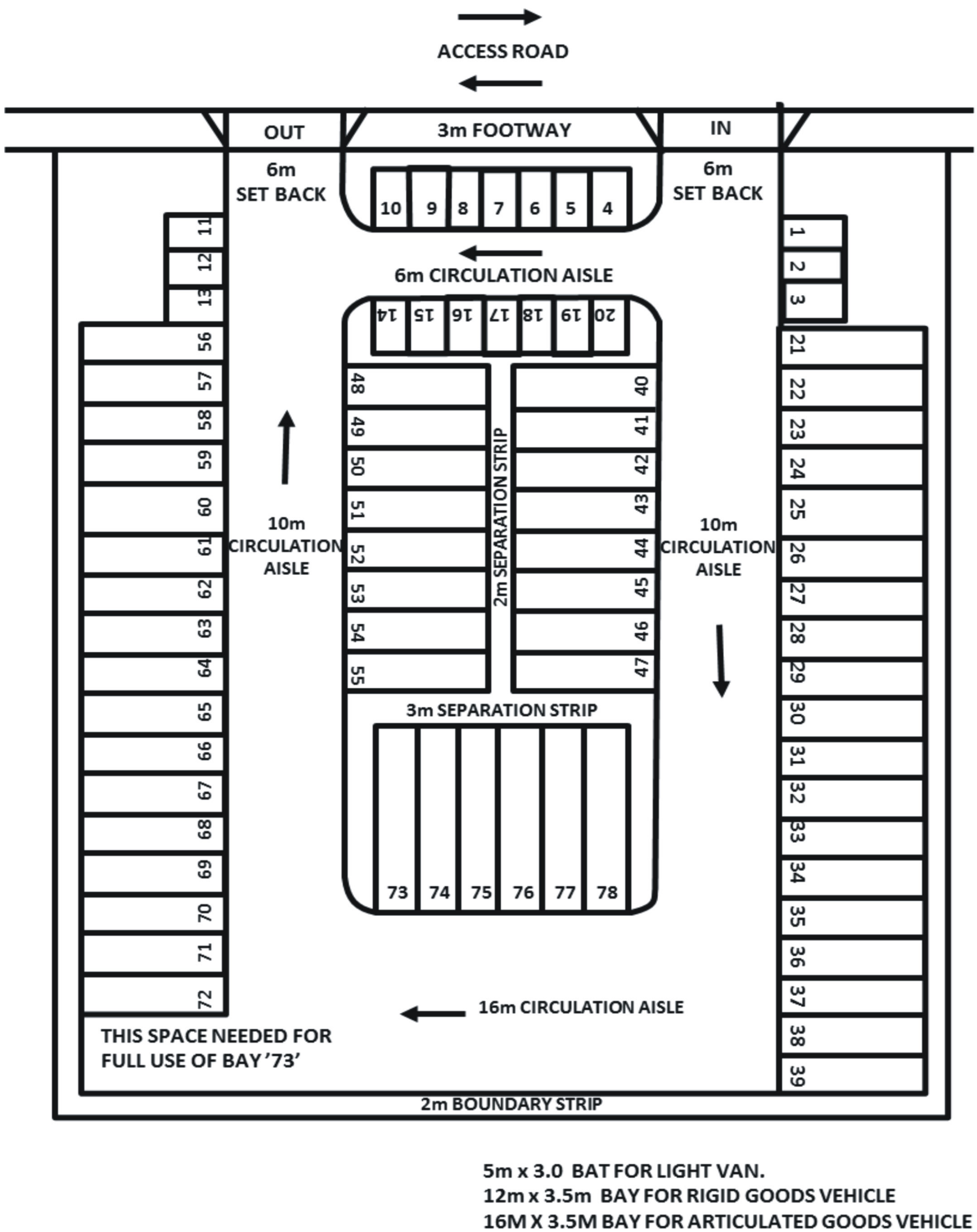



Figure 3.12 shows a typical layout of goods vehicle parking lot

Figure 3.12: Typical Layout of Goods Vehicle Park (84m X 74m Site 78 Spaces)

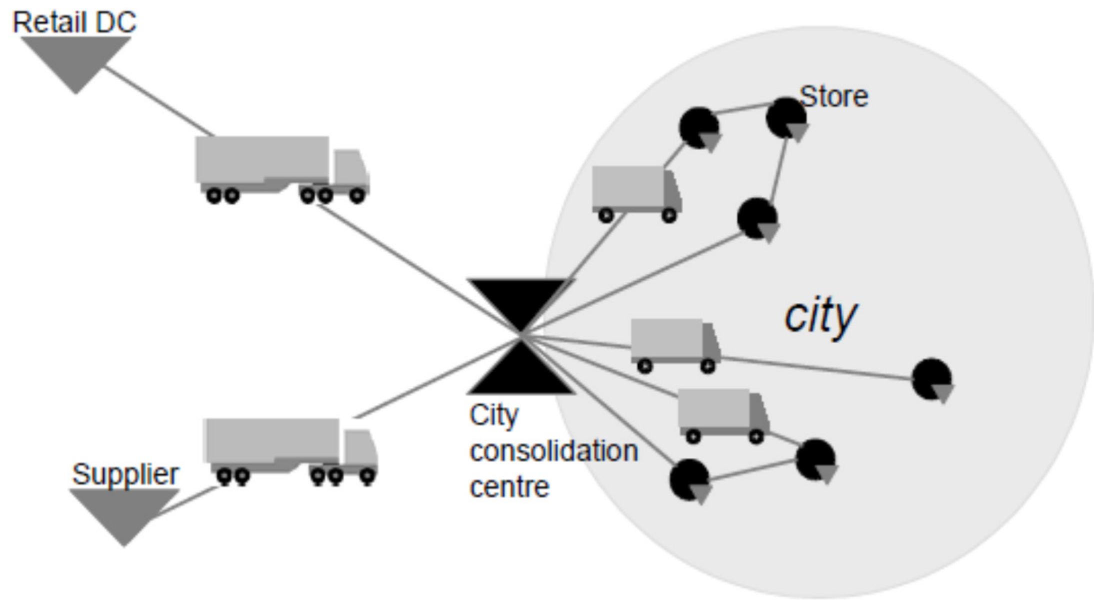


3.4.1.4 Urban freight consolidation centres (UCC)

Urban Consolidation centre (UCC) or Freight Consolidation Centres (FCC) is a logistics facility situated in relatively close proximity to the geographic area that it serves (be that a city centre, an entire town or a specific site such as a shopping centre), to which many logistics companies deliver goods destined for the area, from which consolidated deliveries are carried out within that area, in which a range of other value-added logistics and retail services can be provided. It offers freight transport companies the opportunity to deliver goods destined for urban area to a specialist centre for final delivery rather than having to make the delivery to the final customer in a busy part of the city. It has the potential to improve delivery reliability and to improve the utilization of goods vehicles. In addition, it is possible for a specialist fleet of environmentally-friendly goods vehicle to be used for the final delivery from the urban consolidation centre to the customer. There are benefits resulting from a multi-user Freight Consolidation Centre (FCC) as a means of reducing truck impacts in an urban center.

A UCC conceptually can also be represented as shown in Figure. 3.13.

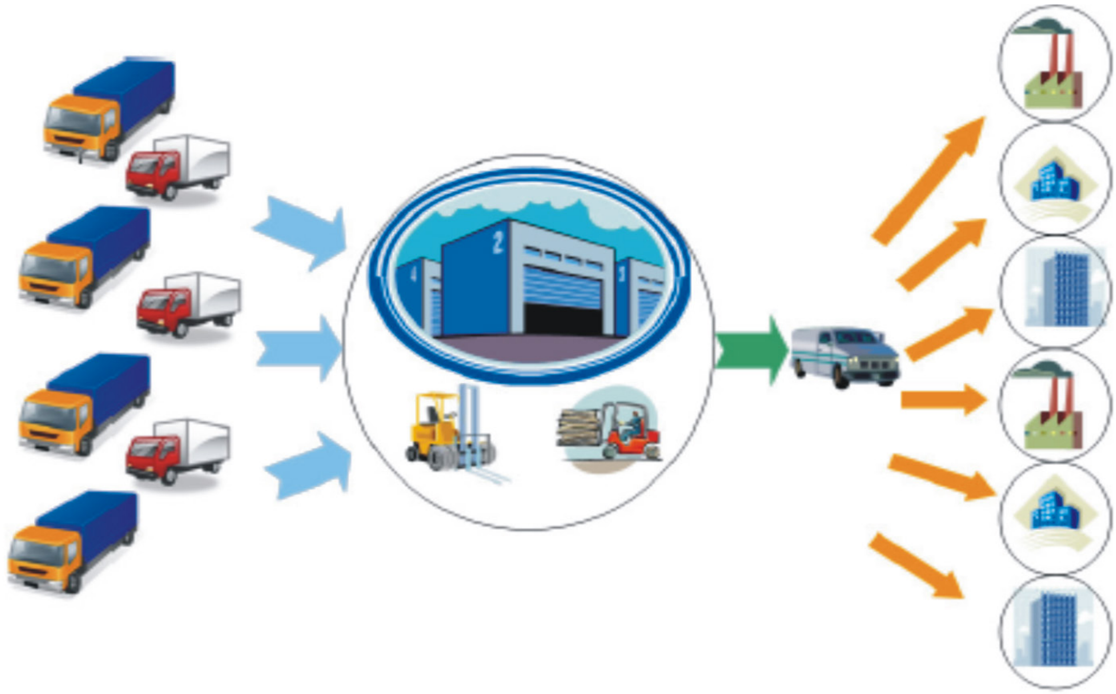
Figure 3.13: The freight consolidation centre concept



Source: Hans Quak et. al

Figure 3.14 shows the basic operations of a consolidation centre.

Figure 3.14: Basic Operations of a Consolidation Centre



Source: Hans Quak et. al

Table 3.5 shows the main activities and associated benefits as outlined of a consolidation centre

Table 3.5: Main activities and associated benefits of a consolidation centre

Activity	Benefits
Consolidation	Multiple dairy deliveries can be consolidated to a reduced number of deliveries, which enables staff to concentrate on core activities, thereby increasing productivity
Cross docking	Deliveries can be made to a consolidation centre at a time to suit the supplier, with onward delivery at times to suit the store, therefore reducing start and transport costs.
Storage	This can be short, medium or long term, depending on requirements Storage can be at carton, case, cage or pallet level.
Replenishment	In comparison to one unmanageable delivery stand Regular deliveries of a product (that is needed by the user throughout the day), are able to react quickly to customer's needs, therefore eliminating lost sales.
Pro-retailing	For retailers pre-merchandising activities can be earned out at the consolidation centre before the stock arrives at the retail outlet This includes unpacking, hanging, security tagging, re-labeling, size cubing and sale markdowns This activity enables store staff to concentrate on customer facing activity rather than being at the back of the store Ultimately, this lowers staff turnover and increases motivation and job satisfaction

UCC has the following potential disadvantages in terms of potentially high set-up costs (especially with high land prices in urban areas), Operational complexity resulting from the differing storage and handling requirements of a wide range of products, potential cost (and time) penalty from introducing an additional point into the supply chain etc. Figure 3.15 and shows freight consolidation process

Figure 3.15: Freight Consolidation process in Operation

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities, GIZ

UFCCs are most likely to be successful in:

i. Specific and clearly defined geographical areas where there are delivery-related problems;

ii. Town centres

iii. Historic town centres that are suffering from delivery traffic congestion;

iv. New and large retail or commercial developments.

Figure 3.16: UCC in operation in Germany - Deutsche Post AG

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities, GIZ

3.4.1.5 Urban Logistics Spaces

Urban logistics spaces are terminals located in dense urban areas where logistics services can be provided to neighbourhood businesses and residents. Depending on its size, it can accommodate pick-up and delivery vehicles. In small facilities with no room for the parking of vehicles, adequate on-street delivery areas must be provided. If a storage service is provided, the minimum area for an urban logistics space is 1,800 to 2,000 m². Such a center is generally associated with about 6 to 8 delivery vehicles and a dozen employees. Services that can be provided in urban logistics spaces may include:

- Receiving of parcels delivered to local businesses and residents
- Collection and sorting of palettes and cardboards from shops.
- Packaging and order processing for local manufacturing firms

3.4.1.6 Warehouse

A warehouse constitutes space for temporary storage of raw materials and / or finished goods for onward transport to customers.

Types

Warehouses are typically of ten types based on their typical functional characteristics (Figure 3.17) as under:

i. **General merchandise warehouse –** This kind of storage facility houses a wide variety of goods, and does not require special storage facilities.

ii. **Specialty warehouse –** These are warehouses specifically designed to suit the requirements of particular goods that cannot be stored otherwise and thus, handles a limited line of goods. For example - food grains, cotton, POL etc.

iii. **Refrigerated warehouse –** To increase the shelf life of perishable goods (farm and other products), storage is provided at cool temperatures that is, in refrigeration.

iv. **Bonded warehouse –** bonded under customs and excise Act, insured against loss, taxes, duties (Ex. tobacco, beverages)

v. **Bulk Storage warehouse –** liquid goods, tank storage (ex. gasoline, POL) or dry products storage (ex. coal, salt etc.).

vi. **Field warehouse –** operated in owners plant, manufacturer leases part of his place to public warehouse.

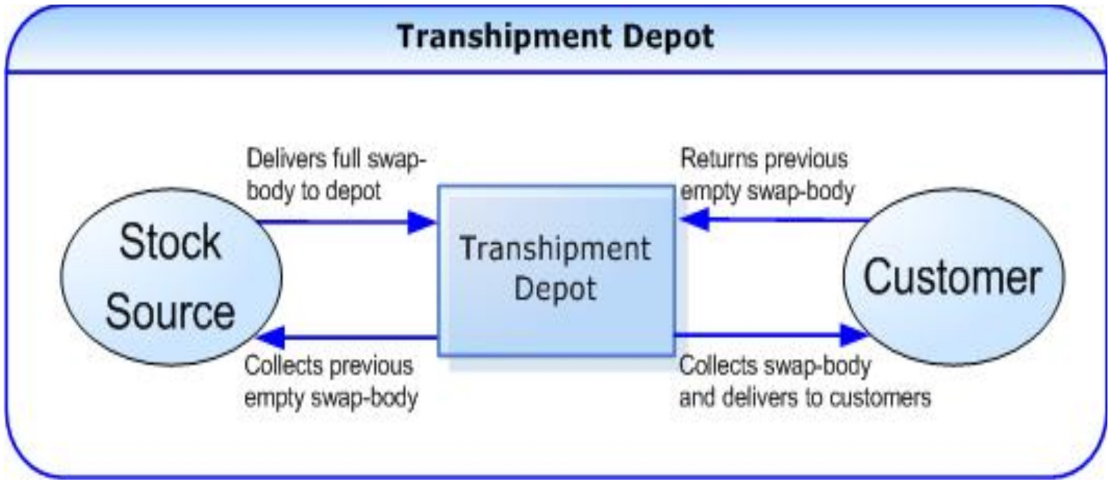
vii. **Distribution warehouse –** located near manufacturer or consuming areas; based on nature of product, time taken for transit, operating cost and product availability in market as per demand.

viii. **Buffer storage warehouse –** built at strategic locations with adequate transport and communication facilities.

