



**Ministry of Housing
and Urban Affairs**
Government of India



GUIDELINES FOR NATIONAL SUSTAINABLE URBAN FREIGHT TRANSPORT SYSTEM

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Urban Mass Transit
Company Limited

Content

| | |
|---|-------------|
| CONTENT | II |
| LIST OF TABLES | IV |
| LIST OF FIGURES | V |
| ACRONYMS | VI |
| EXECUTIVE SUMMARY | VIII |
| 1 NEED FOR THE STUDY | 1 |
| 2 HOW NATIONAL AND STATE GOVERNMENTS ARE DOING THEIR BIT FOR URBAN FREIGHT | 4 |
| 2.1.1 <i>MoCI and its Draft National Logistics Policy</i> ¹ | 4 |
| 2.1.2 <i>MoRTH and its Draft Multi-Modal Logistics Park Policy</i> | 6 |
| 2.1.3 <i>State policies and their relevance for logistics planning</i> | 7 |
| 2.1.4 <i>Other studies and their key learnings</i> | 11 |
| 2.1.5 <i>MoHUA urban freight transport planning and management toolkit</i> | 13 |
| 2.1.6 <i>Importance of integration of urban freight planning into CMP and CDP</i> | 13 |
| 3 URBAN FREIGHT – A VALUE CHAIN CONCEPT | 15 |
| 3.1 COMPONENTS OF URBAN FREIGHT INFRASTRUCTURE..... | 16 |
| 3.2 COMPOSITION OF URBAN FREIGHT..... | 17 |
| 3.3 FUTURE OF URBAN FREIGHT IS CHANGING..... | 20 |
| 3.3.1 <i>Smart mobility for freight</i> | 20 |
| 3.3.2 <i>Track and trace systems for freight</i> | 22 |
| 3.3.3 <i>Just in time delivery</i> | 23 |
| 3.3.4 <i>Hub and spoke model of warehousing</i> | 23 |
| 3.3.5 <i>Mega Warehouses</i> | 23 |
| 3.3.6 <i>Drones for delivery</i> | 24 |
| 3.3.7 <i>EV vehicles for city freight</i> | 24 |
| 3.4 SOLUTIONS CURRENTLY PREVALENT..... | 25 |
| 3.4.1 <i>Strategies for efficient urban logistics</i> | 28 |
| 3.4.2 <i>Logistical Management</i> | 30 |
| 3.4.3 <i>Urban freight management strategies</i> | 32 |
| 3.4.4 <i>Parking / loading area management</i> | 33 |
| 3.4.5 <i>Vehicle initiatives</i> | 34 |
| 3.4.6 <i>Traffic management</i> | 35 |
| 3.4.7 <i>Financial incentives</i> | 35 |
| 4 NATIONAL FRAMEWORK FOR PLANNING FOR URBAN FREIGHT | 36 |
| 4.1 CITY CATEGORIZATION..... | 38 |
| 4.2 MAP FREIGHT INFRASTRUCTURE..... | 39 |
| 4.3 IDENTIFY STAKEHOLDERS..... | 42 |
| 4.4 STAKEHOLDER INTERACTIONS..... | 47 |
| 4.4.1 <i>Individual interactions</i> | 47 |
| 4.4.2 <i>Group interactions</i> | 49 |
| 4.4.3 <i>Analysis and inferences from stakeholder discussion</i> | 50 |
| 4.5 TRAFFIC AND COMMODITY SURVEY..... | 51 |

| | | |
|----------|---|-----------|
| 4.5.2 | <i>Freight survey coverage</i> | 54 |
| 4.5.3 | <i>Mode of data collection</i> | 54 |
| 4.5.4 | <i>Survey instruments</i> | 55 |
| 4.5.5 | <i>Data processing – data stratification, addressing non response</i> | 59 |
| 4.5.6 | <i>Recommendations to increase the effectiveness of survey –</i> | 60 |
| 4.6 | MAP CURRENT URBAN COMMODITY VALUE CHAIN | 61 |
| 4.7 | CHALLENGES AND SOLUTIONS INTO A LOGISTICS PLAN | 61 |
| 4.7.1 | <i>Public Sector Initiatives</i> | 66 |
| 4.7.2 | <i>Key Checks and considerations</i> | 67 |
| 4.8 | CITY ACTION PLAN | 69 |
| 4.8.1 | <i>Pilot Testing and Implementation</i> | 69 |
| 4.8.2 | <i>Follow-up: Reassessment and Modification</i> | 70 |
| 4.9 | KPI FOR IMPACT EVALUATION AND FEEDBACK..... | 71 |
| 4.9.1 | <i>Suggested STEEP framework</i> | 71 |
| 4.9.2 | <i>Definition of Performance Measures</i> | 71 |
| 4.9.3 | <i>Stakeholder outreach and agency coordination:</i> | 72 |
| 4.9.4 | <i>Data collection:</i> | 72 |
| 4.9.5 | <i>Assessment and analysis</i> | 72 |
| 5 | ADOPTING THE FRAMEWORK IN FARIDABAD | 74 |
| 5.1 | CATEGORIZATION OF FARIDABAD BASED ON THE FRAMEWORK..... | 74 |
| 5.1.1 | <i>City Size and Population</i> | 74 |
| 5.1.2 | <i>Regional Context and Location</i> | 75 |
| 5.1.3 | <i>Economic Structure</i> | 75 |
| 5.2 | MAP FREIGHT INFRASTRUCTURE..... | 78 |
| 5.2.1 | <i>Urban Freight Generators</i> | 78 |
| 5.2.2 | <i>Storage and Distribution Facilities</i> | 79 |
| 5.2.3 | <i>Transport Infrastructure</i> | 80 |
| 5.3 | IDENTIFY STAKEHOLDERS | 81 |
| 5.4 | STAKEHOLDER INTERACTIONS | 83 |
| 5.5 | TRAFFIC AND COMMODITY SURVEY | 83 |
| 5.5.1 | <i>Freight survey coverage</i> | 83 |
| 5.5.2 | <i>Traffic projections</i> | 84 |
| 5.5.3 | <i>Commodity composition and value chain</i> | 86 |
| 5.5.4 | <i>Challenges and Solutions Map</i> | 89 |
| 5.6 | FARIDABAD CITY ACTION PLAN AND KPIS | 93 |
| 5.6.1 | <i>MMLP to cater to industries in Faridabad</i> | 93 |
| 5.6.2 | <i>NMT and EV vehicles for last mile delivery</i> | 95 |
| 5.6.3 | <i>Old city area reformation</i> | 97 |

List of Tables

| | |
|--|------|
| TABLE 1: 'STRATEGY BASKET' FOR DIFFERENT TYPE OF CITIES TO DEVELOP SOLUTION ALTERNATIVES FOR VARIOUS PROBLEMS AND CHALLENGES FACED | XIII |
| TABLE 2: CHALLENGES AND OBJECTIVES OF THE STUDY..... | 1 |
| TABLE 3: STATE TRANSPORT POLICIES..... | 8 |
| TABLE 4: DISCUSSION GUIDES TERMINAL OPERATOR | 47 |
| TABLE 5 EBFS SAMPLE SIZE FOR DIFFERENT MARGIN OF ERRORS AT 95% CONFIDENCE | 57 |
| TABLE 6: 'STRATEGY BASKET' FOR DIFFERENT TYPE OF CITIES TO DEVELOP SOLUTION ALTERNATIVES FOR VARIOUS PROBLEMS AND CHALLENGES FACED | 62 |
| TABLE 7: POPULATION OF FARIDABAD | 74 |
| TABLE 8: REGRESSION STATISTICS..... | 85 |
| TABLE 9: REGRESSION RESULTS..... | 85 |
| TABLE 10: SAMPLE RESULTS FOR CLASSIFIED ATTRACTION COUNTS | 85 |
| TABLE 11: LIST OF PRIMARY COMMODITIES CAPTURED IN THE SURVEY | 86 |
| TABLE 12: FARIDABAD SOLUTION MAP | 93 |

List of Figures

| | |
|---|------|
| FIGURE 1: FRAMEWORK PROPOSED FOR SUSTAINABLE URBAN FREIGHT TRANSPORT SYSTEM | XI |
| FIGURE 2: ESTABLISHMENT BASED FREIGHT SURVEY FRAMEWORK | XIII |
| FIGURE 3: TYPICAL VALUE CHAIN OF A COMMODITY | XIII |
| FIGURE 4: TOTAL FREIGHT VALUE CHAIN VS URBAN FREIGHT VALUE CHAIN | 15 |
| FIGURE 5: REPRESENTATION OF COMPONENTS OF URBAN FREIGHT EXAMPLE DELHI..... | 16 |
| FIGURE 6: SYSTEMS, PROCESSES AND VALUE-ADDED SERVICES..... | 17 |
| FIGURE 7: STRATEGIES FOR EFFICIENT URBAN LOGISTICS..... | 28 |
| FIGURE 8: FRAMEWORK | 37 |
| FIGURE 9: CITY CATEGORIZATION FRAMEWORK | 38 |
| FIGURE 10: FREIGHT GENERATORS BENGALURU | 40 |
| FIGURE 11: LOGISTICS FACILITIES BENGALURU | 41 |
| FIGURE 12: END-USERS OF THE LOGISTICS VALUE CHAIN..... | 43 |
| FIGURE 13 ESTABLISHMENT FREIGHT SURVEY | 51 |
| FIGURE 14: INTEGRATED FRAMEWORK FOR DESIGN AND IMPLEMENTATION OF EBFS | 51 |
| FIGURE 15: SURVEY INSTRUMENTS AND THEIR ENQUIRY THEMES | 52 |
| FIGURE 16: THEMES FOR DATA COLLECTION IN EBFS SURVEY | 56 |
| FIGURE 17: PROBABILISTIC SAMPLING OPTIONS..... | 57 |
| FIGURE 18: TYPE OF SURVEY COST | 58 |
| FIGURE 19: STRATEGIES FOUND TO INCREASE THE RESPONSE RATE IN FACE TO FACE INTERVIEW | 60 |
| FIGURE 20: TYPICAL VALUE CHAIN OF A COMMODITY | 61 |
| FIGURE 21: SUGGESTED STEEP FRAMEWORK | 71 |
| FIGURE 22: MAP OF FARIDABAD IN THE REGIONAL SETTING..... | 75 |
| FIGURE 23: TYPES OF INDUSTRIES IN FARIDABAD | 77 |
| FIGURE 24: PERCENTAGE OF NET SOWN AREA UNDER EACH CROP IN IN THE YEAR 2009 | 78 |
| FIGURE 25: URBAN FREIGHT GENERATORS, FARIDABAD | 79 |
| FIGURE 26: STORAGE AND DISTRIBUTION FACILITIES IN FARIDABAD..... | 80 |
| FIGURE 27: MAJOR TYPE OF COMMODITIES ATTRACTED IN DIFFERENT PARTS OF FARIDABAD | 88 |
| FIGURE 28: MAJOR TYPE OF COMMODITIES GENERATED IN DIFFERENT PARTS OF FARIDABAD | 89 |
| FIGURE 29: PROPOSED LOCATION FOR MMLP IN FARIDABAD | 94 |