Figure 3.17: Different types of warehouses

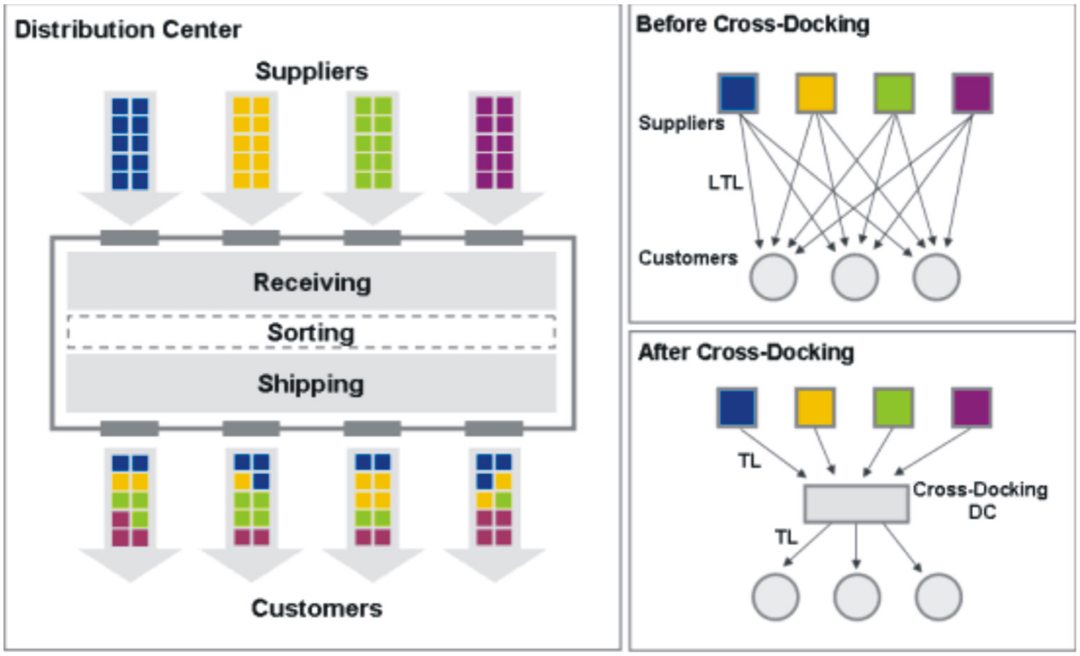
ix. **Trans-shipment depots –** These are located to serve specific customer requirements; orders of customers picked at stock holding depot, loaded to road trailers and dispatched to trans-shipment depot overnight; in morning where local vehicle picks up order & delivers it (Figure 3.18).

Figure 3.18: Concept of Transhipment Depot



x. **Cross-docking –** This facility operates from an empty building; products ordered by product line from suppliers in quantities for one day, orders delivered site and unloaded in one side; orders build up by sorting by locations and completed, orders loaded to outbound vehicle in the other side; It is labour intensive with no inventory requirements . Figure 3.19 shows schematically a cross docking process.

Figure 3.19: Concept of Cross docking process



Planning Norms

i. The land requirement for conventional type storage godowns as per central warehousing corporation (CWC) is as under:

- First 5,000 M.T Capacity = 2.98 Acres (approx.)
- 10,000 M.T Capacity = 4.70 Acres.
- 15,000 M.T Capacity = 7.00 Acres.
- 20,000 M.T Capacity = 8.60 Acres.
- 25,000 MT railway siding godown = 15 Acres.
- 50,000 MT railway siding godown = 25 Acres

ii. The broad dimensions of the godown (Outside to Outside) are 126.01m x 22.26m (413’-6” x 73’)

iii. The roads should have clear width of 6.7 m if there is one row of godowns and 15 m wide road in between two rows of godowns

iv. The plot of land shall be as far as possible rectangular shaped. In case of railway siding godowns long enough to accommodate full length of rake in single placement.

v. The warehousing space norms in kg/sq.m for selected commodities as per Central Warehousing Corporation are given below:

Commodity	Space (kg/sq. m)
Food grains	1054
Fruits and vegetables	721
Hardware and building material	1054
Iron and Steel	904
Timber, machinery, auto parts, textiles, chemicals & fertilisers	968

Source: UDPFI guidelines (1996), URDPFI Guidelines (2014)

Chapter 4:

Urban Freight Management Measures

4.1 Background

Freight movement is essential to the function of cities. The trucks are a major part of wholesaling distribution logistics and inter-modal operations. However freight transport generates externalities including congestion, air pollution, noise and greenhouse emissions which affect the society at large. The goods vehicle operators and drivers too face a range of difficulties when carrying out freight operations in urban areas including traffic flow related /congestion issues, Vehicle access restrictions based on time and/or size/weight of vehicle, Parking and loading/unloading problems etc. In addition the goods traffic also results in safety issues which makes traffic management an imperative strategy to manage urban freight operations. Metropolitan cities around the world are seeking ways to manage urban freight demand and its impact.

4.2 What are measures for goods vehicles access and loading/ unloading operations

There are a number of measures for goods vehicle access and loading/unloading operations in urban areas which are described as under:

4.1.1 Truck routes

Strategies for application at the network level involve the nomination of specific routes for use by trucks. Some of the key factors which need to be taken into account in selecting suitable truck routes are as under:

- Routes should contain all major roads in the area and links between them.
- The routes should serve sites that are major generators of freight.
- Traffic lanes should be of adequate width
- The network should be selected with consideration for abutting land uses; residential and retail land uses and areas with high pedestrian activity should be avoided as much as possible.

- Roads used as a part of the network must have good road geometrics with few sharp turns
- Traffic control on all roads on the network should be adequate, with STOP or GIVE WAY control on all minor side street, and signals or grade separations at all major intersections;
- All planning authorities with responsibilities for roads in the urban area and the freight transport industry should be involved in the selection of proposed routes.
- Clear and sufficient road signs and the dissemination of maps critical to successful introduction of the route.

Truck routes may be also designated only for specific classes of vehicle, of which the following are most common:

i. **Over dimensional truck routes**

These involve the nomination of specific routes for vehicles which exceed statutory mass, height, width or length limits (Figure 4.1). Routes should be such selected that ensure overhead clearance, suitable turn radii at intersections and minimum impact of other traffic. The routes should have strong structure to accommodate heavy vehicles and should be clearly signed. In India cities the arterial network or urban bypass are typical example of such route

Figure 4.1: Over loaded trucks


ii. Hazardous load routes

These involve the designation of specific routes for vehicles carrying hazardous material. The designation of truck routes and the development of management plans for the transport of hazardous materials should be based upon a risk assessment procedure. The roads which are preferred for the transport of hazardous materials in urban areas should have following attributes:

- Routes should be as directed as possible, all else being equal;
- Routes should avoid centers of concentrated population, such as shopping centers, schools, hospitals, cinemas, etc.;
- Rail level crossing should be avoided;
- The choice of route should take into account relative levels of exposure to risk

4.1.2 Signage system

Clear and accurate road signs should be used by urban authorities to explain routings and regulations to goods vehicle drivers in urban areas.

1. Road signs should be used to:
    - Warn drivers about roads that may be prohibited for their vehicle (e.g. narrow streets, vehicle access restrictions) (Figure 4.2).
    - Inform drivers about regulations on roads (e.g. vehicle weight, size, and time regulations) (Figure 4.2).
    - Inform drivers about on-street parking and loading regulations.
    - Direct drivers on advisory truck routes.
    - Direct drivers to truck parks and key industrial areas.
2. Variable message signs can be used to convey real-time information.


Figure 4.2: Road Signs System of Indian Road Congress (IRC)

Time regulations can be imposed on goods vehicles in a particular road or urban area in two ways:

- Time regulations on vehicle access
- Time regulations on vehicle loading

Access time regulations

Access time regulations for urban goods transport are the most important and most commonly used instrument used by urban planners to influence urban goods transport. Access time regulations can be used to prevent vehicles from entering a road or area at particular times of day particularly during peak hours. They can be imposed on all road vehicles or just on goods vehicles (they can also be imposed only on goods vehicles of a certain size or weight). These regulations are usually imposed on roads or areas that are very sensitive to road traffic. Examples include:

- Pedestrianized shopping areas – often all vehicles are banned during the main shopping hours
- Residential streets – goods vehicles above a certain weight or size are sometimes banned from a road or urban area at night to prevent disturbance.
- Entire urban areas – weekend bans are imposed on goods vehicles in some European towns and other cities. For example in New Delhi in the Lutyens Bungalow Zone (LBZ) area the movement of truck traffic is banned throughout the day. Also in the city there are time restrictions for trucks to play only during the off-peak hours. Night bans have been imposed in half of French cities with more than 100,000 inhabitants.

Loading time regulations

Loading and unloading time regulations restrict the times at which vehicles can stop at the kerbside for loading and unloading activities. These restrictions must balance the needs to use the space for loading and unloading and other activities such as parking. Usually loading unloading could be allowed during lean curb side parking demand in an area. The details of such regulations are usually displayed on well sited traffic signs (Figure 4.3)

Figure 4.3: Example of Signage system

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities.

4.1.3 Access and Loading/Unloading Regulations

Access and loading/ unloading regulations are particularly important in areas which area sensitive to delivery traffic (e.g. residential areas, inner areas) where network is narrow with little space for freight operations. In such areas it is important that there is clear signage informing drivers of the access and loading/unloading regulations applying in the area.

Physical barriers may also be used which include retractable bollards (Figure 4.4) or width restrictions.

Figure 4.4: Access control & Retractable bollards

Fig. 4.5 shows alternative loading and unloading layouts options for trucks.

Figure 4.5: (Fig 4.5a, Fig 4.5b, Fig 4.5c, Fig. 4.5d, Fig. 4.5e) Alternate loading and unloading layouts options for truck traffic

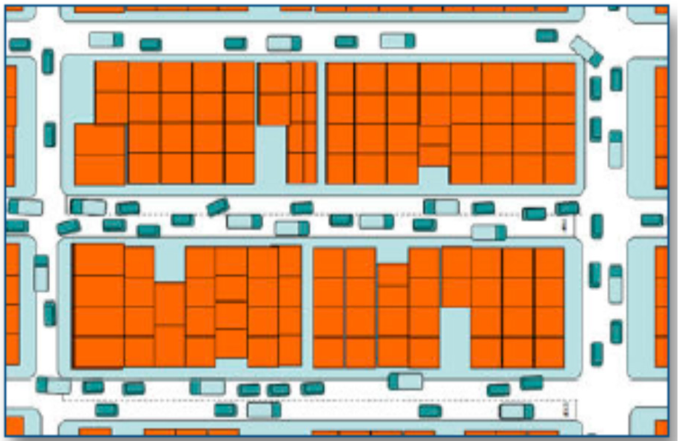


Figure 4.5a: Congestion due to lack of unloading zones.

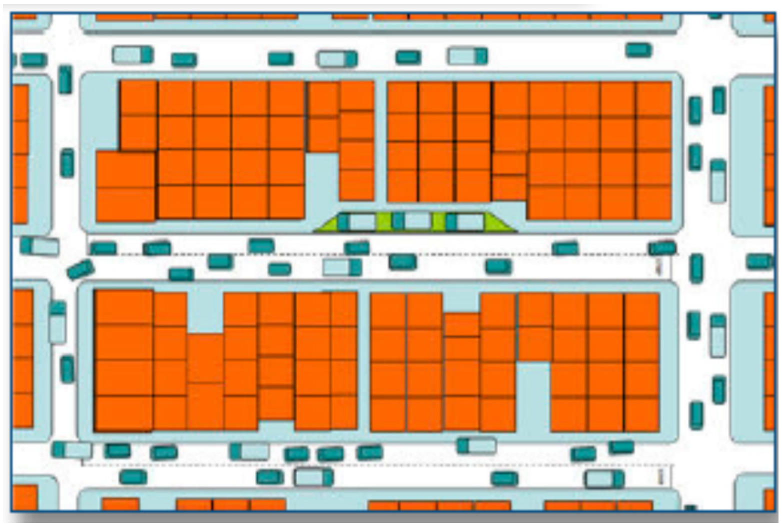


Figure 4.5b: Lay-by unloading.

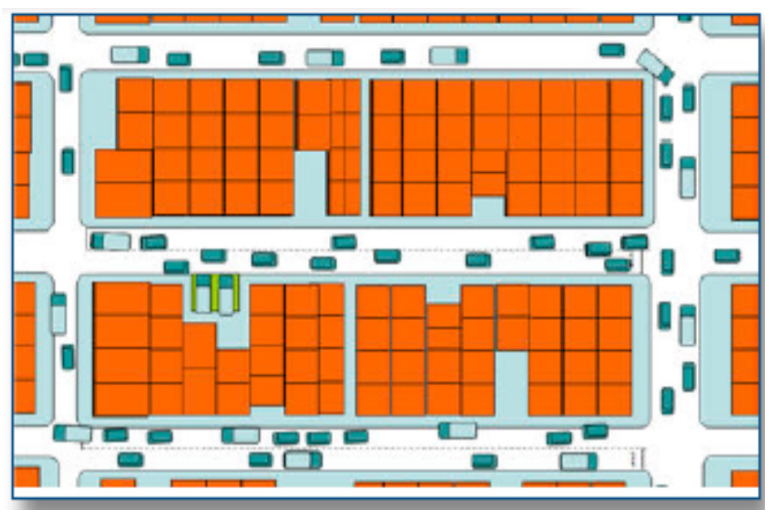


Figure 4.5c: Private property unloading.

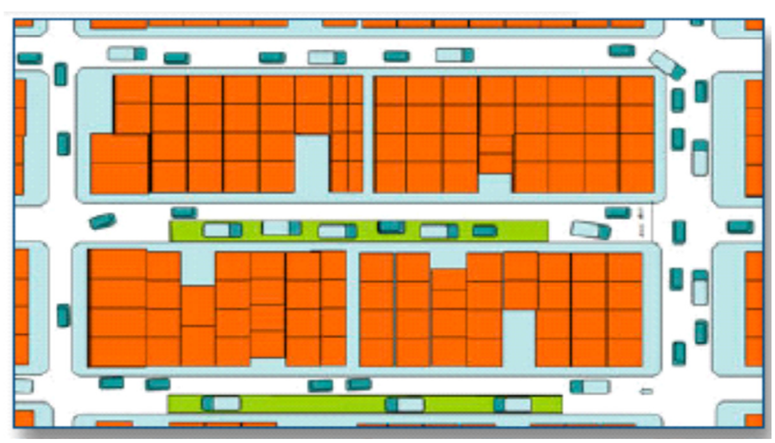


Figure 4.5d: One-way system to make way for ample of-loading space.

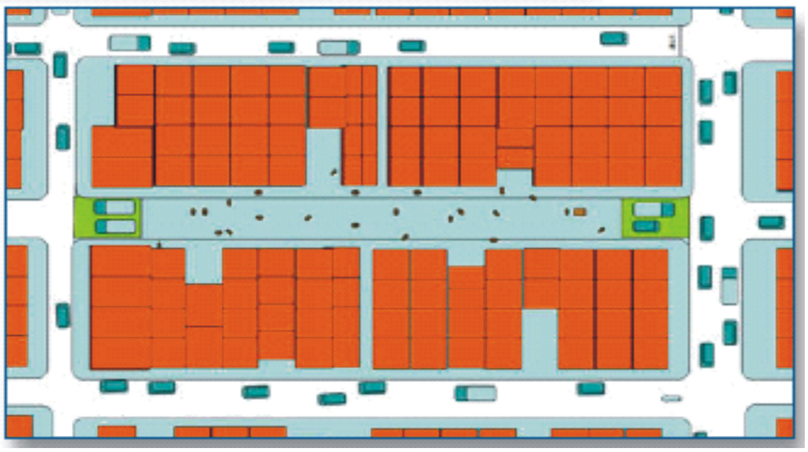


Figure 4.5e: Combination of loading zone and pedestrian precinct.

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities.

4.1.4 On-street loading bays

On-street loading bays can be provided by urban authorities in locations that generate goods vehicle trips but do not have suitable off-street loading facilities such as business districts and retail areas. They provide dedicated space for goods vehicles to load and unload and help in reducing traffic congestion. Some of their features area:

- There can either be unrestricted (allow goods vehicle loading and unloading at all times) or can have time regulations applied to them.
- There can be designed for one or several goods vehicles and should take account of the size of vehicles that are likely to use them.
- There are most useful when there is competition for kerb side space between goods vehicles and other road users.

Figure 4.6 shows the on street loading bays

Figure 4.6: On-street loading bays

4.1.5 Low emission zone

A “Low Emission Zone” (LEZ) or “Environmental Zone” is an area that can only be entered by vehicles meeting certain emissions criteria. They may be based on:

- Geographical area
- Time period
- Vehicle emissions standards, and
- Vehicle types

LEZs have already been successfully implemented and run for several years in several Swedish cities including Stockholm, Gothenburg, Malmo, and Lund. These LEZs were introduced to improve air quality and reduce noise. An LEZ also exists in Rome while there LEZs are also planned in London, Madrid, Paris, Copenhagen, Milan and urban areas in Norway.

4.1.6 Night deliveries

Night delivery is the delivery in the inner city area during the night hours when the city usually is quiet and inactive. Two types of night-time regulations may be introduced:

- Time regulations on deliveries and collections to and from a particular building (e.g. a retail outlet, office or factory)
- Regulations on goods vehicle movement in a part or the whole of an urban area

There may be a number of consequences for freight transport companies due to not allowing night time activities:

- More vehicles may be required to make deliveries in a shorter delivery window
- Deliveries may have to be made in periods of greater congestion (reducing vehicle & driver productivity and increasing fuel consumption)
- Journey times may be slower and less reliable
- The supply chain may be less efficient
- Total supply chain costs may be increased

This concept has immense potential in managing freight deliveries in inner areas of major cities in cities of developing countries like India.

4.1.7 Nearby Delivery Areas (ELP)

ELP is an area of street space that has been dedicated to goods vehicles for the loading and unloading of goods destined for the nearby shops. It comprises installation of an urban transhipment platform on which dedicated personnel, up to two members, provides assistance for the dispatching of consignments for the last mile (inner city). It can accommodate upto to five delivery vehicles at once. In this arrangement the goods are unloaded from incoming vehicles, and can be loaded onto trolleys, carts, electric vehicles and bicycles for the final distribution leg. This approach can also be used to provide additional services (such as home delivery, short-term storage

etc.). The system is intended to make the delivery of goods to the city centre easier and reduce traffic congestion, noise and pollution associated with deliveries.

4.1.8 Urban freight information maps

Urban authorities can provide much valuable information to freight transport operators and truck drivers through the maps and the use of real-time information. The maps on truck atlas show the truck route along with regulations along it, key freight activity locations, parking areas etc. Figure 4.7 shows a freight information map in Germany.

Figure 4.7: FALK Trucker Atlas

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities.

The provision of mapping or route guidance can encourage goods vehicle drivers to use the most suitable routes besides providing information related preferred routes , vehicle height and weight restrictions, access and loading regulations and location of goods vehicle parks

4.3 Use of ITS for Urban Freight Management

The use of ITS and telematics systems can help companies to reduce their operating costs, improve journey reliability and time, and deal efficiently with unexpected incidents. There are various supporting technologies for ITS, including vehicle telematics (on-board units), global positioning systems (GPS), smart cards, and video messaging signs that can be linked to traffic management systems and/or to freight transport management systems. These systems are used to improve route and trip planning as well as services provided to customers (e.g. reliable estimated time of arrival). Many of these systems have been initiated and operated by urban authorities as part of the traffic management systems used to improve the traffic situation within the urban area (e.g. by traffic regulations or access control).

The application of ITS in freight transport can be viewed through following systems:

i. Freight transport management systems (eg. Fleet management systems, tracking and tracing systems)

ii. Traffic management systems (eg. Access control systems, traffic management and information systems)

iii. Last mile logistics systems (eg. Vehicle routing and scheduling , route navigation , real time traffic information system)

A brief description of various systems is as under:

I. Freight transport management systems:

- Computerised Vehicle Routing and Scheduling: Efficient planning by vehicle operators to plan vehicle loads and journeys.
- Navigation systems and traffic control: Used to provide specific routing guidance and real-time information about vehicle location, traffic incidents and changes in customers' requirements.
- In-Cab Communication systems: These allow the driver to communicate with their company planners and also with customer by voice or computer.
- Slot booking systems: Used to co-ordinate and plan goods vehicle arrivals at major sites generating large flows.

II. Traffic management systems

Urban Traffic Management and Control (UTMC) Systems help to improve traffic flow, reduce journey times and delays, and improve road safety. Examples of urban traffic management centres include Berlin, London and Paris. In particular UTMC can involve the use of a range of technology approaches including:

- Urban Traffic Control (UTC) systems to co-ordinate traffic signal timings.
- Variable message signs (VMS) to communicate information to drivers via roadside signs.

- Automated vehicle access controls.
- Car park occupancy sensors.
- Journey-time measurement systems via automatic number-plate recognition technology.

III. Last mile logistics system

Information and communication technology and telematics solutions can have an important influence in making last mile processes more efficient. Some of the areas include:

- Computerized vehicle routing and scheduling
- GPS based route navigation system which provide drivers with detailed routing instructions
- Real time traffic information system which updates transport plans based on real time data to maximize vehicle utilization and first time delivery success


STUDY MIGRATE

Chapter 5:

Urban Freight Policy Measures

5.1 Background

Freight transport is fundamental component of urban life. Urban goods movement issues result from a wide spectrum of development in our society. The urban goods transport is now facing many difficult challenges and the opportunities for dealing with such challenges have increased in recent years due to increase in awareness of the need for sustainable development. Policy making in urban goods transport, where different parties with diverging and conflicting interest have to share limited urban space is quite complex and requires a well formulated policy package backed up by well-designed consultation and participative process.

5.2 Objectives of urban freight transport

There are six areas of objectives for urban freight transport:

- Efficiency objectives
- Economic objectives
- Road safety objectives
- Environmental objectives
- Infrastructure objectives
- Urban structure objectives

Efficiency objectives relate not only to minimizing or reducing transport costs, but also to improvement of the quality of transport services (access, reliability, travel time, flexibility or security of freight).If efficiency improvement in transport affects the national (or regional) income, it serves economic objectives, such as creating business opportunities. Efficient urban freight transport, in fact, serves society at large, as it has economic effects on income, price, market share, and more. In general, Efficiency objectives can easily be quantified. Economic objectives have been quantified with economic models when they concern specific (infrastructure) projects.

Road safety objectives aim at imposing road safety situation by setting target of minimising or reducing accidents. Some of the environmental objectives are as under:

- Reduction of local air pollution such as carbon monoxide, nitrogen dioxide, ozone, aerosols, benzene and lead
- Reduction of traffic noise
- Improvement of general safety (reduction in number of accidents)
- Reduction of other forms of nuisance such as risk, physical hindrance and vibration
- Reduction of the consumption of urban space for transport infrastructures and delivery points
- Reduction of emissions which influence climate change, such as carbon dioxide (C02) and the greenhouse gasses (N20 and methane (CH4)) and acidification (oxides of nitrogen (NOx), sulphur dioxide (S02) and hydrocarbons)

Reduction of road maintenance costs is an infrastructure objective, while preservation and revitalization of (historic) city centers and maintaining the level of services within urban areas belong to the group of urban structure objectives.

It must also be recognised that different policy objectives might conflict. Efficiency improvement, for instance, may conflict with environmental objectives.

5.3 Policy measures

There are different strategies or policy measures in urban freight transport policy and planning (Visser. J, et.al, 1999) as follows:

i. Network strategies: Specific routes can be identified for use by trucks. In addition truck routes may also be designated only for specific classes of vehicles. It is also possible to prohibit trucks to use particular routes (route bans), or to enter a designated local area.

ii. Parking or loading strategies: Different types of facilities for parking, loading and unloading such as curb-side use, off-street facilities and truck parking facilities can be identified.

iii. Location and zoning of land use: Spatial concentrations of transport generating or attracting activities near freight transport facilities can be zoned.

iv. Licensing and regulations: It incorporates various traffic regulations such as allocation of curb space, loading time restrictions, truck route regulations and truck access controls, besides transport regulations, like permits for entering certain areas, or vehicle regulations, to regulate vehicle sizes or emissions.

v. Pricing strategies: Strategies such as road pricing or charges on access or parking have potential could solve traffic congestion.

vi. Terminals and modal interchange facilities: The introduction of transfer points or interchange facilities at the city borders can result in freight transport optimization besides limiting the number of movements of trucks in the urban area.

vii. Traffic information systems: Providing road traffic information through a vehicle information communication system or through electronic traffic information boards along the road can improve freight movement efficiency.

Sustainable Urban Freight Policy Measures

Policymakers can make a wide range of interventions in an attempt to improve the sustainability of road transport operations. These can be grouped into several categories of policy measure including:

- Land use and planning measures
- Transport infrastructure measures
- Managing infrastructure measures
- Pricing measures
- Attitudinal and behavioral measures
- Information provision measures
- Modal shift measures
- Other measures to reduce environmental impact of vehicle use

Table 5.1 shows various policy measures for improving sustainability of urban freight transport

Table 5.1: Policy measures for improving the sustainability of urban freight transport

Policy measures	Scale of implementation
Land use and planning measures	
Design of new developments	National/urban
Mixed use developments	National/urban
Industrial and warehouse location controls	National/urban
Loading standards for new developments	National/urban
Transport infrastructure measures	
Consolidation centres	Urban
Loading bays and areas	Urban
Lorry parks	Urban
Lorry lanes	National/Regional/urban
Managing infrastructure measures	
Lorry routes	Regional/urban
Access time controls / automated access control systems	Urban
Access size/weight controls	Urban

Loading/unloading time controls	Urban/Site specific
Variable use of road space by time of day	Urban
Pricing measures	
Road pricing	National/urban
Tolls	Site specific
Attitudinal and behavioural measures	
Driver training	National/urban
Good practice guidance on vehicle operations	National/urban
Establishing freight partnerships between public and private sector	Regional/urban
Information provision measures	
Freight road signing and mapping	National/urban
Development of urban traffic management and control systems	Urban
Road traffic information	National/Regional/urban
Modal shift measures	
Improvement of highway, railway and inland waterway connections	National/urban
Other measures to reduce environmental impact of vehicle use	
Low emission zones	National/urban
Grants/subsidies for quieter, cleaner vehicles (including cycles)	National/urban

Source: Michael Browne et. al (2011)

Policy interventions in freight transport can take a number of different forms including (a) technological approaches (that aim to improve the performance of equipment and facilities, or reduce environmental impact through the application of technology), (b) economic and fiscal approaches (that aim to influence the demand for transport by making transport more expensive, or encourage a particular mode or fuel type through financial incentives), and (c) regulatory approaches that aim to influence behaviour by restricting the way in which infrastructure or vehicles are used, or put in place qualitative and quantitative controls to help prevent poor standards and operating practices).

5.4 Planning Policies

i. Land use policies, zoning and building regulations for delivery activities

Many land use regulations can serve a local freight policy. Many cities impose the building of off-street delivery areas in new commercial or industrial developments (Tokyo), logistics hubs of goods distribution centre to make urban truck operations more efficient (Seoul), urban consolidation centre to provide bundled and coordinated deliveries (European Cities) and logistics zones in dense urban areas for services to neighbourhood business and residents.

Some of the planning strategies relevant for creating efficiency in urban freight operations are briefly described as under:


i. **Promote intermodality:** This involves developing suitable land parcels available along transportation route/ modes namely inland water way, sea port or rail line for establishing distribution logistics centre and thereby minimising congestion caused by through traffic as well as local distribution traffic.

ii. **Land- Banking:** In case urban freight consolidation centre are not necessary, “land banks” in form of available public space could be reserved for future requirements and suitably integrated in spatial planning policies.

iii. **Waiting areas for trucks:** This strategy involves providing waiting areas for truck to enable them to wait for the time window which allows inner-city delivery. Besides these spaces could also be used for distribution centre functions.

5.5 Parking policies, provision of delivery spaces

Freight needs dedicated urban spaces such as loading and unloading areas besides long term parking space. Insufficient delivery spaces transfers delivery operations on traffic lanes resulting in congestion. It is also seen that many trucks need to park during night time before the early opening of shopping areas. Provision of suitable delivery spaces and parking areas will mitigate congestion problem besides providing opportunities for transfer of goods. These parking areas could also be a place for the transfer of goods into smaller lorries.

In Barcelona, Spain, the municipality has created an innovative system on some of its main streets, by devoting the two lateral lanes to traffic in the peak hours, deliveries during off peak hours, and allowing residential parking during the night.

5.6 Consultation policies, private/public partnerships

The urban distribution of goods is organised by private stakeholders (producers, carriers, retailers, final consumers), operating in an environment which is managed by public authorities. Consultation processes in urban freight can provide interesting and valuable collaborations between private companies that otherwise are not willing to work together. In this regard, private/public partnerships (PPPs) represent a good option. In the United Kingdom, in many cities in general and in London in particular, it has been a common practice for years to discuss and negotiate with transport and logistics professional organizations, leading to compromises.

5.7 Innovative policies

Some of salient innovative policies and practices for structuring and facilitating urban freight mobility include:

1. **Low emission zones (LEZ):** Truck access restrictions could be applied based on environmental criteria where vehicles which meet specific emission criteria setup by local government trucks are permitted to enter the designated LEZ’s such as city centre. In Amsterdam, in the Netherlands, a truck may make deliveries in limited access zones if it meets the following four conditions: it must be less than eight years old, meet the Euro II standard, have a maximum length of ten meters, and load or unload at least 80 % of its merchandise in the central city. In London, the Low Emission Zone set up in 2008

prohibits trucks older than the Euro III standard to enter the metropolitan area. In Tokyo, since 2003, most polluting diesel vehicles have been prohibited.

2. **Combined Use Lanes:** Lanes can be designated for different uses throughout the day (for example, for peak period through-traffic, mid-day temporary truck loading stops, or night and weekend on-street parking). Barcelona uses variable message signs (VMS) to indicate lane use by time of day on its arterial roads

3. **Preferential zoning or property tax relief for properties used in urban goods movement:** It empowers municipalities to plan for and organize future truck mobility. This is done in several Canadian cities, providing incentives to incorporate goods movement into new Development Plans.

4. **Unattended delivery systems:** It allow deliveries to be made when offices are closed or recipients are not at home, so trucks do not need to return goods to the depot for later re- delivery. Such systems include electronic drop boxes and banks of boxes, and designated off-site collection locations such as post offices or convenience stores.

5. **Retail Delivery Stations:** These are micro warehouses with dedicated delivery zones or off-street delivery bays dispersed in commercial cores. Large trucks deliver shipments for multiple nearby destinations to these stations, and goods are later transported to individual businesses by pallet truck, small carts, or wheeled stands. This reduces the number of truck trips and allows large trucks to make deliveries outside restricted or peak hours, while businesses still receive goods throughout the workday.