Acronyms

| | |
|-----------|--|
| 3PL | Third Party Logistics |
| AFS | Air Freight Station |
| CFS | Container Freight Station |
| CMP | Comprehensive mobility plans |
| CONCOR | Container Corporation of India Limited |
| EBFS | Establishment based freight surveys |
| GST | Goods and Service Tax |
| HDV & LDV | Heavy Duty Vehicles and Light Duty Vehicles |
| HSIIDC | Haryana State Warehousing Corporation |
| ICD | Inland Container Depot |
| IPT | Intermediate Public Transport |
| ISIC | International standard industrial classification |
| LEADS | Logistics Ease Across States |
| MAV | Multi Axle Vehicles |
| MEGALOG | Megacity Logistics |
| MMLP | Multi Modal Logistics Park |
| MoCI | Ministry of Commerce & Industries |
| MoR | Ministry of Railways |
| MoRTH | Ministry of Road Transport & Highways |
| MSME | Micro, Small and Medium Enterprises |
| NCTD | National Capital Territory of Delhi |
| NMT | Non-Motorized Transport |
| PFT | Private Freight Terminal |
| RFID | Radio Frequency Identification |

| | |
|------|---|
| TaT | Turnaround Time |
| TCPO | Town and Country Planning Organization |
| UCC | Urban Carrying Capacity |
| ISIC | International Standard Industrial Classification |
| NACE | Nomenclature statistique des Activités économiques dans la Communauté Européenne (Statistical Classification of Economic Activities in the European Community) |
| NIC | National Industrial Classification |
| ULB | Urban Local Bodies |

Executive Summary

Urban freight is of primary importance as it is estimated that almost all global trade originates from, traverses through or is destined for metropolitan areas, which act as major hubs in the global goods distribution network. Therefore, a logical and efficient freight transportation planning, as part of the overall transport planning for the city is essential. The need for this study is to create a framework for complete and holistic transportation planning of the city. Which is why this study proposes that urban freight planning needs to be done in conjunction with planning for public and private vehicles.

There are several challenges that are apparent in movement of freight vehicles in a city, which justify the objectives of this study:

- Urban Freight contributes to 28 % of the cost of total freight value chain. Commercial transport in the city is responsible for anywhere between 10-18% of the traffic congestion. Freight traffic occupies close to 30 % of the transport land use space. Hence impact of urban freight is significant on environmental sustainability. The framework presented in this report aims to help city planners to choose the best probable strategy for their city with minimal environmental disruption.
- Consumers' expectations for shipping and delivery time are rising with the increase of e-commerce in the country. The framework presented in this report aims to provide pointers that could help in maintaining the balance between consumer demand and environmental impact in urban logistics.
- Urban Freight Planning has traditionally been done primarily through restrictive policies such as regulation for vehicle time, vehicle weight and size, and mandatory routes for movement. The framework also looks at strategies adopted by other countries, as case studies to view how to regulate freight traffic movement within urban limits, without always looking to move the terminal out of the city.
- Lack of data on freight flows is often the first key challenge highlighted in any study on freight. This study proposes a commodity-based survey and projection to develop more realistic challenge identification.
- Passenger and freight traffic in a city use the same infrastructure. However, their plans are prepared independent of each other. This framework combined with CMP toolkit can become a comprehensive source for transportation planning both passenger and freight in urban areas. UMTA can be an ideal institutional framework for implementation of the framework along with CMP.

At the national level, governments typically promote logistics - through infrastructure spending, laying out transport and land-use policies, enforcing stringent environmental standards, promoting environment friendly transportation and to some extent supporting research and pilot projects to develop the road map.

There are many policies by the central government such as the MoCI National Logistics policy, NHAI MMLP policy, State Logistics or warehousing policies, state transport policies that address various aspects of urban freight.

At city level there are CDPs, City Master Plans, CMPs that should address aspects of urban freight. However, urban freight remains a minor aspect even though it creates a much larger impact on the population and environment.

Urban logistics or Urban freight is a subset of total freight value chain that falls within the urban centers/urban agglomeration. There are 5 key components of Urban Freight Infrastructure Network, Nodes, transport infrastructure systems, processes and value-added services and Stakeholders.

Characteristics of Urban freight of a city is dependent of three criteria:

1. City Size and population
2. Regional context
3. Economic character - Industrial and agricultural production of the City.

Based on these characteristics, a city can act as a

1. production center for goods but the consumption of goods in general in the city is low. This is referred to as a production plus city.
2. consumption center for goods due to its large population and tertiary sector economy.
3. both production and consumption center because the city has a wide economic base and large population, as well as acts as a regional center for goods distribution.

There are many new concepts that promotes faster and more efficient movement of goods. Market conditions are changing rapidly. Systems and infrastructure need to be geared-up-to this continuous change. Some of the key latest developments in the sector are:

1. **Smart mobility for freight:** Smart Mobility is about moving goods faster, seamlessly and in a convenient way, both in urban and interurban environments.
2. **Track and trace systems for freight** Tracking and tracing the flow of freight across the value chain is increasingly becoming an important work stream for all stakeholders involved in logistics value chain.
3. **Just in time delivery:** Just-In-Time (JIT) delivery is a strategy that helps facilitate speedier delivery of material. It is particularly used in delivery of raw material orders and manufacturing.
4. **Hub and spoke model of warehousing:** Hub and Spoke model are complex system of freight movement, where connections are arranged like a wheel. Freight traffic moves along spokes connected to a central hub.
5. **Mega Warehouses:** Mega warehouses are extra-large storage warehouses exceeding 1 million square feet. With the increase in ecommerce in India there has also been an increase in mega warehouses around metro cities.
6. **Drones for delivery:** Delivery of small packages using drones is already in advanced stages of development. Companies like amazon, uber and google have their own product development centers.
7. **EV vehicles for city freight:** Government of India has made a commitment to move towards Electric vehicles (EV) for mobility in urban areas. Many schemes that promote use of EV busses public transport, e-bike sharing systems etc. have been launches in many cities in the country. Considering this use of EV vehicles for the last mile connectivity is not very far.

The most ideal way to handle the negative externalities produced at ground level (due to traffic etc.) should be addressed at root-cause level. Two sets of strategies can be considered: the first seeks to modify the nature of freight demand, the second focuses on land use. The freight traffic congestion, pollution etc. can be handled by managing the freight demand and or reforming the land use structure, as opposed to modifying the logistical activities or the vehicle traffic. Some of the key strategies used for Urban freight planning are:

1. Strategies for efficient urban logistics
2. Logistical Management
3. Urban freight management strategies
4. Parking / loading area management
5. Vehicle initiatives

6. Traffic management
7. Financial incentives

Urban freight should not be dealt with as a separate exercise in planning, but should be an important part of the larger city planning exercise. It is also proposed that this framework should be a part of the CMP toolkit and urban freight plan should become a part of comprehensive mobility plan in every city.

Most of the issues that plague the urban freight and logistics systems remain complex and there are no perfect solutions. Almost all the decisions or interventions result in multifold and divergent impacts. Some of them remain unpredictable, or unintended impacts. For example, if ULB intends to build the bypass, there will be negative trade-off for the local businesses and there may be unintended relocation of business towards highways.

As mentioned earlier urban freight management strategies tend to be restrictive or retrofit in nature. It is proposed that these strategies need to be based on larger planning principles of good for masses, and should be arrived at after evaluating diverse set of options. Therefore, “this National Framework for planning for Urban Freight” has been based on five key tenets:

1. Understanding logistics issues from different stakeholder groups perspectives thereby developing a partnership for the processes from all involved stakeholder groups at the onset of planning process
2. Comprehensive data and insights in all aspects of trade and logistics
3. Clear roadmap to follow with clear role and responsibility allocation. Short term, medium- and long-term strategies for urban freight management in typical city by size, type of economic activities and its geographical location in critical macro-logistics chain.
4. Financial support, institutional support and capacity building.
5. Forward and backward linkage of the urban freight plan i.e. linkage with state and national policy as well as the CMP of the city.

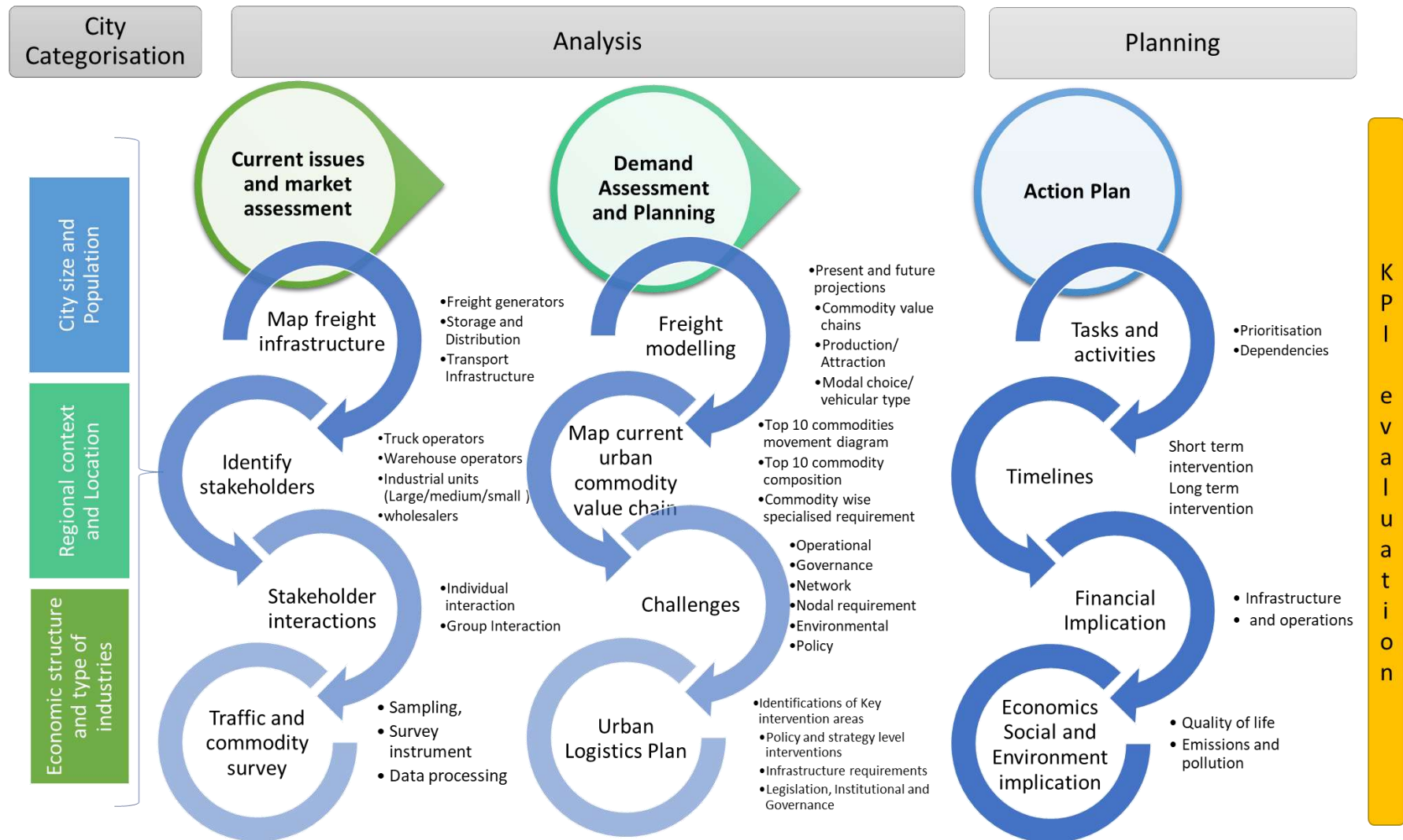
The underlying objectives of this framework is to achieve:

- **Mobility:** ease of movement, goods ideally delivered Just-In-Time. Therefore, the balance between sufficient road Transport network capacity and reduced traffic congestion is the main issue.
- **Sustainability:** Environmental issues and energy conservation (through use of cycles, rickshaws and e-bikes) would need to be taken into account.
- **Liveability:** For the residents, individual safety, security (restricted timings, corridors and modes for delivery) etc.

The framework described would help planners to develop strategies, to overcome challenges in urban freight management, all the while keeping the above requirements as a base. This framework provides an understanding of the nuances of urban freight from different perspectives with examples and data.

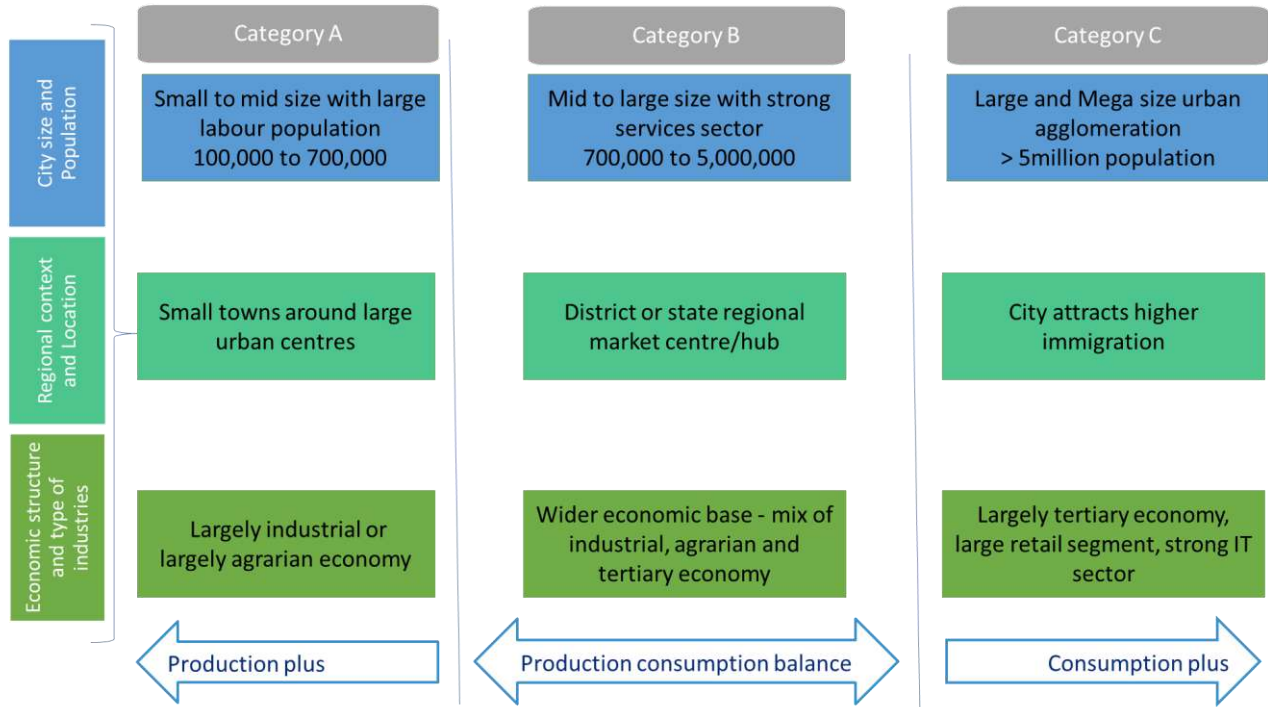
Following image depicts the overall framework for planning for urban freight in a city:

Figure 1: Framework Proposed for Sustainable Urban Freight Transport System



First step in starting with implementation of the framework is categorizing the city. All cities exhibit different degrees of characteristics of production center and consumption center. These characteristics depend on three factors- the population of the city, its economic structure and its regional setting.

City Categorisation



The next step to planning for freight is capturing detailed information about the 5 key urban logistics infrastructure components - Network of rail and road, transport infrastructure systems, processes and value-added services and list out the Stakeholders and correlate their characteristics into Freight generators, storage and distribution infrastructure and transport infrastructure.

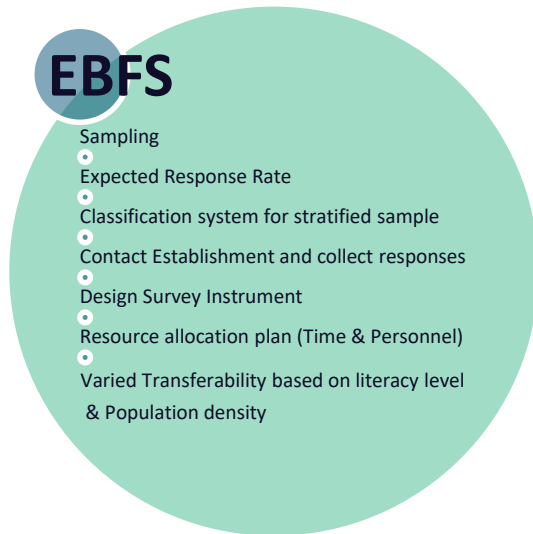
It is important to list our key stakeholders under each category and conduct interviews or discussion to understand real aspects of freight value chain in the city



Stakeholder discussions can either be done through individual interactions or through group interactions.

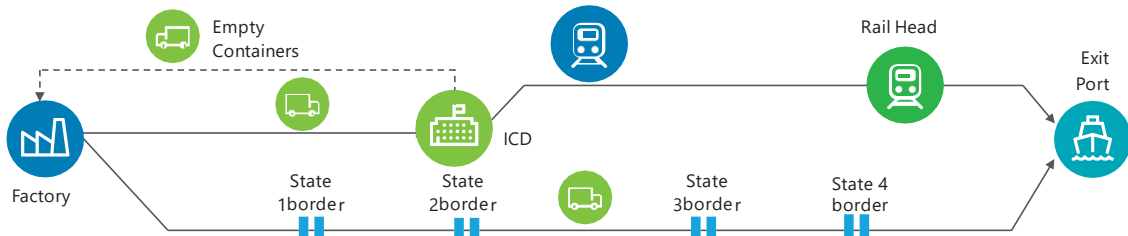
Establishment based freight surveys (EBFS) has been found to be the most explanatory technique to understand the logistics in a city. The survey provides both goods flow and vehicle activity data besides linking goods flow and vehicle activity to business sector/land use/supply chain.

Figure 2: Establishment based freight survey framework



Capturing of the value chain of top commodities helps in understanding the nature of movement of commodities. A typical value chain¹ of commodity can look like as shown in the figure below:

Figure 3: Typical value chain of a commodity



This study has adapted from various international tools and developed a comprehensive catalogue of 26 critical measures suitable in Indian context. Based on these, the following section simplifies the catalogue to include the practices that have high probable transferability to the ‘production plus’, ‘production – consumption balanced’ or ‘consumption plus’ cities.

Table 1: 'Strategy basket' for different type of cities to develop solution alternatives for various problems and challenges faced²

| Solutions | Category A city (Production plus) | Category B city (Production consumption balance) | Category C city (Consumption plus) | Checks or considerations |
|------------------------|--------------------------------------|---|---------------------------------------|--------------------------|
| Land use policy | | | | |

¹ Source: 2018 & 2019. MoCI. LEADS - Logistics Ease Across States

² Source: structure and clustering adapted from CoE SUFS toolkit and collection of best practices.

| | | | | |
|--|---|--|--|---|
| Integrating Freight into land-use | Ensuring adequate perspective for freight planning | Balanced perspective, resources and priorities to freight | Securing land use for future, Balance freight and passenger | <ul style="list-style-type: none"> Private sector engagement Engage and coordinate with public agencies |
| Regional plan | | | To address the dependencies of smaller towns cities around | <ul style="list-style-type: none"> Locational issues Desired size, capacity, and connectivity Lead agency Resources needed to operate the project |
| City development plan | Addressing comprehensive analysis of problems and solutions | Addressing comprehensive analysis of problems and solutions | Addressing comprehensive analysis of problems and solutions | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project Engage and coordinate with public agencies |
| Old city and core area reforms | Whole city has focus and dependency on it | Old city and core have road safety issues, congestion in wholesale markets | Most complex to delink wholesale, freight from core city areas | <ul style="list-style-type: none"> Enough right-of-way available Other projects required to fully complete the project |
| Demand Management | | | | |
| CMP and CTTS | | Integrated planning of passenger and freight | Integrated planning of passenger and freight | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project Engage and coordinate with public agencies |
| Modal shift | | Congestion and pollution issues | Congestion and pollution issues | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project Engage and coordinate with public agencies |
| Traffic governance through UMTA and UTF | | | Governance and funding gaps | <ul style="list-style-type: none"> Lead agency |