6. **Freight Villages:** These are essentially planned unit developments for freight transfer which allow freight companies to achieve greater efficiencies by co-locating with supporting services within a secured perimeter and near transportation connections.

5.8 Freight Traffic Management and Enforcement Policies

i. Truck and van access restrictions

Restricting large trucks in cities has been one of the most popular measures in developing countries, due to road limitations. The policy measures that tend to have been implemented most commonly relate to time restrictions (on access and loading/unloading), and weight/size restrictions on access to part or all of an urban area. There are several different types of time restrictions that can be imposed on goods vehicle making deliveries in urban areas. These include:

- Night-time delivery restrictions imposed by authorities at the point of delivery (i.e. site specific restrictions usually imposed by the local planning authority),
- Area-wide loading and unloading time restrictions on the kerbside,
- Access time restrictions for goods vehicles (and other vehicles) in pedestrianized and other areas,
- Sunday trading restrictions (which can prevent stores from receiving early deliveries).

Table 5.2 shows the logistics performance parameters of different vehicles size which could be used to identify the need for enforcing vehicle access restrictions and it likely local environment impact.

Table 5.2: Logistics Performance parameters of different vehicle sizes (typical/ average weight and size parameters)

Vehicle Category	Van	Light Delivery Vehicle	Medium Sized Truck	Heavy Duty Truck	Truck and Traller
Weights ratio					
Gross weight kg	3,500	7,500	15,000	24,000	40,000
Payload kg	1,600	4,400	10,000	17,500	30,400
Payload/gross weight ratio	**0.46**	**0.59**	**0.70**	**0.73**	**0.76**
Volume and roadspace usage					
Load capacity m^3	7.34	32.86	51.93	60.44	98.83
Roadspace occupation m^3	47.51	78.68	103.71	115.89	168.00
Roadspace m^3/load capacity m^2 ratio	**6.47**	**2.39**	**2.00**	**1.92**	**1.70**
Energy consumption and emissions					
Diesel per 100 km	9.8	14.5	25.0	32.0	44.0
CO_2 g/km	**245**	**363**	**625**	**800**	**1,100**
CO_2 g per m3 and km	**33.36**	**11.03**	**12.04**	**13.24**	**11.13**

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

Very restrictive delivery time windows can lead to serious bunching of delivery vehicles immediately before and after restricted periods, possibly with queuing for access to premises which can cause traffic congestion. Moreover, they may reduce the scope for load consolidation. They also reduce the likelihood that suitable vehicles will be dedicated to city center work. There may therefore be a case for easing restrictions in some cases, allowing delivery over longer periods, but avoiding times of peak shopping activity and with the enforcement of low speed limits. Relatively severe gross weight limits on access to part or all of an urban area should also be avoided, except where local circumstances strongly dictate to the contrary. This will help achieve the benefits of greater load consolidation, and reduce the total number of commercial vehicle movements in the city center. Figure 5.1 shows the metro Manila truck ban.

Figure 5.1: Metro Manila truck ban

Truck Ban 1 (EDSA only)	6 AM to 9 PM everyday except Saturdays, Sundays and Holidays. No cargo truck shall be allowed to travel or pass along EDSA.
Truck Ban 2 (10 major routes)	6 AM to 9 AM and 5 PM to 9 PM everyday except Saturdays, Sundays and Holidays. No cargo truck shall be allowed to travel or pass along these routes.
Definition of Cargo Truck	"Cargo truck" as used in the ordinance refers to motor vehicles, whether loaded or empty, having a gross vehicle weight of 4,500 kg or more, principally intended for carrying cargo.

Truck Ban Hours:
6 AM – 9 PM
6 AM – 9 AM; 5 PM – 9 PM
Alternate route from Port Area to Outside
Alternate route from Outside to Port Area

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

To assist traffic flow at those times when deliveries are permitted, co-ordination of urban freight policy with other policies is important. The popularity of totally traffic-free areas for shoppers and pedestrians is acknowledged by transport operators but it is also apparent that the practical effect of these measures has been to reduce significantly the time available for deliveries, and the cumulative effect of applying these measures in successive town centers is making it increasingly difficult to achieve daytime deliveries. These operating difficulties are especially severe for organizations attempting to carry out multi-drop work in towns and cities. The problem of vehicle access time restrictions during a working day could be solved if some collections and deliveries were performed at night.

ii. Pricing policies

Pricing strategies in general aim to affect the nature and extent of urban freight activities through the pricing mechanism. Pricing overs three distinct features: road pricing, charges levied on trucks entering a congested area, and commercial rates. Road pricing in the short term, is expected to have little effect on freight or truck flow while in the longer term it is expected to encourage the use of both smaller and larger trucks at the expense of medium trucks. In addition it could encourage some re-routing of trucks away from central city areas, on the assumption that prices would be higher there.

The outcome of such measure would depend upon the strength of a number of interacting forces, notably the final demand elasticity for the good being carried, the importance of transport costs in total production and distribution costs, and the market structure under, which the operators and retailers operate.

5.9 Evaluation of urban freight initiatives

There are some urban freight initiatives based on various planning and management policies which adopt innovative practices with the objective being to minimise the negative effects of freight transport, increase efficiency and ultimately enhance sustainability in urban areas. Table 5.3 shows a broad categorisation of major freight initiatives.

Table 5.3: Categorisation of major urban freight initiatives

Category of initiatives and objectives	Example
Operations	• Off-peak/night deliveries
• to improve operational efficiency including speed and reliability of deliveries, reduction of costs, convenience and customer service, and operational safety	• Information and technology tool (real-time traffic information, routing and scheduling, vehicle tracking systems)
	• consolidation of deliveries
Land use and infrastructure	• Relocating logistics and industrial activities
• to reduce demand for freight transport by reorganising land Use patterns in Urban area	• Off-street unloading facilities
	• Underground logistics system
Environment	• Urban consolidation centre
• to reduce or minimise the environmental impacts of Urban freight transport	• Use of environmentally-friendly/clean vehicles (electric vehicles, freight trams, cargo bikes)
	• Low emission zones
Regulations	• Access restriction (vehicle weigh size/ dimension/time/load factors)
• to influence Urban transport behaviour and patterns through the implementation of traffic and transport policies	• Dedicated facilities for freight traffic
	• Road pricing
	• Incentives
Technology • To Improve operational performance through equipment and facilities	• Access controls systems
	• Information technology for reduced noise operations.

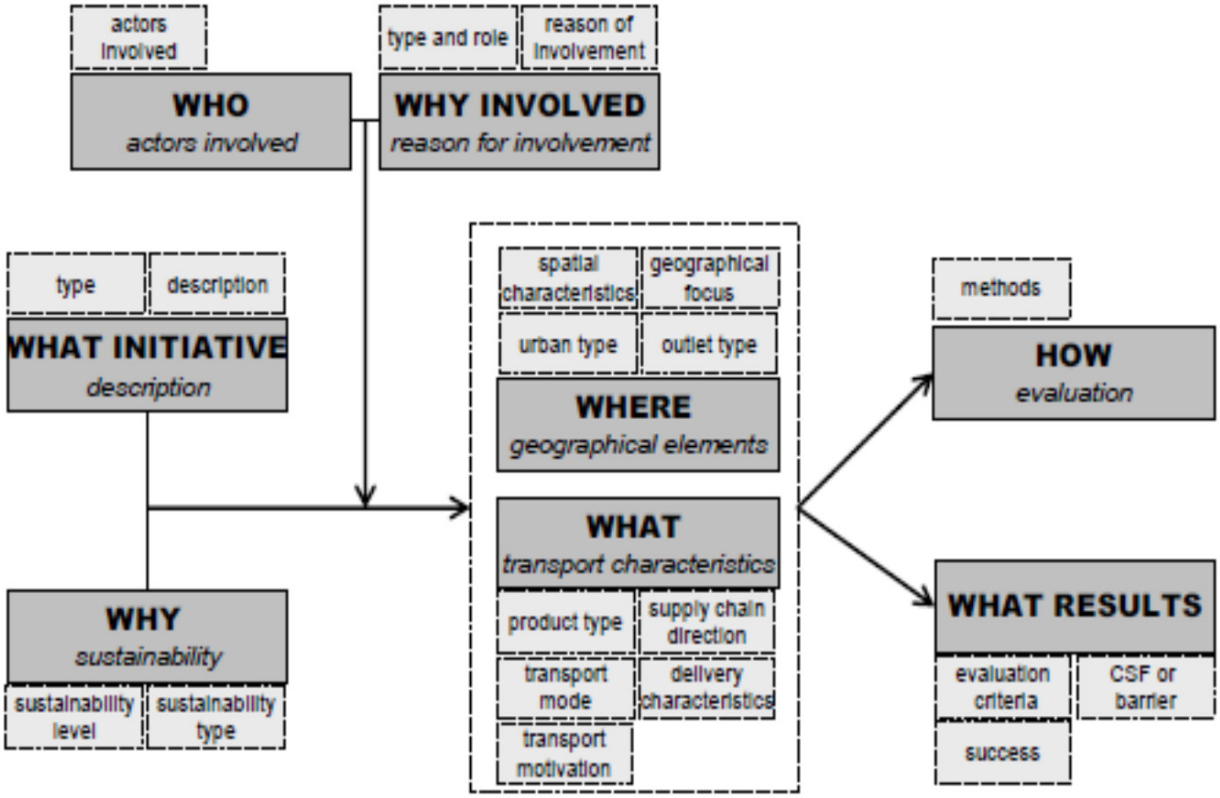
5.9.1 What is an evaluation framework of urban freight transport initiatives

Often the decision makers or city officials would like evaluation of sustainable urban freight transport initiatives undertaken in a city. This integrated framework must incorporate all the elements necessary in a comprehensive evaluation such as:

- Who are the actors involved
- What are the urban freight initiatives
- Type of sustainability
- Place or location of application
- Transport and freight characteristics
- Evaluation criteria or approach
- results

A conceptual framework proposed for such an evaluation is shown in Figure 5.2

Figure 5.2: Framework for evaluating UFTS initiatives



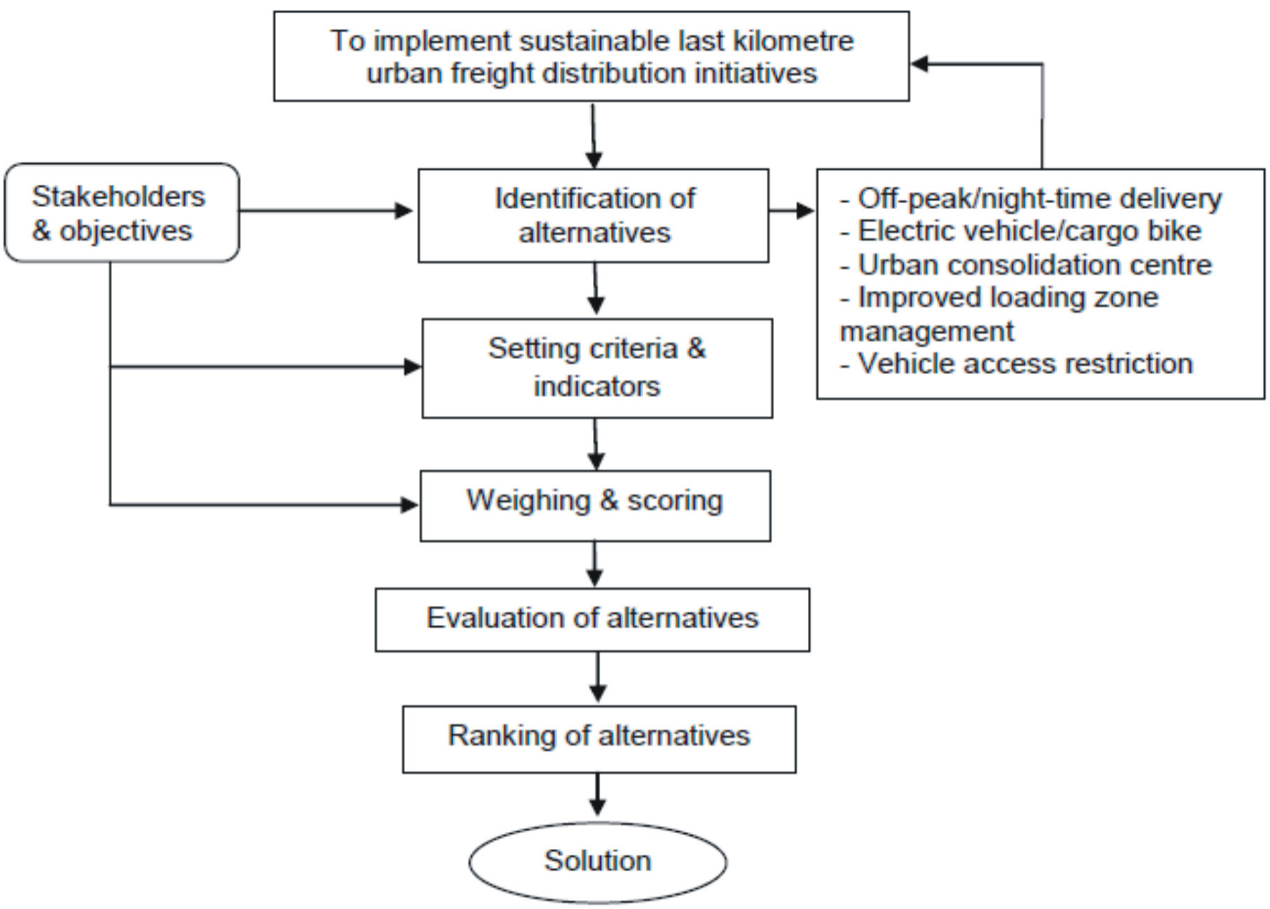
Source: Hans Quak et. al.

5.9.2 What is the approach for evaluation of alternate sustainable last mile distribution initiatives

Multi criteria decision analysis approach could be adopted to evaluate alternate urban freight transport measures for last mile distribution as shown in Figure 5.3. The framework comprises of seven steps described as under.

The first step is the definition of the problem namely, the implementation of sustainable last kilometre urban freight distribution initiatives. Secondly, the relevant stakeholders involved in the last kilometre urban freight distribution will be identified along with their objectives. Stakeholders in the transport policy context are those individuals and groups who have a particular concern, or an interest in a problem or in the consequences of any decisions taken. Stakeholders' views will need to be taken into account in the evaluation process. The key stakeholders, in the study context, are retailers, freight carriers, local government or transport planners and the urban community. The third step is the setting of alternatives. The alternatives for evaluation will be formulated from the retailer survey, interviews with fleet managers and transport planners, and the potential strategies. Fourthly, the criteria that are of concerns to all stakeholders will be set (e.g. economic, environment, social and operation) and the indicators will be established for each individual criterion. In the fifth step, all the criteria will be weighed according to their significance (relative importance) to the decision. The proposed methodology will

Figure 5.3: Proposed sustainable urban freight distribution initiatives evaluation approach



employ the AHP method based on pairwise comparisons for establishing weight for criteria and performance scores for initiatives on the different criteria. The criterion scores can be expressed in quantitative such as: investment cost, or scores on an ordinal indicator such as high/medium/low for criteria with values that are difficult to quantify. The sixth step is the overall analysis, summation of weighed criteria and calculation of final scores for each of the alternative measures. The performance of the alternatives will be assessed against the criteria. Finally, the final ranking and selection of the appropriate alternative sustainable last kilometre urban freight distribution will be obtained. The appropriate measures will be the one with the maximum total scores.