| | | | | |
|---|--|--|--|--|
| | | | | <ul style="list-style-type: none"> Engage and coordinate with public agencies |
| Cargo consolidation centers | | | At each district or wards gaps in freight distribution | <ul style="list-style-type: none"> Private sector engagement Engage and coordinate with public agencies |
| ITES | | | | |
| Real time information management | | Quick information and variable charging | Quick information and variable charging | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project Risk of the technology/project becoming obsolete |
| Artificial intelligence and fuzzy logic | | | Complex interaction needs modelling | |
| Custom IT solutions | | | | |
| Last mile deliveries | | | | |
| Staggered or dedicated slotting | Congestion and delay in freight delivery | Congestion and delay in freight delivery | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Private sector engagement |
| Training and awareness | | | | <ul style="list-style-type: none"> Private sector engagement |
| Alternate choice for last mile delivery | | | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Desired size, capacity, and connectivity Resources needed to operate the project |
| Infrastructure management | | | | |
| Ring road development | | Through traffic bypass | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Enough right-of-way available Locational issues |

| | | | | |
|--|---|---|---|---|
| Upgradation of existing infrastructure | Congestion, pollution, loading offloading | Congestion, pollution, loading offloading | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Enough right-of-way available • Desired size, capacity, and connectivity |
| Cluster development | | Hub for Aggregation of freight | Hub for Aggregation of freight | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project |
| Building bye-laws | Norms for controlled development | Norms for controlled development | Norms for controlled development | |
| Dedicated freight parking and loading zones | | | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Enough right-of-way available • Locational issues <p>Desired size, capacity, and connectivity</p> |
| Parking management | | | | |
| Loading and parking restrictions | | Congestion, pollution, loading offloading cause passenger inconvenience | Congestion, pollution, loading offloading cause passenger inconvenience | <ul style="list-style-type: none"> • Enough right-of-way available • Desired size, capacity, and connectivity |
| Parking reservation system | | | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Desired size, capacity, and connectivity |
| Shared parking | | | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Policy/project be mandatory or voluntary • Locational issues • Desired size, capacity, and connectivity |
| Dedicated parking | | | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Locational issues • Desired size, capacity, and connectivity |

| | | | | |
|-----------------------------|---|---|--|--|
| | | | | |
| Vehicle initiatives | Pollution, safety | Pollution, safety | Pollution, Safety | <ul style="list-style-type: none"> • Incentive for participation (or penalties for not) • Lead agency |
| Traffic management | Congestion, pollution, safety, incentive, penalty | Congestion, pollution, safety, incentive, penalty | Congestion, pollution, safety, incentive, penalty | <ul style="list-style-type: none"> • Enough right-of-way available • Desired size, capacity, and connectivity |
| Financial incentives | | | Incentive, Penalty, Business margins, Impacts, and Saving. | <ul style="list-style-type: none"> • Lead agency • Private sector engagement • Engage and coordinate with public agencies • Policy/project be mandatory or voluntary • Incentive for participation (or penalties for not) |

The comprehensive strategy basket covers array of interventions such as policies, programs, and projects. An example of a policy could be to give delivery trucks preferential access to curb space in commercial areas; an example of a program might be an ongoing effort to incentivize carriers to purchase electric trucks; and an example of a project could be an intersection redesign effort. Selecting the appropriate combination is of great importance.

The matrix (of strategy basket) takes care of the issues such as geographic scope of the challenge and strategy to address the root cause (s) and its more apparent manifestations. This strategy basket can point city authorities in the right direction however, detailed planning and option evaluation exercise alone can help estimate costs and benefits (discussed in next section). An assessment of the trade-offs inherent in the allocation of scarce resources, are only possible through a formal planning and stakeholder participation process.

An action plan is a comprehensive list of Tasks and activities defined by their timelines, dependencies, task owner and KPI for follow-up. Preparing an action plan has following steps:

1. **Detailing out the Tasks/projects.** Projects have to be detailed out with sub tasks and activities, that are to be undertaken in order to implement the solution: Each solution identified would require certain task to be completed before the solution can be implemented. Here the planners would have to detail out the list of each task, any sub-tasks and activities that would ultimately have to be completed to implement the solution.

2. **Defining the timelines and dependencies** with other tasks and activities. Each activity is associated with the time. Assessing and defining a range of time in which the tasks and activities have to be defined in the action plan.
3. **Short term, medium term and long-term division:** The set of solutions identified would then be divided into short term, medium term and long-term Tasks and activities. Short-term would generally be tasks that would be completed in a year, while long-term would-be tasks that would take around 5 years to complete. Long term tasks would usually be heavy capital-intensive solutions that would require time for raising capital and then long construction periods. Long term tasks could also include institutional and governance changes that would require changes in the working cultures of organizations.
4. **Detailing out the funding requirement with possible sources:** A base case cost has to be estimated for each task/project. This could be based on thumb rules so as to get an estimate. Detailed costs can be worked out when detailed reports and investigations are conducted. The tasks will have to be identified and funding sources would need to be identified. Funding sources could include government grants, convergence with government programs, bonds, Private funding through PPP etc.
5. **Identifying the owner of the solution and supporting actors:** Owner of the solution here refers to the person or designation in the organization that will take the responsibility of implementing the solution. Identifying an owner is important to ensure that the projects are finally implemented and seen through to its completion. This also ensures that someone is answerable to the results of the implementation process.
6. Define KPIs for follow-up activities: It is important to define measurable outcomes, which can at the end reveal the success of the project.

Pilot Testing and Implementation

Finally, in this report the proposed framework is implemented for Faridabad. The key findings of the Faridabad case study are:

Faridabad is one of the most industrialized cities of Haryana. There are many manufacturing as well as retail market bases scattered across city leading to considerable freight movement along certain roads within the city. Faridabad with its growing economy also has growing freight movement for both within and regional freight traffic. Some of the key challenges that have been highlighted by stakeholders and that have been found in after the traffic and commodity analysis are:

1. Congestion on major entry points of the city

NH-44 has become a major arterial road of Faridabad as the city has grown on both sides of the highway. The railways line too passes through the city right along the National highway. There are many storage and distribution facilities such as - godowns, warehouses, railway goods shed etc. are scattered along the national highway and the railway line.

Heavy traffic on the highway causes congestion at both the ends where the highway inters the city limits. trucks are parked on the highways curbs near the various road side dhabas, eateries all along the highway.

Solution – Integrated Multi modal logistics park facility

Both Agro based and manufacturing based business to be shifted to concentrated hubs Multi modal logistics parks with integrated facilities for all kind of freight operations and all stakeholders such as truck parking, lodging and boarding facilities for truck operators, office space for freight forwarders etc. The analysis of

freight flows and spatial preferences from stakeholders shall be able to guide the appropriate locations and available land parcel.

2. Congested old / core city areas

Old Faridabad starts from the old Sabji Mandi, Ahirwada, and extends through Bassa Para. There is an FCI storage near MCG corporation road in Sector 16. Old city area is home to cottage industries related to utensil making, pottery, carpentry, mehndi grinding and manufacturing glass bangles. Anaj Mandi and vegetable Mandis are also located within the old city leading to heavy traffic of trucks. This part of the city generated significant freight traffic due to the presence of FCI godowns and other cottage industries.

Solution: Shifting of certain facilities to create loading unloading space for wholesale markets

Some of the facilities such as the FCI warehouses and 'Anaj Mandis' can be shifted to an outer location while the space vacated can be used to create facilities such as parking for the wholesale market.

As mentioned in the report many time urban freight strategies involve proposing shifting of the wholesale markets, cottage industries to a new location outside the city. However, most of the time there is significant opposition from the local traders and industries. Often such strategies remain proposals on paper and are never implemented. Therefore, it is proposed in this framework, that only those facilities that are not directly linked to larger economic activity of an area to be shifted out.

3. Lack of Loading unloading spaces in the Industrial areas

Due to its proximity to Delhi and the basic industrial infrastructure provided by the government, there has been rapid industrial development in the planned industrial zone as well as the old Faridabad and Ballabgarh. Industrial development in Faridabad, paradoxically, is in the peripheral sectors i.e. Hodal and Palwal. This partially sorts the problem of freight traffic for the industrial hub in Faridabad and through traffic that is bound to Delhi or Agra/Gwalior (on the NH 44). However, truck parking space, loading off-loading space is grossly inadequate for the freight traffic produced by the factories in the industrial estate and around it on the NH-44.

Solution – Integrated Multi modal logistics park facility

It is important the MMLP is planned near the industrial area and the highway such that it caters to the needs of both the industries and the truckers.

4. Poor quality of trucks and services

Trucking industry in India is highly disaggregated. It is characterized by cut throat competition given the large number of single or small fleet truck owners. As market rates tend to fluctuate there is an incentive to drive and earn more. This leads to practices such as overloading, over speeding, not taking required breaks, violating the regulatory provisions etc. Further, the driving hours often violate the Motor Transport Workers Act.

Given the structure of the freight transport industry, most of the trucking companies/owners (being small – approximately 80%) do not focus much on service quality. The competition is cost based rather than service based; this considerably affects the consumer experience but tends to remain low key or even ignored in the transport operator's purview.

Solution: Incentives and disincentive structures to promote annual maintenance of trucks

This is a larger and complex problem requiring action at the central and state level. Incentives and disincentive structures should be designed to promote better maintenance of freight vehicles.

5. Growing services sector and hence the ecommerce freight

For a long time, Faridabad was the industrial hub of Haryana, defined by factories, warehouses and industrial estates. In last few years it has grown to include residential estates, modern schools and high-end hospitals, malls, corporate offices and other such benchmarks of 21st century urban growth.

Owing to expanding economy and its proximity to National Capital, many businesses and corporate houses too made it their head-quarters. This further gave impetus to its secondary and tertiary sector related economy and population. With it grew the consumptions needs in the city and it gradually became the consumption plus city hosting a population of 1.6 million and a density of 2,421/sq.km (6,270/sq. mi).

However, urban expansion has many issues in the linear city of Faridabad such as growing e-commerce for deliveries to the door step. This has become a major concern in the city with many trips catering to last mile small deliveries.

Solution: Use of EV vehicles for last mile small deliveries and place small freight consolidation centers all across the city

It is important to place small freight consolidation centers, all across the city, especially where dense populations are residing, for freight loading /unloading, sorting and reconsolidation of freight for both offices and residential land use.

Strategies need to be put in place for promoting use of e-vehicles for delivery of small packages across the city.

6. Poor public transport connectivity for worker population to both industrial or freight infrastructure

One of the unintended developments of the rapid industrial developments without plans for worker accommodation or transportation of worker population, is growth of slums. Faridabad also faces the same problem. There has been a growth of slums across Faridabad worker population travels to the industrial areas for work. There is lack of proper public transport to facilitate their movement to and from the industrial or freight infrastructure.

Solution: Development of rental housing for workers

7. Freight traffic is a significant contributor to air and noise pollution in the city

The major cause of air pollution in Faridabad is the discharge from automobiles. large number of industry related vehicles ply on Faridabad roads and pass through the city on the National highway.