Chapter 6:

Supporting Case Studies

6.1 Background

An efficient and sustainable development of urban freight transport in developing environment entails not only an in-depth knowledge of the basic principles of its planning and management aspects but also an exposure and appreciation of some of the best practices around the world which have been successfully implemented and assess its transferability potential in context of developing countries in particular.

In this context a review of some of the best international practices on urban freight planning and management has been carried out related to freight consolidation centres (Bristol and Heathrow airport), urban logistics space (Paris), freight quality partnerships (U.K), delivery through cargo cycles (Paris), nearby delivery areas (France), commercial vehicle regulations (New York), out of hour deliveries (London), last mile delivery (Europe). In addition couple of best practices in Indian context related to Mumbai Dabbawallahs and urban delivery van network of Jaipur have also been reviewed and presented in the following sections.

6.2 International Practices

6.2.1 Freight Consolidation Centres (Bristol and Heathrow Airport)

Urban Consolidation centre or Freight Consolidation Centres is a logistics facility situated in relatively close proximity to the geographic area that it serves (be that a city centre, an entire town or a specific site such as a shopping centre), to which many logistics companies deliver goods destined for the area, from which consolidated deliveries are carried out within that area, in which a range of other value-added logistics and retail services can be provided. It offers freight transport companies the opportunity to deliver goods destined for urban area to a specialist centre for final delivery rather than having to make the delivery to the final customer in a busy part of the city.

There are benefits resulting from a multi-user Freight Consolidation Centre (FCC) as a means of reducing truck impacts in an urban center. FCC is usually implemented for one or more of the following reasons:

- To reduce truck traffic levels (reducing truck movements in the urban area through improved consolidation or modal shift);
- To alter the type of truck used (e.g., fewer light or very heavy trucks);
- To reduce the environmental impacts associated with truck activity (i.e., through a reduction in total trips and/or greater use of environmentally friendly vehicles);
- To improve the efficiency of urban freight transport operations (through improved load factors or fewer deliveries); and
- To reduce the need for goods storage and logistics activities near the urban core (offering storage facilities at the FCC, as well as other value-added services).

i. Bristol FCC

Bristol, England, is the largest urban area in the southwest region of the United Kingdom. In 2009, the city of Bristol had an estimated population of 433,100. It is a regional center for industry, commerce, education, and culture, and serves as a major transportation hub providing a gateway to the southwest region of the United Kingdom via the M4 and M5 motorways. It has an estimated drive-to-work population of over 1 million, and is considered one of the most congested cities in the United Kingdom with average peak hour traffic speeds of approximately 16 mph. In the city center, the main retail area of Broadmead receives 100,000 deliveries per year, contributing to congestion and harmful emissions. Truck movements contribute to the congestion and pollution problems found in Bristol, as well as other issues relating to road safety, negatively affecting the condition of the roads and causing conflicts with other road users (NCFRP, 2012).

Figure 6.1: UCC at Bristol, UK

Source: BESTUFS, Good Practice Guide on Urban Freight Transport

Unlike the traditional single city center shopping experience offered in many United Kingdom cities, Bristol has several specialty retail areas (e.g., Queens Road/White Ladies Road, Christmas Steps/Michaels Hill, and Clifton Village), each with its own unique retail experience. The City Council's transportation strategy, set out to support the economy of the city and the effective delivery of goods, is seen as essential in

achieving this aim. Bristol City Council's Local Transport Plan and Air Quality Action Plan both state the need to reduce the impacts of trucks without adversely affecting the economic vitality of the city center. In response to one of the strategies, which the Bristol City Council set out, was through the use of the Freight Consolidation Center (FCC); achieve a 50 percent reduction in associated delivery trips and a doubling of load factors related to consolidated reverse flows (NCFRP, 2012).

The Bristol FCC opened in 2004, (Figure. 6.1) consisting of a 5,000-square-foot warehouse operated by Exel Logistics, on an established industrial estate (Emerald Park), 11 km northwest of Bristol close to both the M4 and M5 motorways. There are benefits resulting from a multi-user FCC as a means of reducing truck impacts in an urban center. The Bristol FCC serves the Broadmead area of Bristol's urban core where over 300 retailers are located. The Bristol Consolidation Centre (BCC) is serviced by two delivery vehicles (a 7.5-ton and 17.5-ton rigid). To act as a "stick" and enhance the appeal of the Bristol FCC to retailers, Bristol City Council restricted freight vehicle access times to the main pedestrian portion of the retail area from 5 A.M. to 8 A.M., and 6 P.M. to 8 P.M., and accompanied this restriction with a strict requirement for trucks to use a one-way route system. Logistics providers/suppliers' vehicles with goods destined for city center retailers deliver into the Bristol FCC where items are stored. Once a vehicle load has been consolidated, the goods are loaded out in roll cages via one of the three dedicated Bristol FCC service vehicles into the city center for a round-robin style delivery. When launched, the consolidation center was 100 percent publicly funded, with time-limited financial assistance (2002–2006) coming through the VIVALDI (Visionary and Vibrant Actions through Local Transport Demonstration Initiatives) Project. Since 2006, efforts have been made to move to a business model based on maximum cost recovery from the participating retailers.

The impacts of the scheme have been positive. The number of roll cages which passed through the centre rose from 101 in May 2004 to 401 in December 2004 resulting in an 8% reduction in vehicle trips into Bristol centre for retailers in scheme. By October 2005 nearly 42,772 total vehicle km; 529 tonne of CO_2 emissions; 0.8 kg of NOx and 11.0 kg of PM10 emissions had been saved as a result of the scheme (NCFRP, 2012).

ii. Heathrow Airport Retail UCC, London

The objective of the UCC at Heathrow Airport, London started in 2007 was to alleviate congestion within airport / reduction in vehicle movements / security / environmental improvement / reduction in handling costs/improve delivery to retail units/improve waste management (BESTUFS, 2007).

All deliveries (except newspapers and high value / high insurance items) are made to a consolidation centre outside the airport perimeter where inbound deliveries are security checked (scanned) and sorted by delivery address into sealed roll cages and then delivered to a regular schedule (Figure. 6.2). Some low value items e.g. soft drinks are delivered on pallets. The service includes: delivering to individual premises by a dedicated "delivery team" located within each terminal and the return of packaging / waste to the depot. The logistics of this operation comprises of two 20 m2 warehouse (25 m2 chilled), 1500 roll cages, 8 operational & clerical staff managing this 24 hour / 7 day operation. A partnership between British Airports Authority and a logistics provider was established which was initially voluntary since 2000 but later compulsory for all retailers in the terminals since 2004. The results of the scheme showed that in 2004 the consolidation centre received 20,000 vehicle deliveries which resulted in 45,000 store deliveries

being made from the consolidation centre on 5,000 vehicle trips. About 190 out of 240 retail outlets are using the consolidation centre. Nearly 70% reduction in vehicle trips was observed for those goods that flow through the centre, resulting in an estimated savings of 144,000 vehicle kilometres in 2004. Further the vehicle emissions reductions also increased as goods throughput has grown, with CO_2 savings of 100 kg per week in 2004 (BESTUFS, 2007).

6.2.2 Urban Logistics Space (Paris)

The City of Paris lies in the northern central part of France. It covers 105 km², has a population of 2.2 million inhabitants and represents 1.6 million jobs. Its population density is 21,000 inhabitants per km^2. As most large European cities, Paris faces urban problems related to transport and traffic. The spatial dispersion of logistic facilities in the metropolitan area has increased the distance travelled by trucks and vans which deliver to the city, leading to increased CO_2 emissions. The city has a freight policy that focuses on developing experimental actions, in order to promote new ways of delivering to the city center. One of the pillars of this policy is to develop small logistic facilities in the city center. The city took several measures to reintroduce logistic facilities in the center, and to demonstrate their usefulness by using concrete examples of innovative ways of delivering, using environmentally friendly vehicles (BESTUFS, 2007).

Figure 6.2 : CHRONOPOST express freight clean delivery

Source: Paris Freight Policy, 2011, Department of Roads and Mobility Management

Chronopost Concorde is an innovative organization of parcel deliveries in the 7th and 8th Boroughs of Paris using clean delivery vehicles as well as an Urban Logistics Space (ULS) (Figure. 6.2). It is the good example of the Urban Logistics Space policy of Paris, a policy that is easily transferable to any large city provided it owns or regulates the use of urban car parking public facilities. Chronopost is active on both the Business to Business and Business to Customer markets. The company has 3,500 employees and it delivers 240,000 parcels each day around the world, and has a market share of 18% in France. Chronopost developed a new organization which is based on a main transport link from a hub outside Paris to the Concorde ULS, and final deliveries using a fleet of

electric vehicles from the Concorde ULS to the clients. The hub outside Paris is located in Charenton, one of the Eastern cities of the first ring around Paris. From operational point of view, the Concorde ULS gives Chronopost the advantage of being very close to its clients which means no wasted time in congestion before delivering the first customers, and a higher productivity (70 addresses per route instead of 56 addresses when the route started from a hub outside of the city limits). The total distance travelled by traditional vans has decreased by 75%, resulting in corresponding impact on local emissions. The decrease in emissions observed largely owed to use of an electric fleet for final deliveries and the new logistic organization (one shuttle between the ULS and an external hub instead of a fleet of vehicles (BESTUFS, 2007).

6.2.3 Freight Quality Partnerships in the UK

FQPs are a means for urban authorities, businesses, freight operators, environmental groups, the local community and other interested stakeholders to work together to address specific freight transport problems.

- FQPs provide a forum to achieve best practices in environmentally sensitive, economic, safe and efficient freight transport.
- FQP partners exchange information, experiences and initiate projects regarding urban freight transport.
- FQPs have been formed by many local authorities in the UK.

Suggested action points for setting up a Freight Quality Partnership in the UK were as under:

Action points for urban planners before setting up an FQP	Action points in developing an FQP
1. Through consultation, develop a distribution strategy	1. Identify problems and collect the necessary information to clarify their precise nature
2. Consider how an FQP could help you deliver your distribution strategy	2. Assess the various solutions and reach consensus on what should be done
3. Promote the benefits of the FQP - internally to secure the necessary commitment and externally to attract partners	3. Draw up a timed action plan for delivering the solutions, identifying who is responsible for each task by when
Action points in setting up an FQP	**Action points for maintaining momentum in an FQP**
1. Set initial objectives that are specific, measurable, achievable, realistic and timed	1. Consider how you can maintain interest and keep the momentum going
2. Appoint a Freight Champion who will take responsibly for the FQP within the Authority	2. Use publicity to promote the Partnership and its activities
3. Identify and recruit partners that help achieve your objectives	3. Constantly monitor progress of the process, outputs and outcomes
4. Establish the FQP's management structure including a chair and secretariat	

5. Decide when, where and how often you should meet	
6. Identify funding sources and seek the necessary endorsement	
7. Try to pre-empt potential problems	

Source: UK Department for Transport

6.2.4 Delivery through Cargo Cycles (Paris)

La Petite Reine is a company which developed a new delivery service for densely populated urban environments exclusively using "cargo-cycles" or electrically powered tricycles with a container at the front or at the back (Figure 6.3). La Petite Reine means "the little queen" in French, a familiar nickname for bicycles. It was founded in 2001 in Paris and has since then been expanded to Bordeaux, Rouen, Dijon, Geneva, and Lyon in September 2010. It now makes some 2,500 deliveries every day for clients including DHL, ColiPoste, Monoprix, Dannon and more. La Petite Reine also maintains a fleet of about 75 cargo-cycles for hire on demand by businesses that need to make small to medium-sized urban deliveries over a distance up to 30 km. Weighing only 80 kg (as opposed to a tonne or more for most delivery vans), each cargo-cycle can carry about 180 kg of merchandise in its 1,400 litre cargo space.

Figure 6.3: La Petite Reine cargo-cycles

In 2002, the City of Paris financed a feasibility study to evaluate the capacity of delivering goods with tricycles (BESTUFS, 2007) The feedbacks from a large scale questionnaire survey were very positive, with great interest demonstrated by both local stores (603 positive answers on a total of 624) and express transport companies. La Petite Reine started its activity of parcel collection and deliveries mainly as a subcontractor to major express delivery companies, such as DHL, FedEx or Chronopost. These companies discovered that tricycles could be better fitted to cities than vans. For example, in 2006 when Ciblex started to work with La Petite Reine, four tricycles replaced six ciblex vans and provide the following advantages:

- Access is possible in pedestrian areas; Tricycles are allowed in bike and bus lanes; Operational cost is lower than for a motor vehicle;
- The terminal (the Urban Logistics Space) is close to the market area where goods are picked up and delivered. This shortens the reactivity time of the company in case of unexpected events or unplanned operations.

6.2.5 Nearby Deliveries Areas (ELP) (Bordeaux- France)

In Bordeaux, a system was established to ease the delivery of goods in the city centre, involving the creation of 'nearby delivery areas' (Espace de livraison de proximité - ELP). The ELP approach comprises the installation of an urban transhipment platform on which dedicated personnel, up to two members, provide assistance for the dispatching of consignments for the last mile (inner city). ELP is an area of street space that has been dedicated to goods vehicles for the loading and unloading of goods destined for the nearby shops. It can accommodate to 5 delivery vehicles at once. Goods are unloaded from incoming vehicles, and can be loaded onto trolleys, carts, electric vehicles and bicycles for the final distribution leg (Figure 6.4). This approach can also be used to provide additional services (such as home delivery, short-term storage etc.). The system is intended to make the delivery of goods to the city centre easier and reduce traffic congestion, noise and pollution associated with deliveries. It is collaboration between freight transport companies, the Chamber of Commerce of Bordeaux and the Bordeaux metropolitan authority. The ELP operates from Monday to Friday between 09.00 and 17.00 and on Saturday between 09.00 and 11.00. Initial results show that the ELP system is very popular with freight transport companies because it offers the guarantee of an available and secure unloading area close to the commercial area in the city centre. A second ELP was set-up in Bordeaux in 2005 (BESTUFS, 2007).

Figure 6.4: Delivery van in France

Source: BESTUFS, Good Practice Guide on Urban Freight Transport

6.2.6 Commercial Vehicle Regulation and Out of hours Delivery (New York & London)

i. Vehicle Regulations, New York

Commercial vehicles are essential to the commerce and services of America's largest city New York City which hosts a population of more than 8 million in an area of just 300 square miles. The city had experienced a 35 percent increase in truck volumes over the past 20 years with no comprehensive changes to the regulations or policies governing truck access and no changes in the number of truck route miles (street capacity) to meet this demand. Only 5 percent of the city's streets were designated as truck route streets. Most designated truck routes operated at or near capacity. A survey of freight stakeholders revealed that most stakeholders had limited knowledge or did not understand New York City's truck route regulations.

New York City Department of Transportation (NYCDOT) in 2007 sought to simplify the truck regulation scheme, while improving effectiveness and created a new Office of Freight Mobility. To accomplish the goals, as a strategy, besides releasing an electronic online version of the city's first comprehensive citywide truck route map coupled with truck route signage pilot program for truck drivers , a Delivery Windows Program was launched to make curb space available for delivery trucks. It was felt that by reducing the number of trucks double parking, traffic congestion can be reduced and air quality improved. In addition, reasonable curbside access supports the New York City economy by improving the efficiency of truck deliveries. To address curbside access, NYCDOT implemented a multi-pronged approach. By working with merchants and through curb utilization surveys, information was gathered in specific neighbourhoods regarding peak demands for curbside access. Using the data gathered delivery windows were installed

alongside a protected bike lane with offset parking on Columbus Avenue in Manhattan, First and Second Avenues in Manhattan, along the Fordham Road Bronx Bus Rapid Transit (BRT) route, and were planned for Church Avenue in Brooklyn in January 2011.