There is a lack of organized and cheap public transport in Faridabad available to worker population. Often the worker population use the shared auto and other IPTs operated by private individuals. There is a new city bus service however its use has not become widespread.

Solution: development of NMT and EV IPTs for worker transportation

1 Need for the study

Urban freight is of primary importance as it is estimated that almost all global trade originates from, traverses through or is destined for metropolitan areas, which act as major hubs in the global goods distribution network. Therefore, a logical and efficient freight transportation planning, as part of the overall transport planning for the city is essential. The need for this study is to create a framework for complete and holistic transportation planning of the city.

Urban freight planning needs to be done in conjunction with planning for public and private vehicles.

Following table highlights the key challenges that exist in the context of urban freight transportation and how the objectives of this study propose to address them through the framework:

Table 2: Challenges and objectives of the study

| Challenges | Objectives of study |
|--|--|
| <p><u>Impact of urban freight is significant on freight value chain and environmental sustainability</u></p> <p>Though Urban Logistics is often viewed as the last mile connectivity in the total value chain of goods, its impact on general population and public is rather significant Following sums up its impact:</p> <ol style="list-style-type: none"> 1. High proportion of cost of entire value chain - Urban Freight contributes to 28 % of the cost of total freight value chain. 2. Congestion on urban roads - Commercial transport in the city is responsible for anywhere between 10-18% of the traffic congestion. 3. Higher space occupancy - Freight traffic occupies close to 30 % of the transport land use space. <p>Pollution - causes close to 40% of the noise and air pollution. Globally, Urban freight produces 25% of urban transport related CO2 emissions and 30% of other transport related pollutants, e.g., particulate matters (PM) and Nitrogen Oxide (NOx).</p> | <p>Efforts for planning the subset - the Urban freight - have primarily been through restrictive policies such as regulation for vehicle time entry, vehicle weight and size, and mandatory routes for movement.</p> <p>Internationally cities are increasingly using smart technologies for mobility of freight traffic through urban areas. Some of the strategies used include: dynamic routing for truck traffic, “radically programmable” city streets where dynamic markings can change areas from loading zones to thoroughfares depending on the time of day and season.</p> <p>The framework presented in this report aims to help city planners to choose the best probable strategy for their city with minimal environmental disruption.</p> |
| <p><u>Fast changing expectations of consumers</u></p> <p>Consumers’ expectations for shipping and delivery time are rising with the increase of e-commerce in the country. e-retailers like Amazon and Flipkart have developed several incentives and strategies like, next day delivery, 2-hr delivery, etc., which have raised consumers’ expectation.</p> | <p>The trade-off between the economic advantages of an efficient and effective urban freight system and various environmental disadvantages generated is becoming ever more critical.</p> <p>The framework presented in this report aims to provide pointers that could help in maintaining the balance between consumer demand and environmental impact in urban logistics.</p> |

| | |
|--|--|
| <p><u>Lack of comprehensive policy and planning</u></p> <p>Urban Freight Planning has traditionally been done primarily through restrictive policies such as regulation for vehicle time, vehicle weight and size, and mandatory routes for movement.</p> <p>Terminals that have been subsumed within the city limits face several operational issues such as reduced hours of operation. For example, CONCOR terminal in Whitefield in Bengaluru can operate for only 8 hours. As additional ₹2500 crore requires to be invested to move the operations to a larger facility, outside the city.</p> <p>Often, state and city governments plan to move the terminals outside the city. Despite this, these terminals continue to operate as usual. For example, CONCOR terminal in Tughlakabad is located within the city limits. Despite the issues of congestion and long waiting times, the terminal operates at high capacity due to the proximity to the city and preference of location for the stakeholders.</p> | <p>If the terminal continues to operate in reduced operational hours there is inefficient use of infrastructure.</p> <p>If the terminal is shifted outside the city the cost of last mile delivery increases leading to upward impact on cost of goods.</p> <p>This framework proposes an extensive stakeholder discussion and feedback in the early stages of the planning process in order to develop the right strategies for urban freight traffic management.</p> <p>The framework also looks at strategies adopted by other countries, as case studies to view how to regulate freight traffic movement within urban limits, without always looking to move the terminal out of the city.</p> |
| <p><u>Lack of robust freight data and expertise to do freight analyses and planning</u></p> <p>Lack of data on freight flows is often the first key challenge highlighted in any study on freight. This is closely followed by the lack of expertise and understanding of how freight traffic behaves.</p> <p>There have been significant efforts at the national level by MoCI, MoRTH and MoHUA to address this data gap such as VAHAN by MoRTH, Logistics portal by MoCI</p> <p>MoHUA has also commissioned several studies that provide critical information to city managers about different aspects of urban freight planning.</p> | <p>Key studies that have been completed by MoHUA in last few years are</p> <ol style="list-style-type: none"> 1. 2016. Urban Freight Transport Planning and Management, Toolkit. 2. 2018. Megacity Logistics: Metrics, tools and measures for Sustainability (FINAL REPORT). 3. 2019. Efficient Urban Freight Best Practices. <p>This study proposes to build upon these studies to develop a comprehensive and concise framework for Urban freight planning.</p> <p>This framework proposed to link city size, location and economic category to freight planning strategies. This will help city planners to customize strategies to their particular “city-type”.</p> <p>This study proposes a commodity based survey and commodity based projection to develop more realistic challenge identification.</p> |
| <p><u>Passenger and freight traffic plans are prepared independent of each other</u></p> <p>Passenger and freight traffic in a city use the same infrastructure. However, their plans are prepared</p> | <p>City Comprehensive Mobility Plans (CMPs) should also include mobility plan for freight traffic. This framework can be combined with the CMP toolkit, such that</p> |

independent of each other. Freight traffic is often the ignored component of any urban plan. This usually leads to an under-estimation of traffic on the urban roads, in turn leading to unplanned congestion of roads.

the CMP become a truly comprehensive mobility plan of both passengers and freight.

UMTA an authority for planning for transportation in urban agglomerations should also be responsible for planning for urban freight transportation. This framework combined with CMP toolkit can become a comprehensive source for transportation planning both passenger and freight in urban areas.

Multiplicity of stakeholders

Logistics system of a city involves multiple stakeholders. These include shippers, freight carriers, terminal operators, residents, administrators, government officials to name a few. Each group has its own specific objectives with respect to its place in the urban freight value chain. No individual stakeholder, either public or private can be responsible for issues or its management in totality.

Also, urban freight is typically a fiercely competitive business. Businesses usually compete for 3-5% operating margins. Therefore, they build silos with closely guarded information to defeat competition. Policy makers need to enter these silos and integrate them.

National Government's role is redefined as the visionary and regulator. While the local government needs to be entrusted for enabling collaborative network of business. This framework therefore lays extensive emphasis on stakeholder consultation and involvement of all players in developing the City freight plan.

The players know their requirements the best and involving them at an early stage will be the key to developing practical solutions for the city.

2 How national and state governments are doing their bit for urban freight

Logistics and freight have always been talked about in the context of movement of goods across international borders or within a nation. Efforts have always been made to improve efficiency for long-haul freight logistics through measures such as location optimization, economies of scale, advanced business models based on real time data and R & D.

At the national level, governments typically promote logistics - through infrastructure spending, laying out transport and land-use policies, enforcing stringent environmental standards, promoting environment friendly transportation and to some extent supporting research and pilot projects to develop the road map.

Logistics sector is a key contributor to economic growth of a country. In India logistics cost is estimated at 13-14% of GDP, which is very high compared with more efficient global environments such as USA 9-10%, Europe 10%, Japan 11%. India also has a skewed modal transportation mix, with 60% of freight moving on roads, which is significantly larger than in key developed economies. Freight movement in India has doubled to ~2,300 Bn Ton in FY15, from ~ 1,200 Bn Ton from FY 08. Freight movement in the country is expected to continue its growth trajectory, with an expected annual growth rate of 8-10% over the next ten years³. With this expected growth in freight movement in the country, there is a need to focus on improving the logistics efficiency to reduce the overall cost and time of the freight movement in India.

Various Ministries of government of India have come out with draft policies that address challenges in freight from different perspective. Consecutively state governments have also come out with state logistics policies or state logistics park policies to address some of the challenges at the state level. Some of the key policies at the national and state level are discussed and their relevance for the Urban logistics are listed, here in this chapter.

2.1.1 MoCI and its Draft National Logistics Policy¹

Ministry of Commerce and Industries (MoCI) is the nodal ministry that plans and implements policies related to movement of goods – both EXIM and Domestic. MoCI has released its Draft National Logistics policy that details out center's thinking and planning for logistics infrastructure³. The primary aim of the National Logistics Policy 2018, is to enable integrated development of the logistics sector in the country. It aims to inform, clarify, strengthen and prioritize the key objectives, focus areas and the governance framework for Logistics in India. It also clarifies the role of the various stakeholders including central ministries, state governments and other key regulatory bodies.

The policy mentions improvement in first mile and last mile connectivity as one of its goal in order to increase efficiency in the logistics value chain and a reduction in the logistics cost from 13-14% to 10% of GDP by 2030. The key aspects of the policy that would be directly relevant to the Urban Component of the value chain are:

1. Improving first mile and last mile connectivity to expand market access of farmers, MSMEs and small businesses. **Key projects will be identified by the logistics wings to drive the first mile and the last mile connectivity.** These projects when identified will fall within the ambit on the urban logistics and hence would have to be incorporated and detailed-out in the respective city plans.

³ Source: MoCI, 2019. MoCI. Draft National Logistics Policy.

2. Identify key OD pairs where **movement of goods can be facilitated through coastal shipping** and inland waterways: Urban centers where Coastal shipping and inland waterway is developed will face a new set of challenges. This may then will have to be addressed by Urban Planning authorities.
3. Focus will be given to perishable commodities given the specialized nature of requirements for their packaging, transportation and storage. India is the second largest producer of fruits and vegetables in the world with fruit production of 92 MT and vegetable production of 178 MT. The wastage in fruits is around 25-30%, mainly driven by the limited availability of cold chain infrastructure at the right locations. The Logistics Wing will work with the Ministry of Food Processing Industries, Ministry of Consumer Affairs, Food & Public Distribution and the Departments of Horticulture in respective states to identify key policy interventions and infrastructure enhancement to promote penetration of cold chain facilities and adoption of reefer trucks in strategic locations. **Focus will also be to encourage start-ups working in the ‘farm to plate’ space**
4. Creating an Integrated National Logistics Action Plan that will define logistics priorities across ministries and states. Define an annual execution plan, and continuously monitor progress against the set objectives of driving efficiency and reducing costs and dwell times. **Policies programs and projects when defined in the national and then in the state plans, will have to be reflected in the city level plans.** Therefore, the linkages have to be clearly defined in the Urban Logistics framework.
5. A **non-lapsable Logistics fund will be created**, to drive progress against the key thrust areas. The Logistics fund can be deployed for providing various initiatives. Some of the initiatives that would have direct impact on Urban logistics plan are:
 - **viability gap funding** for select MMLP projects,
 - first and last mile projects
 - projects for poorly-serviced remote areas,
 - promote set up of specialized storage infrastructure such a cold storage for perishables

2.1.1.1 MoCI and State Logistics Performance Index called LEADS

Ministry of Commerce releases an annual survey of state logistics performance called “LEADS” (Logistics Ease Across States)⁴. This survey is based on the world banks national LPI and undertaken across all states. The survey captures stakeholders’ perception about logistics infrastructure and services in their states. The study then develops a logistics index for each state.

Results of this survey are presented in a study report currently available for years 2018 and 2019. This report provides key insights into the real issues and challenges in providing logistics infrastructure in states. Key learnings from the LEADS studies for 2018 and 2019 highlight that stakeholder expects policy support and private sector collaboration. Findings of the studies highlight stakeholder requirements categorized into four groups:

1. **Infrastructure development**: These challenges relate to the provision of logistics infrastructure in the country. Challenges under this category relates to Connectivity, Capacity Development, Ancillary Infrastructure, Digital Connectivity.
2. **Regulatory process improvement**: These challenges relates to processes and policies of central and state governments. Challenges highlighted in the reports under this category would include Single Window clearances, Terminal Infrastructure, Regulation non-existent, GST Implementation, TaT Improvement, Process improvement

⁴ Source: MoCI, 2019. LEADS - Logistics Ease Across States

3. **Improving operating environment** – These challenges relate to operations conditions in the existing environment. Key challenges under this category are Land Policies, Labor laws & Unions, Security measures.
4. **Service quality improvement**: These challenges relate to service quality of the infrastructure providers which very often is the government's port authorities, the customs department. Key challenges under this category are Competitive Pricing, Skill & Competency.

Challenges highlighted in the report, that directly related to the urban logistics are:

1. **Approach to Port/Airport**: Approach to airports for vehicles carrying air cargo and to ports in port towns has been highlighted as the biggest bottleneck by stakeholders. Biggest example of this is the JNPT port terminal in Mumbai. It has become critical to plan for quick evacuation of cargo from the port through both road and rail as the current access routes have become congested leading to further congestion in the port. MoCI, MoRTH and MoR have been planning to improve access, both roads and rail, to ports through significant investment in port connectivity projects.
2. **Entry restrictions around EXIM gateways**: there are entry restrictions around major EXIM gateways that often leads long ques of trucks. Often stakeholders are unable to plan for such delays which leads to significant time and cost overrun. Investments in online services such as online forwarding of documents, online clearances etc. could go a long way in reduction of these ques and therefore impact transportation in towns where these gateways are located.
3. Changes to land-use policy and town planning: inconsistencies in land use planning and state land-use regulations have been a major roadblock in efficient planning for warehousing infrastructure in many cities.
- 4.

2.1.2 MoRTH and its Draft Multi-Modal Logistics Park Policy

Ministry of Road Transport and Highways (MoRTH) has developed a draft Multi Modal Logistics Park (MMLP) Policy. MMLP concept integrates various components across the logistics value chain at a single facility and acts as an intermediary in the supply chain. MoRTH has decided to develop MMLPs in 35 cities with highest freight movement that covers more than 60% of the total road freight movement in India, to improve the logistics efficiency in the country.

The policy defines an MMLP to be a multi-modal freight-handling facility with a minimum area of 100 acres comprising - warehouses, specialized storage solutions such as cold storage, facilities for mechanized material handling and inter-modal transfers, container terminals, bulk / break-bulk cargo terminals etc. In addition, a Multi Modal Logistics Park is expected to provide value added services such as packaging, minor processing, customs clearance, provisions for late stage processing activities such as sorting / grading and cold chain, aggregation / disaggregation, etc. the policy promotes two basic concepts of freight planning at the national level.

1. **Hub and spoke model**: The policy promotes a concept of "hub-and-spoke" model. A clear objective of Govt. of India, is to reduce the cost of doing business, and further to reduce the transport component as a percentage of total logistics costs through more competitive rail offerings. The hub and spoke model of logistics has proven to be more efficient in not only reducing the cost but also reducing the travel time, distances for freight vehicles thereby reducing emissions. In the Urban context this will help improve the environmental health of the city.

2. **Value-adding logistics services** at the MMLP: consolidating provision of value-added services such as sorting, grading, packaging etc. at an MMLP has its own advantages in achieving economies of scale and time efficiencies. Peripheral value-adding services supporting an inland intermodal terminal or dry port can include the following:

- Basic services such as container repair and refurbishment, container cleaning and maintenance, empty container storage, and in-bond warehousing.
- Intermediate services such as specialized warehousing (e.g. refrigerated, high-security, liquid/bulk handling and storage), general warehousing for less-than-container loads (LCLs), cartage, delivery and pickup, grouping (consolidation of loads), and shipping line container parks.
- Specialized services such as export packing, insurance, freight forwarding, 4PL management and commercial services.

Many of these MMLPs are now being planned by the government right outside the cities leading to various challenges to be faced by city planners. These challenges could be:

1. Freight movement towards the city could originate concentrated from the MMLPs and redistributed through different routes, rendering all existing plans related to freight movement, redundant. Authorities in these areas should redefine their transport infrastructure plan.
2. MMLPs will induce work related movement from the urban areas towards the MMLPs. Hence provision of public transport to and from the MMLPs would have to be developed.
3. Not only recalibration of freight vehicular traffic, on the roads connecting MMLPs to the city, would have to be done, but also the private vehicular traffic will have to be recalibrated.

2.1.3 State policies and their relevance for logistics planning

There many different State level policies that address issues relevant to urban freight. Some states have specific logistics policies. There are state transport policies that has a component of urban freight, state industrial policy that addresses the need for logistics infrastructure in industrial areas, there is the new formation of UMTA that will address all transport related issues in an urban agglomeration.

2.1.3.1 State logistics policies

There are state level logistics specific policies for example Haryana's warehousing policy, Chhattisgarh Logistics park policy, which covers different components of Urban Freight. Implications of such state level policies will need to be accounted for in the City's logistics infrastructure planning.

Box 1: Haryana Logistics Warehousing and Retails Policy 2019⁵

The Industries and Commerce Department of the Government of Haryana established a Logistics Warehousing and Retails Policy in 2019. It is targeted to equip Haryana with a state-of-the-art infrastructure seamless and best buying experience to the consumer and conducive regulatory environment for the Logistics Warehousing and Retail sector. It also aims to maximize returns for retailers.

In detail the policy entails measures towards simplification of regulatory laws and procedures for this industrial sector. It will also aid in the creation of quality and cost competitive multi-modal Logistics and Retail-oriented infrastructure. It aims to promote human capital development initiatives by innovatively creating a labor-pool specifically skilled towards the sector. Its mission includes attracting private sector investment initiatives such as PPP; upgradation and adoption of modernized technologies; and fostering a strong ecosystem for delivering on big ticket industry and infrastructure projects.

⁵ Source: Government of Haryana, 2019. Haryana Logistics Warehousing and Retails Policy

Through its mission the Policy aims to create at **least 5 Logistics Parks across Haryana with private sector participation by the year 2023**. Its objective is to be able to attract investments of INR 10,000 Crore and generate upto 25 000 new employment opportunities. It will develop retail hubs in major towns of the State to provide impetus to consumption.

The policy needs to be effectively implemented and monitored for which the Administrative Secretary of the Department of Industries and Commerce shall formulate and head a “Policy Implementation Committee - PIC”. The members of the PIC shall include Director Industries and Commerce, **Director Department of T&CP**, Managing Director HSIIDC Managing Director Haryana State Warehousing Corporation and representatives of concerned Association (Logistics Warehousing and Retail).

2.1.3.2 State transport policies with components of freight transport

Most states of India have state level transport policies includes State Transport Policy (STP), State Road Policy (SRP), State Road Safety Policy (SRSP), etc. Major focus of these policies is on improving rural connectivity, inter-city transportation, road transportation, improving goods transportation on highways, etc. Some of these policies also include small section for urban transport and sometimes urban freight. Of twenty-nine states which prepared road safety policies; seven states proposed strategies to promote public transportation and IPT yet missed mentioning urban freight strategies⁶.

All State Transport Policies focused keenly on goods mobility facilities on rural roads and improving inter-city transportation system however failed to address Urban freight issues comprehensively. Manipur state transport policy does talks about the importance of managing urban freight movement. Following table shows various state transport policies and how they address freight movement.

Table 3: State Transport policies

| # | States | Year | Theme | Details | Source Link |
|---|-------------|------|---|--|---|
| 1 | Pondicherry | 2017 | Road Transportation, Public Transportation (Urban and Rural Transportation), Parking, Goods Transport, Motor Vehicles, Road Safety, Integration of Land Use and Transport Planning. Rail Transportation Air transportation, & Coastal Shipping, | Goods Transport Identified need of planning for inter-modal infrastructure for goods transportation. Strategies: (i) Goods transport by road/rail/coastal transport system planned to modernize to facilitate their inter-modal integration. Multi-Axle Trucks and container transport will be encouraged by creating necessary infrastructure, terminal facilities and wayside amenities for these vehicles and for their parking and servicing (ii) Speed governors and intelligent transport system will be adopted for smooth goods movement by road. (iii) Introduction of Green channel will be considered for avoiding unnecessary detentions and harassments of vehicles at | http://transport.puducherry.gov.in/pdf/files/transport-policy-2017.pdf |