In 2009 as part of a Off-Hours Delivery Program the Office of Freight Mobility formed a partnership with Rensselaer Polytechnic Institute, Rutgers University, the Rudin Center at NYU Wagner, and ALK Technologies on a USDOT-funded program to encourage off-peak deliveries between 7 P.M. and 6 A.M. The pilot ran from late 2009 through early 2010, with encouraging results for the 33 participants. The participants included a diverse group of 8 delivery companies (carriers) and 25 business locations (receivers) that participated in the pilot for at least 1 month, and included restaurants and retail stores. Feedback from the off-hours delivery program suggested that fewer deliveries during normal business hours allowed shops and restaurants to focus more on their customers. In addition, receivers said their staffs were more productive because they waited around less for deliveries that were tied up in traffic. Carriers found that their trucks could make more deliveries in the same amount of time because their service time at a receiver's location was reduced from 1.8 hours to 0.5 hours. They also saved money on fuel costs and could use a smaller fleet by balancing daytime and night-time deliveries. Legal parking was more readily available during these hours, and drivers reported feeling safer and less stressed. The study also found that travel speeds from a truck depot in New Jersey to a delivery driver's first stop in Manhattan improved by 75 percent (NCFRP, 2012)

ii. Out of Hour Deliveries, London

The city of London is the largest metropolitan area in the United Kingdom and the largest urban zone in the European Union. There are approximately 7.5 million residents in Greater London (2007) with a population density of 4,542 inhabitants per square kilometer. As a commerce center, London generates approximately 20 percent of the United Kingdom's GDP, and is one of the world's major international finance hubs. Congestion costs the freight industry around £800 million per year. Population growth projections suggest that freight activity could increase by up to 15 percent over present levels by 2025. Central London attracts 180,000 light trucks and 60,000 heavy trucks each day. Commercial trucks travelled 5.6 billion vehicle kilometers on London roads in 2007. Approximately 60 per- cent of all commercial vehicle kilometers were attributed to company-owned light trucks in London between 2003 and 2005, reflecting the importance of the service sector as a freight vehicle trip generator. It is also estimated that commercial trucks account for approximately 25 percent of CO_2 emissions resulting from transportation in the city. As per the practice across London, planning and environmental health restrictions limit when retailers and businesses can take delivery of goods and services. Individual Boroughs (32 across London) decide on their own delivery restrictions, primarily to protect residents from noise disturbances (NCFRP, 2012).

Out of Hour deliveries (OHD) is a strategy addressing deliveries made during periods when local night time restrictions may apply or during other periods when delivery restrictions apply. It offers one suite of measures to enable more sustainable movement of goods in the capital. The London Freight Plan published in December 2007, encouraged communities to examine OHD strategies within the Greater London area. OHDs can improve driver and fleet productivity; improve the environmental footprint of the logistics operation by operating vehicles more efficiently during times when there is less congestion; and reduce the wider impacts (e.g., crashes, noise, and parking) of logistics operations on the local area. To help local

authorities facilitate night time deliveries, the Department for Transport (DfT) published Delivering the Goods: Guidance on Delivery Restrictions (Department for Transport 2005), which set out to inform local authorities on how to implement and enforce delivery restrictions within their areas. This accompanied guidance on night time deliveries by the Freight Transport Association. Delivering the Goods, a toolkit for improving night-time deliveries, was designed to help logistics providers set up pilot trials for OHD, while highlighting the important role local authorities have to play in protecting the interests of local residents. In London, there also are incentives for commercial vehicle operators to implement OHD strategies. OHDs made outside the charging period, in addition to greatly improving fleet efficiency, also can save money on access charges.

In a study of the potential for OHDs in London undertaken by Transport and Travel Research Ltd. (2008), retailers who operate their own fleets were more likely to be interested in the OHD concept than those relying on contracted transportation services. This was due to private fleets being more likely to give their own drivers direct access to their stores without security concerns. The results suggested local authorities were interested in aiding businesses in developing OHD strategies provided that local noise regulations were not compromised and industry-led solutions (e.g., noise curtains, rubber floor mats, and driver training) applied whenever possible (NCFRP, 2012).

Another example of OHD implementation was by the supermarket chain Sainsbury of U.K which is the third largest supermarket chain in the United Kingdom with approximately 537 supermarkets and 335 convenience stores in their network. In 2007, Sainsbury's undertook a trial delivery program to evaluate impacts associated with moving to night time deliveries in the borough of Wandsworth. The Noise Abatement Society (NAS)—a working group of Sainsbury's and the Wandsworth Borough Council—developed a framework to have night time restrictions lifted at the Sainsbury's supermarket in Wandsworth for a 3-month period to conduct the trial. The purpose of the trial was to quantify whether night time deliveries had any detrimental impact on local residents or the wider community. For the OHD trial, the delivery profile that had been imposed on the market in Wandsworth was amended to incorporate specific deliveries during the previously restricted period between 1:30 A.M. and 3:00 A.M. It was observed that between October and December 2007, the Sainsbury's-Wandsworth ODH delivery trial.

- Reduced the maximum recorded noise level during roll cage unloading by 8 to 10 decibels. (This was primarily attributed to the use of "dock curtains" on the loading bays to contain the noise from inside the trailer.)
- Reduced average delivery vehicle journey times by 60 minutes over a round trip from the distribution center.
- Produced a saving in drivers' time of 2 hours per day, equal to 700 hours or £16,000 per year.
- Removed 700 vehicle journeys from the road annually (2 per day during the congested period), which is equivalent to a 68-ton reduction in CO_2, and a 700-liter per year savings in fuel.
- Improved mean vehicle turnaround times at the store by 37 minutes.
- Increased overall staff productivity by 15 percent and improved product availability.

6.2.7 Last Mile delivery solutions

i. Kiala Points, Europe

Kiala provides a collection point service for long-distance retailers or e-commerce shops for non-food products in Belgium, Luxembourg, the Netherlands, France and in future in UK. It has established a network of collection points (Kiala Points) at which customers can collect, pay for and return their parcels. As part of the scheme transport between the retailer warehouses, pick- points and Kiala Points are organised. Two main networks are operated: a consumer oriented network and a professional network for time critical deliveries for express couriers, travelling sales staff, and field engineers. The customer can select a preferred store for collecting their delivery. Once the delivery to the store has been made the customer is informed via SMS or Call Centre that their goods are ready for collection. The application also manages the data flows from and to end-customers, direct selling companies, collection delivery points and transportation partners. State of the art technology reduces costs, increases efficiency. In addition the system allows the customers to track & trace their parcel on the Kiala Internet site (BESTUFS, 2007).

ii. Locker-banks (Packstation), Germany

Locker-banks are groups of reception box units (lockers similar to collection points as they are not sited at each customer's premises buts sited in apartment blocks, work places, car parks, railway stations etc. Customers may be notified by message about when their delivery has arrived, the box number and location, and the code to open the box. Locker-banks require the customer to make the final leg of the journey. However, locker-banks are located to make the deviation in customer's journeys as short as possible.

PackStation is a system provided by Deutsche Post in Germany (Figure 6.5). It offers consumers and professionals the possibility of access to their parcels 7 days per week, 24 hours per day. As a process the customers are issued with a PIN, an Internet password & a city plan CD-ROM showing all the PackStation locations. The system can also be used to make return shipments. A customer is informed of delivery by e-mail and/or SMS and the packages can be held for up to nine calendar days. Two types of machine are currently being used:

- a static system, similar to a left luggage lockers in stations
- machines without lockers that work using a rotary

It was first introduced in Germany in Dortmund and Mainz in 2001. By the end of 2005, DHL had introduced it in 90 cities. Large companies (including BASF, Microsoft, Siemens Medical Services and SAP) have locker banks on their premises to cope with personal parcels for employees (BESTUFS, 2007).

Figure 6.5: Packstation inside the central railway station in Frankfurt

Source: Urban Freight in Developing Cities - Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

6.3 National Practices

6.3.1 Mumbai Dabbawalas (Mumbai)

A dabbawala is a person in Mumbai whose job is to carry and deliver freshly made food packed in lunch boxes from home to office workers. Mumbai Dabbawala, formerly known as MTBSA (Mumbai Tiffin Box Suppliers Association), provides services like collection, transportation and delivery of lunch boxes from home to office location in the morning in Mumbai (Figure 6.6) . In the evening the empty lunch boxes are moved in the reverse direction. This service is aimed at the middle income group families, small traders and owner managers and started a lunch delivery service with about 100 men in 1890.


Figure 6.6: The Dabbawalas of Mumbai

Dabbawala carrying dabbas from home to nearest railway station

Dabbawala bicycling to the closest Mumbai suburban railway station

Re-sorting of dabbas at destination railway station

Dabbawalas delivering dabbas in crates from destination to end customer

Source: Urban logistics practices – Mumbai Case Study (2011), TURBLOG

Since then they have expanded to 5000 employees today covering about 60 to 70 kms. and handling about 2,00,000 lunch boxes "dabbas" i.e. (4,00,000 transaction a day in a time of about 3 hours). They charge between Rs. 150 to Rs. 300 (roughly 3-7 USD) per dabba per month depending on the location and collection time

A collecting dabbawala, usually on a bicycle, collects dabbas either from a worker's home or from the dabba makers. As many of the carriers are illiterate, the dabbas have some sort of distinguishing mark on them, such as a colour or group of symbols. The dabbawala then takes them to a designated sorting place, where he and other collecting dabbawalas sort the lunch boxes into groups. The grouped boxes are put in the coaches of trains, with markings to identify the destination of the box (usually there is a designated car for the boxes). The markings include the railway station to unload the boxes and the destination building delivery address. At each station, boxes are handed over to a local dabbawala, who delivers them. The empty boxes are collected after lunch or the next day and sent back to the respective houses. Each dabbawalla handles about 35 dabbas in daily. For some of the areas where there are a large number of dabbas to be delivered, two or three dabbawalas are assigned

who use a hand cart to push these to their respective owners. By the time a dabba reaches its final destination, it will be handled by four dabbawalas. It will be the same for the return of the empty dabbas after lunchtime. The same dabbawala who delivered at the offices of a specific area will collect them and reach the closest station. Then the same sharing-out will start again until the dabbawala of the residence area has gathered his customers in order to begin his return delivery (Ravichandran, 2005). Figure 6.7 shows various activities being performed by the dabbawalas.

In terms of its operations the lunch boxes are usually marked in several ways: (1) abbreviations for collection points, (2) colour code for starting station, (3) number for destination station and (4) markings for handling dabbawala at destination, building and floor. The dabbawalas have started to embrace technology, and now allow for delivery requests through SMS. A colour-coding system identifies the destination and recipient. VLP: Vile Parle (suburb in Mumbai), 9EX12: Code for Dabbawalas at Destination, 9: Floor no. 9, EX: Express Towers (building name), 12: 12th Floor, E: Code for Dabbawala at residential station, 3: Code for destination Station e.g. Churchgate Station (Nariman Point). New York Times reported in 2007 that the 125-year-old dabbawala industry continues to grow at a rate of 5–10% per year. Reportedly their mistake rate is just 1 in 16 million deliveries which caused the Forbes Global magazine to award this service the six sigma performance rating in 2001 (Purohit. N)

Environmentally speaking, the process focuses on: reducing energy use and toxic emissions by using public transport; enhancing recycling of materials through using the same dabba over and over as opposed to fast food containers and wrappers, which are typically use-and-throw; maximizing the use of renewable resources; and basically being an eco-efficient process. From a social standpoint, the system enhances workplace conditions by providing a good place for employee development through mentorship and trust. In addition, the dabbawala business model is philanthropic in nature. Governance is achieved by instilling ethics, values and principles in employees and by holding employees accountable at all times.

6.3.2 Urban Delivery Van Network (Jaipur)

UDAN is an Urban Delivery Network of tempo [goods vehicle] drivers and helpers in the city of Jaipur, capital of the state of Rajasthan, India (LOGISURE, 2014). The network is a solution to the emerging issues in modern urbanization like increasing traffic congestion, rising pollution levels, asymmetry of information in a city like Jaipur. Prior to this initiative the urban freight generation pattern and availability of carriers or service providers in the Jaipur city was not in sync with each other as a result all the goods tempos on a stand did not get trips for loading on a regular basis. Also, most of these tempos plied half loaded trips and had empty return trips due to lack of access to freight on return trips. There were other reasons like lack of trust and absence of professional service behaviour necessary to handle households.

With the advent of UDAN initiative a collaborative platform connecting urban freight with service providers (Figure 6.7) was facilitated by the company LOGISURE which has brought in positive economic, social and environmental benefits. With a centralised planning of dispatches the freight movement tempo owners have collaborated and are managing their deliveries which has brought about optimal utilization, reduced empty runs thereby reducing costs of deliveries within city. The concept of UDAN is that it acts as a;

Collaboration Platform – Owing to the availability of a network of thoroughly screened and trained local tempo owners and helpers, businesses within a city can manage their delivery/distribution requirements professionally. This collaboration also helps the tempo drivers and owners in stabilising their income and flow of work.

Communication Channel – UDAN connects all the local stakeholders of the loading sector – Local businesses, Tempo owners and helpers, Market Load Operators, Auto manufacturers, Traffic police, urban development and authorities, NGO, Education and Training institutes and Citizen. It is a channel where stakeholders come together and talk about issues relating to this sector and how it can help increase city mobility, spread awareness about rules and regulations and share responsibilities.

The distribution is carried out through customer mobile apps that can be used to place the orders, to pick and deliver right products at right place and then the customer can also track the order online. Some of the unique features of this network are:

- The client does not have to create/maintain own captive fleet or pay for the full month or per trip even for part load but the charges are as per use basis.
- There is a flexibility to increase or decrease the number and type of delivery vans as per needs of the client facilitated through creation of a large pool of tempos and delivery vans meeting varied requirements of body type and payload.
- The vehicles are available on call basis and the client does not have to be bothered about the availability of vehicles.
- The performance of the client's deliveries is monitored through a centralized control room. Also the deliveries are organized as per the clients preferred time windows.

Figure 6.7: Conceptualized Urban Delivery Van Network, Jaipur

The UDAN initiative has resulted in immense benefits in comparison to previous situation shown as under:

- Fuel emission in dry run has reduced from 1 litre/trip to 0.58 litre per trip
- Dry run percentage has reduced from 42% to 20%
- CO_2 emission in dry run has come down from 1600 g/trip to 1000 g/trip
- Average daily trip per month increased from 1.4 to 2.7 trips

Annexures

A.1 : List of Database on City level Urban Freight Activities

A. Existing Urban Freight Status		
A.1 Freight Generator		
A.1.1	**Type:**	
A.1.2	**Location:**	
A.1.3	**Specialised Commodity Moved:**	
A.1.4	**Total No. of Establishments:**	
A.1.5	**Total Daily tonnage Handled:**	
1.	**Daily Goods Flow in the city (in Vehicles and Tonnes)**	
	Intercity Inbound	
	Intercity Outbound	
	Intra-City Flows	
2.	**Mode Wise Average Trip Length -**	
	LCV/Tempo	
	2 Axle Trucks	
	3 Axle Trucks	
	Multi Axle Vehicles (MAV)	
3.	**Trip Length Frequency (% of Trips)**	
	Below 50 km	
	50 to 100 km	
	100 to 150 km	
	150 to 200 km	
	200 to 300 km	
	300 to 500 km	
	More than 500 km	

4.	**Trip Frequency Distribution of Goods Traffic**	**More than once in a day**	**Daily**	**Weekly**	**Occasio-nally**
	LCV/Tempo				
	2 Axle Trucks				
	3 Axle Trucks				
	Multi Axle Vehicles (MAV)				
5.	**Commodity Share of Goods Vehicle Traffic at Outer Cordon Locations (in %)**				
	Food grains				
	Fruits and Vegetables				
	Household Goods				
	Chemical and Fertilizers				
	Petroleum				
	Building Materials				
	Textiles				
	Ores/Minerals				
	Timber				
	Manufacturing Goods				
	Others				
6.	**Modewise Pay Load (in T)**				
	LCV/Tempo				
	2 Axle Trucks				
	3 Axle Trucks				
	Multi Axle Vehicles (MAV)				
7.	**Number of Goods Vehicle Trips Produced/Attracted in the city**				
8.	**Amount of Goods (in tonnes)**				
	Food grains				
	Fruits and Vegetables				
	Household Goods				
	Chemical and Fertilizers				
	Petroleum				
	Building Materials				
	Textiles				
	Ores/Minerals				
	Timber				
	Manufacturing Goods				
	Others				

9.	**Types of Goods Terminal In the City like**	
	Truck terminal	
	Transport Nagar	
	IFC	
	Container Depots	
	Warehouses	
	Railway Yards	
	Ports	
	Airports (Cargo)	
10.	**Number of Truck Terminals in the City**	
11.	**Road Side Truck Bays**	
	Road Stretch (km)	
	Number of trucks per day	
12.	**Truck Terminal Details**	
i.	Location	
ii.	Area	
iii.	Activities (Truck Parking Facility, Transit and Transhipment of goods of trucks)	
iv.	Amount of Goods Handled daily (in tons)	
v.	Inflow of Trucks per Day (Number)	
vi.	Outflow of Trucks per Day (Number)	
vii.	Components of Truck Terminal (Yes/No; If Yes, then Numbers/Capacity)	
	Transport Agencies	
	Circulation	
	Parking Space (Area and Number of Trucks)	
	Open Space	
	Petrol Pump	
	Service Centre	
	Godowns	
	Weigh Bridge	
	Administrative Offices	
	Fire Stations, Post Office and Dispensary	
	Bank, Bus Station, Electric Sub-Station	
	Cold Storage	
	Spare parts Shop	

13.	**Total Commodity Handled by Terminal**	
i.	Inflow	
ii.	Outflow	
iii.	Overall	
14.	**Truck Parking Areas**	
i.	Location	
ii.	Area	
iii.	Capacity	
15.	**Truck Parking in Commercial Areas like Mandis/Retail Markets**	
i.	Location	
ii.	Type of Commodities	
iii.	Loading and Unloading Spaces	
iv.	Parking Provision for Hand Carts/ LCVs/Tempos/Other Goods Vehicles	
v.	Average Parking Duration	
vi.	Vehicle parked/Day	
16.	**Truck Parking in Industrial Areas**	
i.	Location	
ii.	Type of Commodities	
iii.	Loading and Unloading Spaces	
iv.	Parking Provision for Hand Carts/ LCVs/Tempos/Other Goods Vehicles	
v.	Godowns	
17.	**Railway Yards**	
	Commodities Handled	
	Transit Sheds/Platforms used as Godowns/Storage Spaces (Area)	
	Approach Road Conditions	
	Office Space	
	Goods brought in (Mode and From)	
	Goods sent (Mode and From)	
	Number of Road based Vehicles using the yard per month	
	Activities Performed (Loading/Unloading)	
18.	**Godowns**	
	Storage Space	
	Commodities Handled	

	Monthly trucks - Loading and Unloading Goods			
	Commodities Handled			
19.	**Inflow of Goods (tonnage)**			
20.	**Growth Rate of Goods Traffic (%)**			
21.	**Average Pay Load**			
	Commodity	**Tonnes**	**Vehicles**	**Pay Load**
22.	**Distance**			
	Distance	**Tonnes**	**% of Tonnes**	
	Below 50 km			
	50 to 100 km			
	100 to 150 km			
	150 to 200 km			
	200 to 300 km			
	300 to 500 km			
	More than 500 km			
B. Urban Freight Management				
1.	Designated Specific Route (Yes/No, If Yes, length)			
2.	Length of the Route (km)			
3.	Truck Traffic Lane Width (m)			
4.	Landuse Break Up along the Route (in %)			
5.	Residential			
6.	Commercial			
7.	Industrial			
8.	Others			
9.	Traffic Signs			
10.	STOP			
11.	GIVE AWAY			
12.	Designated Hazardous Load Route (Yes/No, If Yes, then km))			
13.	Designated High Productivity Vehicle Route (Yes/No, If Yes, then km))			
14.	Ban on Trucks on certain routes at certain times (Yes/No), If Yes, then length of route and timings			
15.	Prohibition of Heavy Vehicles in certain areas			

16.	Exclusive Lanes for Trucks/Trucks and Other High Occupancy Vehicles	
17.	One Way Streets	
18.	Reversible Traffic Lanes	
19.	Intersection Channelization	
20.	Improved Direction Signs and Variable Message Signs	
21.	Speed Limits	
22.	Street Lighting	
23.	Median Barriers	
24.	Designated Loading/Unloading Zones in Retail and Commercial areas	
25.	Area Wide Loading and Unloading Restrictions on the kerbside	
26.	Designated Parking for Trucks waiting for long hours	
27.	Intelligent Transport System	
i.	Real Time Traffic Information System	
ii.	Real Time parking Information System	
iii.	Automated Enforcement of parking Regulation	
iv.	Automated Enforcement of Traffic Regulation	
v.	Toll Collection	
vi.	Automated Access Control	

A.2 : Freight Survey Performas

A.2.1 : Goods O/D Survey At Freight Terminal

I. Goods O/D Survey At Freight Terminal									
Sl.No.	Truck Type	Origin	Destination	Goods Type	Weight (Tonnes)	Frequency Of Visit	Distance (Km)	Halt Duration (Hr.)	Remarks

A.2.2: Vehicle Count for Freight Vehicle

II. TVC for Freight Vehicles												
TIME	FAST MOVING GOODS						SLOW MOVING GOODS					
	LCV TEMPO	HCV	MAV	MAV (CONTAINERS)	AUTO RICKSHAW	VANS	OTHERS	CYCLE RICKSHAW	ANIMAL CART	HAND CART	HEAD LOADS	OTHERS
FROM												
TO												
FROM												
TO												
FROM												
TO												
FROM												
TO												
TOTAL												

A.2.3 : Establishment Survey

III. Establishment Survey									
1	**Name of the Establishment (with Location):**								
2	**Type of Establishment**								
	i)	Trade & Commerce:	Wholesale:		Retail:			Wholesale Retail:	
	ii)	Industries:	Small Scale:		Medium Scale:			Large Scale:	
3	**Size of Establishment**								
	i)	Plot Area/ Built-up Area:							
4	**Types of Commodities Handled/Manufactured:**								
5	**No.of Employees**								
	i)	Permanent:			Temporary:				
	ii)	Local:			Migrated:				
6	**Commodity Details**								
	i)	Quantity Handled/Day:							
	ii)	Origin:							
		a)	Origin (Distance):	Within City		within MA		Outside MA	
		b)	Quantity handled/ day:						
		c)	Mode Used:	NMT	3W	Mini LCV	LCV	Truck	Others
	iii)	Destination:							
		a)	Origin (Distance):	Within City		within MA		Outside MA	

		b)	Quantity handled/ day:						
		c)	Mode Used:	NMT	3W	Mini LCV	LCV	Truck	Others
7	**Storage/Warehousing Details**								
	i)	Location:	<2km		2-5 km		>5 km		
	ii)	Size (area):							
	iii)	Handling Capacity (Tons):							
	iv)	Existing Level of Utilization:							
8	**Parking Details**								
		Place of Park-ing							
		a)	For Customers:	At the Premises		1-2Km		>2Km	
		b)	For Transport Operators:	At the Premises		1-2Km		>2Km	

9. Problems & Constraints

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10. Suggestions

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A.2.4: Parking Survey

IV. A. OFF STREET PARKING FOR GOODS VEHICELS						
PARKING LOCATION :					NAME	
NO OF VEHICLES PARKED BEFORE SURVEY :					DATE	
ENTRY				EXIT		
S. NO.	TYPE OF VEHICLE	REG. NO.		TYPE OF VEHICLE	REG. NO.	

IV. B. ON STREET PARKING

ENUMERATOR:	
DATE:	**NAME OF ROAD:**
LOCATION:	**ENTRY/EXIT POINT:**
TIME :	

Vehicle Reg. no.	**Time**													

A.2.5: Truck Driver Survey

V. Truck Driver Survey											
A. General Information											
Vehicle type:				Place of Registration:					Type of Commodity Moved		
Capacity:				Permit Type (State/National):					Quantity		
Age of Vehicle:											
B. Trip Information											
Trip. No	Time	Origin	Destination	Distance (km)	Purpose (Loading/Unloading/Returning empty)	Mode Used	Time (min)				Place of Idle Parking
							For Loading	Unloading	Idling	Total time	
IV. Transport Operator Survey											
B. General Information											
1) A)	Size (Area):				Small		Medium			Large	
B)	Storage Facility:				Sq.m						
C)	Storage Location										
	a)				Within Establishment:				Sq.m		
	b)				Outside Establishment:				Sq.m		
2)	Year of Establishment										
3)	Ownership Status										
					Owned						
					Rented						
4)	Types and no. of Vehicles in Fleet										
					Type			Number		Capacity	
					Mini-LCV						

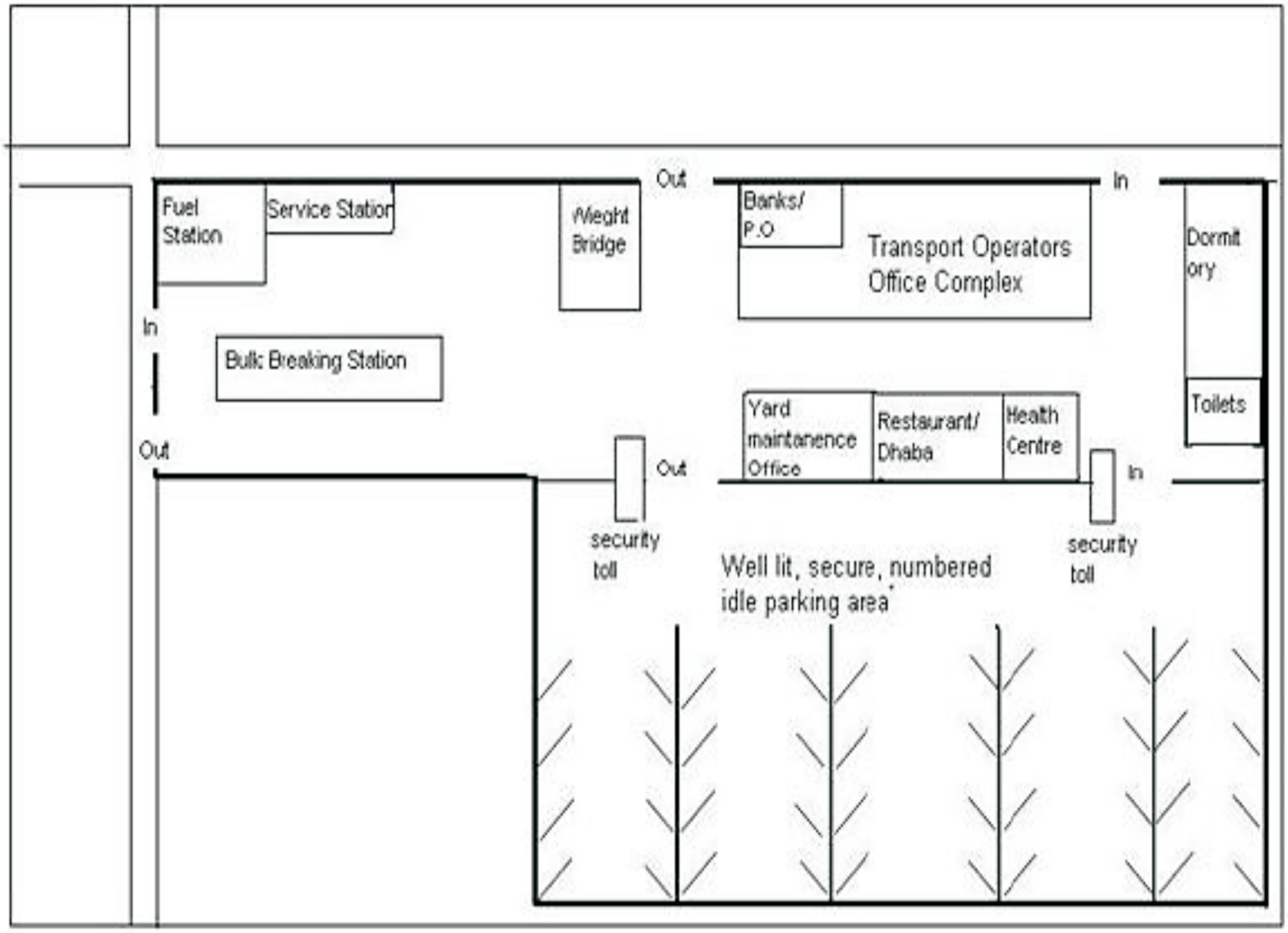
		LCV		
		HCV		
		Others		
5)	Restriction of Operation			
	i)	Temporal		
	ii)	Spatial		
6)	Parking facilities availability			
	a)	Location		
	b)	Area		
		Issues		Suggestions
7)	No. of Employees			
	a)	Full Time		
	b)	Part Time		
C. Trip Information				
8)	Area of Operation (States)			
9) A)	Commodity Type Transported			
	a)	Specific		
	b)	All		
B)	Tonnage Handled per Day			
10)	Average Commodity weight per shipment			
11) A)	Transportation Cost / Tonnage			
B)	Criteria for Costing			
	i)	Based on Tonnage		
	ii)	Based on Commodity Type		
	iii)	Based on Distance		
	iv)	Combination of Above (Specify)		
	v)	Any Other		


12)	Operational Timing		
	a)	Loading	
	b)	Unloading	
13) A)	Time taken for one vehicle load to		
	i)	Load	
	ii)	Unload	
B)	Place of		
	i)	Loading	
	ii)	Unloading	
C)	Place of Idle Parking of Fleet		
D)	Time spent/truck in idle parking		
14)	Average Distance of Haulage per trip		
	i)	Within Delhi	
	ii)	Outside	
15)	What percentage of goods is distributed within city?		
D. Attitudinal Information			
i.	Traffic Restriction, if any		
ii.	Place of Parking		
ii.	Problems faced in distribution of freight		
	a)		
	b)		
	c)		
	d)		