⁶ Source: STPs

| | | | | | |
|---|------------------|------|--|---|---|
| | | | | <p>check posts. All check posts will be modernized with intelligent vehicle inspecting system to reduce detention period of vehicles for checking.</p> <p>Improving the quality of transport system in the urban region is going to be an important factor in the future economic growth of Union Territory of Puducherry (4-5).</p> | |
| 2 | Himachal Pradesh | 2014 | <p>Road Transport</p> <p>Stage Carriage Passenger Transport (Public Transportation to rural areas)</p> <p>Goods Carriage Vehicles and Road Safety</p> <p>Water Transport</p> | <p>Goods Carriage Vehicles</p> <p>Planned to develop appropriate fiscal incentives to encourage scrapping the obsolete fleet causing pollution and safety hazard</p> <p>For maximum efficiency gains to accrue, new and efficient firms will be encouraged to enter the market with relative ease while forcing old and less-efficient ones to upgrade or quit. Such a policy will force firms to constantly innovate and adapt quickly to the changing environment thus creating dynamic efficiency and also serve to diffuse socioeconomic power, broadening participation in economic and social advances while ensuring opportunities for new entrepreneurs.</p> <p>A working group proposed to set up with experts from the industry to incentivize introduction of new technology in the goods carriage vehicles.</p> | <p>http://rajpatrahimachal.nic.in/openFile.aspx?id=19222&etype=Notice</p> |
| 3 | Kerala Draft | 2011 | <p>Road Transportation</p> <p>Public Transport</p> <p>Urban Transport</p> <p>Intermediate Public Transport</p> <p>Parking</p> <p>Rural Transport</p> <p>Goods Vehicle</p> <p>Motor Vehicle</p> <p>Fare Structuring</p> <p>Inter-Modal Transport Coordination</p> <p>Rail transportation</p> <p>Air Transportation.</p> | <p>Goods Vehicle</p> <p>Kerala is a consumer state, depends on other states for almost all commodities of daily consumption.</p> <p>Strategies:</p> <p>Goods transport by road/rail/coastal transport system planned to modernize to facilitate their inter-modal integration. Multi-Axle Trucks and container transport will be encouraged by creating necessary infrastructure, terminal facilities and wayside amenities for these vehicles and for their parking and servicing</p> <p>Speed governors and intelligent transport system will be adopted for smooth goods movement by road.</p> <p>Modernizing goods transport systems by facilitating intermodal integration and check</p> | <p>https://kerala.gov.in/documents/10180/46696/Transport%20Policy%20for%20Kerala%202011-%20Draft</p> <p>http://www.newindianexpress.com/states/kerala/2018/jul/02/kerala-transport-policy-in-favour-of-e-vehicles-may-get-approved-</p> |

| | | | | | |
|---|-------------------------|------|--|--|---|
| | | | Sea Transportation and Inland waterways | posts to reduce detention period of vehicles for checking. | 1836688.html |
| 5 | Manipur (Draft Revised) | 2013 | Road Transportation Public Transport System Para-Transit System School Bus Transportation International Bus Service Urban Transport Freight/Goods Transport System Rail Transportation Civil Aviation Inland Water Transportation | As economic activities in cities expand with growing of city population, a substantial amount of freight traffic would be generated. Timely & smooth movement of such freight is crucial to the wellbeing of the people and the viability of the economic activities. However, with limited capacity of transport system, freight traffic and passenger traffic are so staggered to make optimum use of the transport infrastructure. Therefore, planned to use off-peak passenger travel times to movement of freight. | http://www.indiaenvironmentportal.org.in/files/file/draft-revised-state-transport-policy.pdf |
| 7 | Chhattisgarh | | Passenger Transport Goods transport Inter-state transport Motor vehicle taxation Control on accidents and motor vehicle pollution Information Technology and Modernization | Ensuring public safety with training drivers to operate the vehicles transporting dangerous and hazardous goods. Powers shall be delegated to the check post in-charge officers for providing facilities temporary services. | |

2.1.3.3 State Road Safety Policy (SRSP)

In 2017, the Supreme Court of India, issued direction to States and UTs to formulate state road safety policy and to prepare road safety action plan with annual targets for reducing road accidents and deaths. States and UTs formulated State Road Safety Policy (SRSP) but followed the same kind of structure. SRSP did not propose strategies or targets for improving road safety in urban areas even urban areas account for 42% of road accidents. Key strategies of SRSP are - raise awareness about road safety, strengthen institutional environment, establish a road safety database, ensure safer road infrastructure, safer vehicles, safer drivers,

road traffic safety education and training, enforcement of safety laws, etc. industrialization may also impact the modal structure of the freight transport system.

In India, more than 60% of the freight traffic moves through road network. While the share of railways in movement of goods has been reducing and share of inland water ways is very minimal.

2.1.3.4 State Industrial policies and their impact on urban freight plan

Evolution of industrial development over the years have also impacted the freight movement across the country, state and cities in India. Adoption of a different process of industrialization could lead to a different level of freight movement intensity. Intensity here would mean distance over which freight is moved between the production centers and consumption centers.

States locational policies for setting up industrial estates, and the new concept of integrated industrial estates have led to development of industrial towns. Industrial towns generate and attract huge freight traffic. Planning for this freight traffic becomes an essential aspect of authorities of these industrial towns.

2.1.3.5 UMTA and the importance of integrated urban freight planning

NUTP 2006, recommends the creation of a Unified Metropolitan Transport Authority (UMTA) in all million-plus cities, which refers to cities having population of ten lakhs or more. The creation of UMTA will be facilitated by a Nodal Agency, which shall be selected from amongst the existing state agencies already involved in providing urban transport services in the city. The thrust of this recommendation is to address the issue of a weak institutional set-up coming in the way of an overall, coordinated and efficient implementation of transportation plans and policies in urban areas. In the absence of a unified institutional mechanism, the various institutes work in isolated silos and many policies and programs either replicate their efforts or are not able to be implemented due to a lack of division of responsibility.

The urban transport functions of UMTA include policy making, planning for infrastructure and services, regulatory functions, operation of public transport and construction and maintenance of infrastructure. It will also undertake planning and regulatory functions and ensure the functioning of a well-coordinated urban transport system in the city.

MoHUA has developed an operations document for serving as a guidance tool to cities for operationalization of UMTA. While some cities have set-up UMTAs, many cities across India have not been able to achieve this so far. Also, among those that have been set up, not all are fully functional. It is recommended that cities should take up the setting-up of UMTAs at priority and the Framework for Sustainable Urban Freight that is being proposed by the medium of this report should also come under the ambit of UMTA for its implementation.

2.1.4 Other studies and their key learnings

2.1.4.1 World bank study on Mega city logistics: Metrics, Tools and Measures for Sustainability (MEGALOG) conducted by CRR⁷

"Megacity Logistics: Metrics, Tools and Measures for Sustainability (MEGALOG)" study conducted in 2018, focused on developing:

1. a sustainable city logistics matrix
2. measures for capacity development for sustainable city logistics (SCL),

⁷ Source: CSIR-CRRI, 2018. Mega City Logistics Report (MEGALOG)

3. development of freight transport demand model and logistics flow model and
4. knowledge sharing among stakeholders.

The city of New Delhi i.e. National Capital Territory of Delhi (NCTD) was selected as study area for this study. Mega-Log report developed a list of indicators to measure New Delhi's performance in the area of sustainable city logistics.

Study used the traditional four-step modelling exercise to collect data for the city of Delhi. The data included - trip data both for freight productions and attraction, socio-demographic variables (like population, commercial area, residential area, Industrial area, Number of workers etc.) for all 360 zones of the city, different classes of freight vehicles and the average distance each class of vehicle commute inside Delhi.

The study's key objective was to see the feasibility and applicability of an Agent Based Modelling (ABM) for City Logistics. The study found that a **well-designed agent-based modelling approach that includes the business models and perception of multiple stakeholders of the domain would be useful to identify effective solutions** (e.g. policy, regulation, facilitating schemes) to achieve sustainable urban freight. Four important priorities for the future that have been identified in the study:

- Reduction of negative effects of urban freight transport while maintaining productivity.
- Identification of workable urban freight solutions including roadmaps towards data, tools and appropriate research.
- Increase of the knowledge base including data collection, models and scenarios.
- Collaboration with other stakeholders to realize solutions towards sustainability.

An agent-based model (ABM) for Delhi can be created to analyze the interactions between urban freight entities to understand the background of movements of freight delivery vehicles and responses of these agents to policies for urban freight related problems.

2.1.4.2 TDA whitepaper on Zero Emission Urban Freight⁸

The Transport De-carbonization Alliance (TDA) was launched in 2018 to form a 'coalition of the willing' of the 3Cs (Countries, Cities/Regions, and Companies) to accelerate this worldwide transformation of the transport sector towards a net-zero emission mobility system before 2050. Current members of TDA include – Countries (Cabo Verde, Costa Rica, Finland, France, Luxembourg, Rotterdam, & Scotland) and Companies (Alstom, Brisa, CEiiA, Deutsche Post DHL group, EDP, ITAIPU Binacional 2, Michelin, PTV-Group, Tevva)

TDA released its **whitepaper on zero emission urban freight**. The paper details out a five-step methodology to facilitate joint action and risk alleviation when taking measures to reduce and eliminate urban freight emissions.

Key action points highlighted in the white paper include:

- **National legislation.** Set the overall ambition for zero emission. For example, "All new urban freight vehicles sold from 2030 onwards must be zero emission."
- **Setting long-term environmental targets combined with short- to mid-term targets**, including robust accounting systems and measurement planning. Public reporting (e.g. through Corporate Responsibility (CR) Reports and/or Annual Reports) and a strong commitment from the board will help create transparency and reach the targets.

⁸ Source: TDA, 2019. Whitepaper on zero emission urban freight

- **A Sustainable Urban Logistics Plan (SULP) for each city.** Looking at a tailor-made solution for each city, considering multimodal zero emission solutions (zero emission vehicles, rail, boat, cargo bikes, city hubs) and building new logistical chains based on data sharing and integration for a live-able and future-proof urban area.
- **Set a clear goal:** Zero Emission Freight Zones in all frontrunner cities by 2025. Not only will this decrease pollution levels, it will also be a strong signal to the automotive industry to produce clean freight vehicles in larger quantities AND will force a shift to a different (data driven) way of transporting goods.

2.1.5 MoHUA urban freight transport planning and management toolkit

Ministry of Urban Development (MoUD), Government of India undertook the preparation of toolkit on “Urban Freight Transport Planning & Management” under the Sustainable Urban Transport Project (SUTP)⁹. The toolkit talks about the important aspects of urban freight transport planning and management. It aims to develop an understanding among city officials, planners and consultants about urban freight related strategic planning and management tools.

The toolkit highlights various policy objectives and management measures for improving the sustainability of urban freight transport. Measures for goods vehicles access, loading/unloading operations, best case practices world-wide, have been described in the toolkit.