A.2.6: Truck Operator Survey

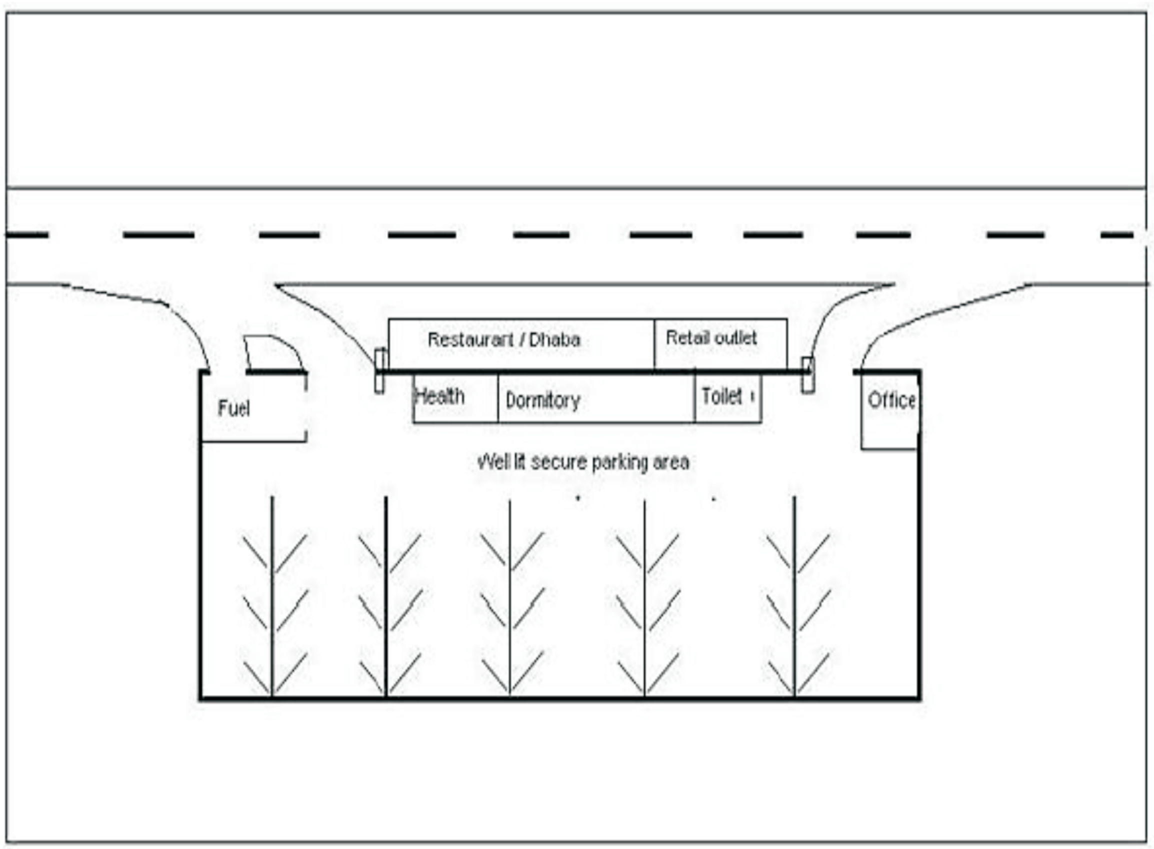
VI. Truck Operator Survey																
Sl. No	Truck No.	Trip No.	Origin	Destination	Purpose			Time (min)				Place of Idle Parking	Commodity Type	Quantity Carried (Tonnes)	Freight Charge (Rs.)
					Loading	Unloading	Empty	For Loading	Unloading	Idling	Total time				

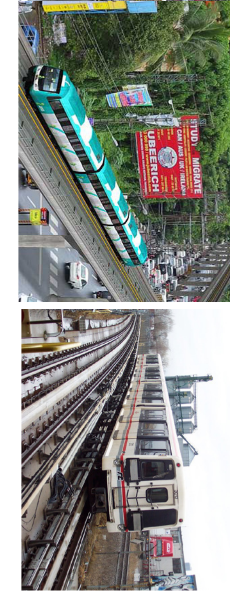
A.3 Schematic Layout of a of Truck Terminal in Karnataka



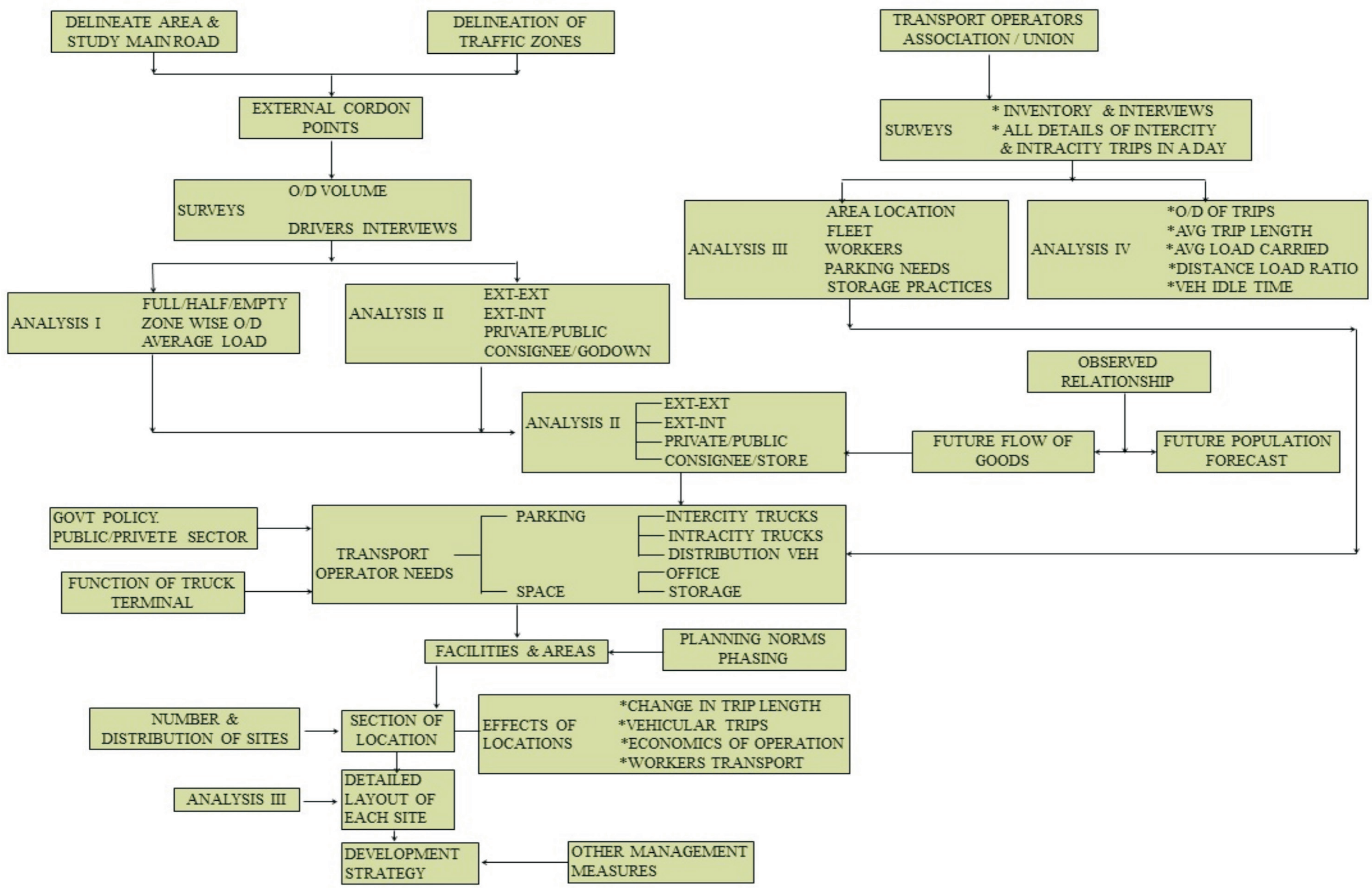
Source: S. Nayana Tara, Restructuring the Truck Terminal Infrastructure in Karnataka

A.4 Schematic layout of a Transit Terminal in Karnataka

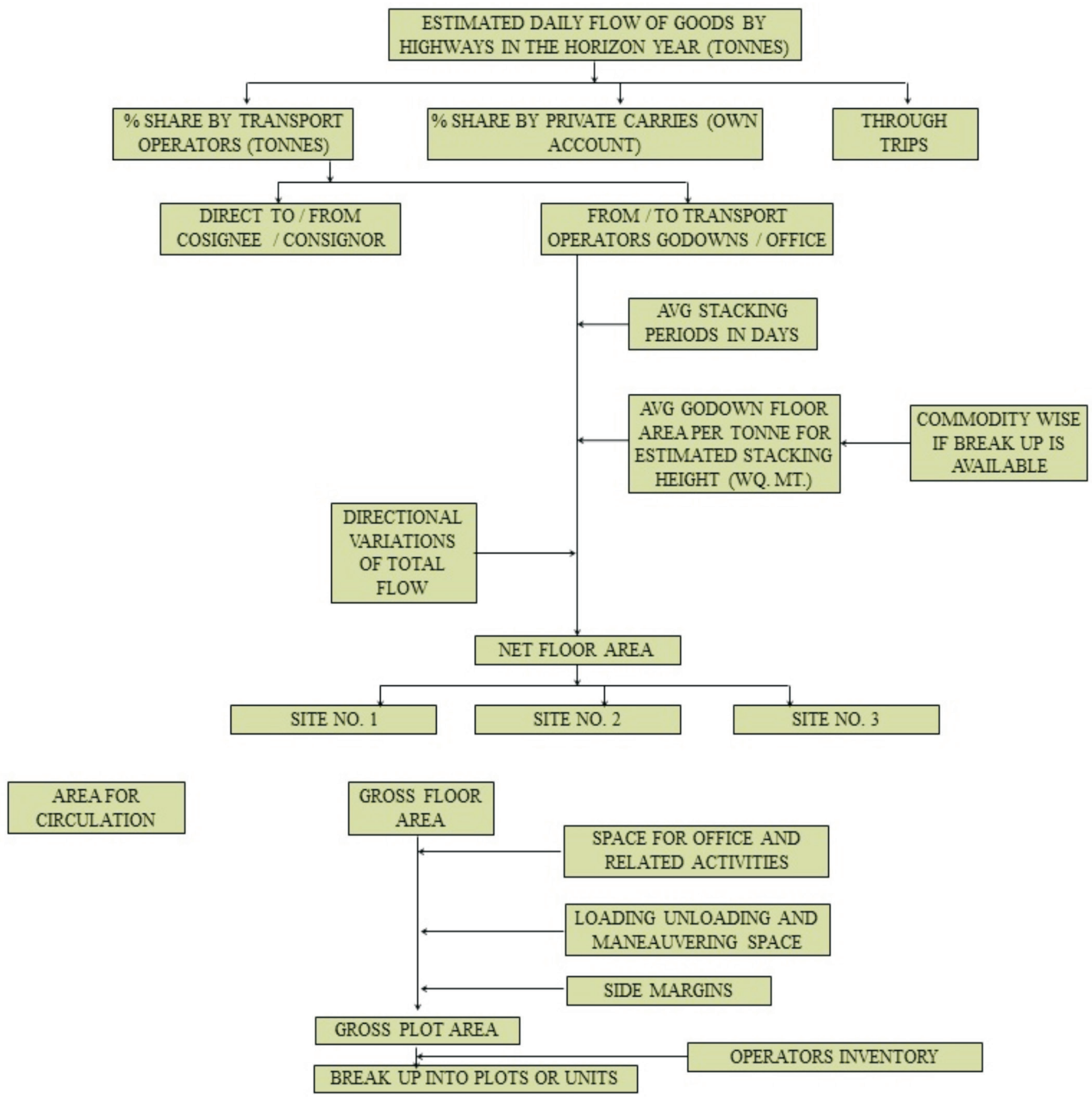




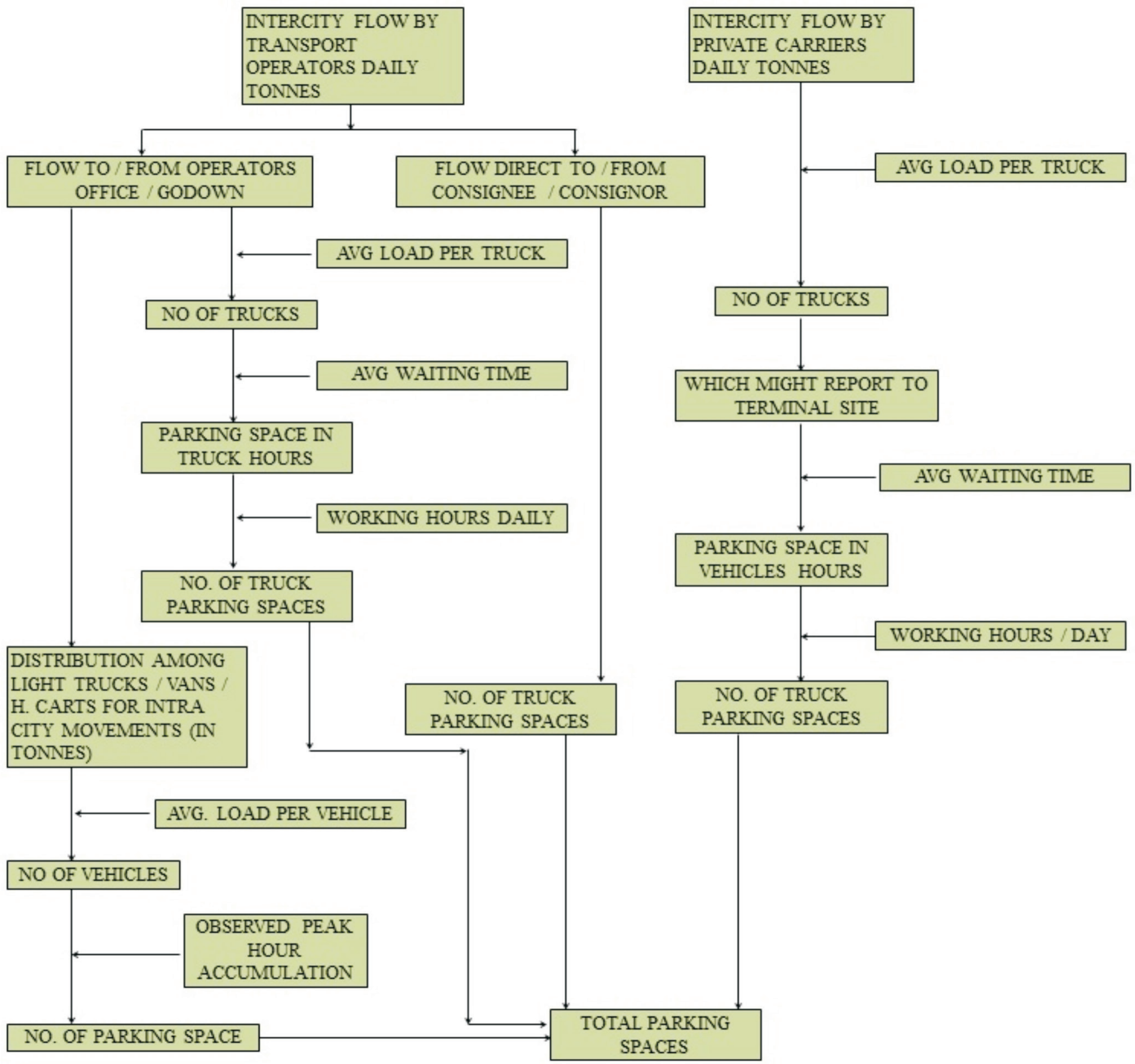
A.5 : Proposed Approach for Planning of Truck Terminals in Metropolitan Cities



A.6 : Proposed Approach for Estimation of Godown Space for Transport Operators in Truck Terminal



A.7 : Proposed Approach for Estimation of Parking Spaces in Terminal



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