The Toolkit describes the methodology for freight data collection, methodology for freight modelling, basic understanding of components of logistics and list of policy measures for managing the freight movement within the urban areas. Various urban freight policy measures listed in the toolkit are -

- 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-storey urban logistic buildings,
- low emission zones,
- Unattended delivery systems (locker banks),
- Urban freight management policies such as vehicle access restrictions, space management, pricing etc.,
- In addition, a policy evaluation framework has been presented

MoHUA Urban freight transport planning toolkit provides a good understanding of how data should be collected and projected for planning for urban freight and is liked here in this

2.1.6 Importance of integration of urban freight planning into CMP and CDP

Comprehensive Mobility Plan (CMP) is a vision document that provides strategy and policy measures for achieving desirable mobility patterns (people and goods) for a city. It aims at the mobility of people and not of vehicles, and in line with the vision of the NUTP, it emphasizes the importance of pedestrian facilities,

⁹ Source: MoHUA, 2016. Urban Freight Transport Planning and Management, Toolkit

non-motorized transport measures, and public transport systems, including buses and sustainable mass rapid transit systems. The CMP provides solutions under six categories, including Freight. The Plan aims at desirable mobility of goods, along with people with thought and emphasis given to Freight movement and patterns within a city limit. However, most CMPs stop at providing recommendations related to Freight terminals, loading and unloading facilities and parking facilities for trucks. It does not get into the details of route-planning, trip chains, and details of exact fleet distribution. It is also because there is a lack of availability of secondary data on Freight and while the CMP collects detailed data for passenger vehicles, it does collect some Freight traffic data also but does not have the capacity to get into intricate details for the same. A review of the latest CMP, conducted for the city of Faridabad suggest the following recommendations for managing freight traffic.

1. Manage the heavy demands placed on the regional infrastructure, by balancing the needs of freight and passenger traffic.
2. Improve the array of transportation options available to regional freight users.
3. Restrict the heavy vehicles entering the city during day time.
4. Develop truck terminals near cordon points and distribute the goods in the city through LCV/sustainable transport choices
5. By pass the external freight traffic passing through the city.
6. It is advisable to develop a Freight Operator Recognition Scheme. A tiered set of membership levels can be given to frequent operators coming to the city.
7. Develop a freight information portal i.e. a single interface is available for information on the freight movement.

These are policy suggestions that definitely should be adopted, but only as part of a larger Freight policy framework. While the suggestions are sound, it is important develop the framework so as to develop very specific recommendations, particular to each city during the preparation of CMPs and CDPs that should be easily adoptable and implementable.

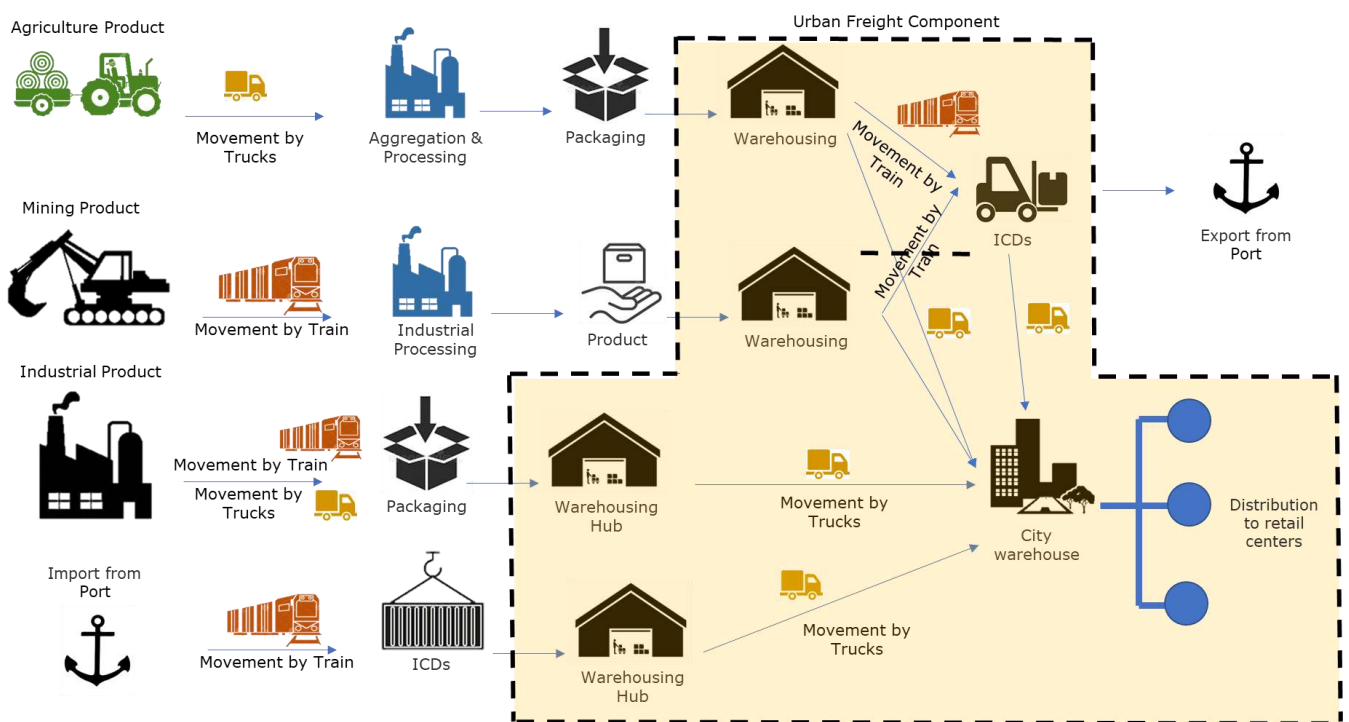
3 Urban freight – a value chain concept

Freight moves from production centers to the consumption centers through a network of routes and nodes. This movement is facilitated by support services and stakeholders. With some value add at each node this movement of goods from production centers to consumption centers is called the freight Value chain. First and last mile connectivity are primarily about producer and consumer end logistics. These can be broadly classified in terms of -

- Agricultural sector,
- Industrial Sector,
- Mining Sector, and
- Imports/Exports

Different typical Value chains for each classification have been depicted in the Diagram, below:

Figure 4: Total freight value chain vs urban freight value chain



Processes

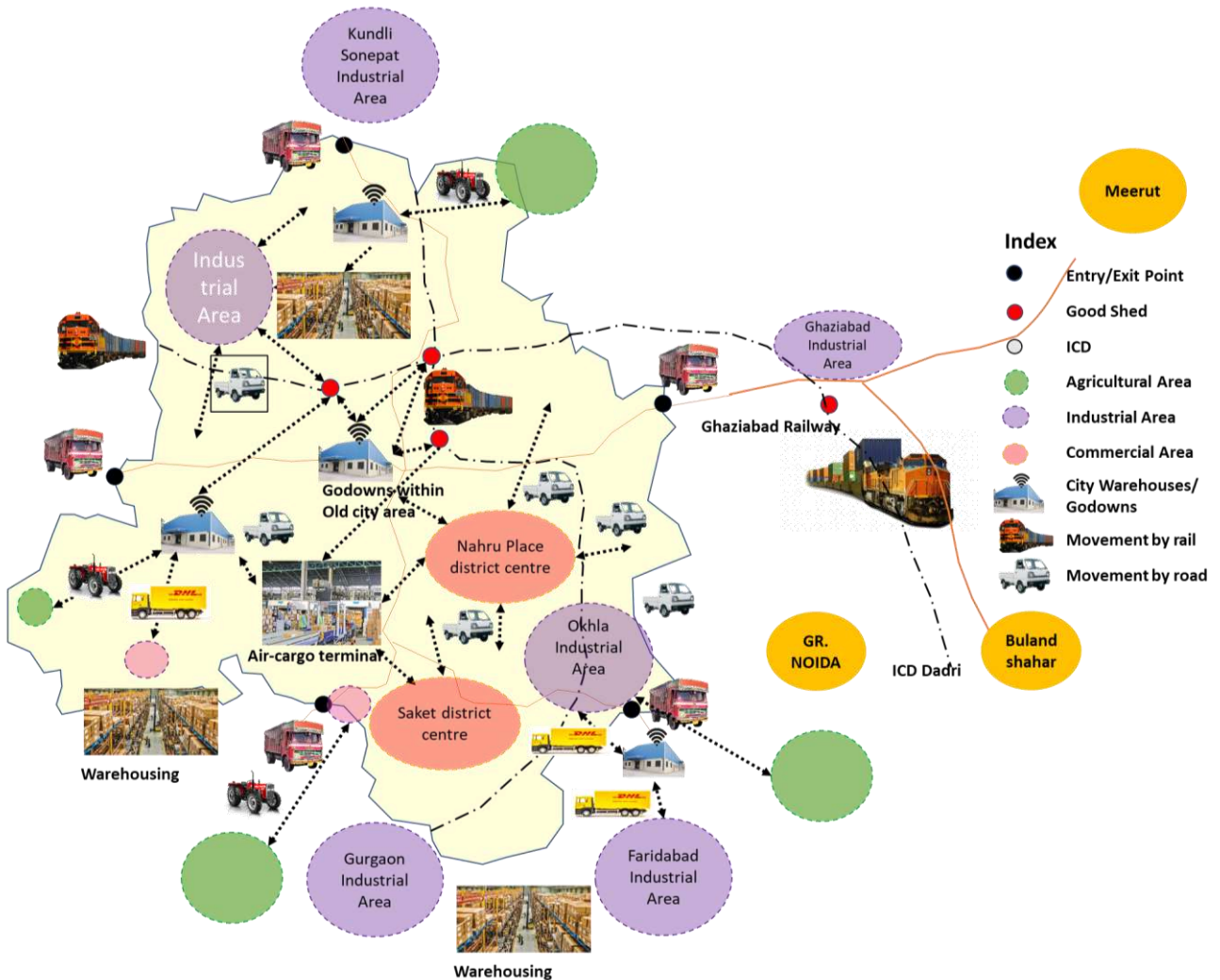
| STEP 1 - Production | STEP 2 - Processing and packaging | STEP 3 - Storing | STEP 4 - Distribution |
|--|---|--|--|
| <ul style="list-style-type: none"> • Products from the production center (Agricultural, Mining, Industrial and Imports) are moved through the network on-trains, container trains, trucks to the processing center. | <ul style="list-style-type: none"> • The products are processed at the processing center into the intermediate of finished commodities. • Commodities are packed in bags, cartons, jars, drums, metal cans, bags, of different quantities | <ul style="list-style-type: none"> • Packed commodities are stored in different types of storages. Food grains are stored silos or in bags and stacked in well aerated warehouses, perishables are stored in cold storages, white goods/consumer goods are stored in multi-tier warehouses. | <ul style="list-style-type: none"> • Packaged product is transported through rail terminals, Goodsheds, ICDs, to <ol style="list-style-type: none"> 1. warehouses in the cities for distribution to retail outlets. 2. To ports for export |

Urban logistics or Urban freight is a subset of this value chain. It is that portion of the value chain that falls within the urban centers/urban agglomeration. Following schematic shows explains - what is Urban freight within the context of total freight value chain.

3.1 Components of Urban Freight Infrastructure

Urban logistics has started getting its due importance only recently. To plan for Urban freight, it is important to understand its characteristics first.

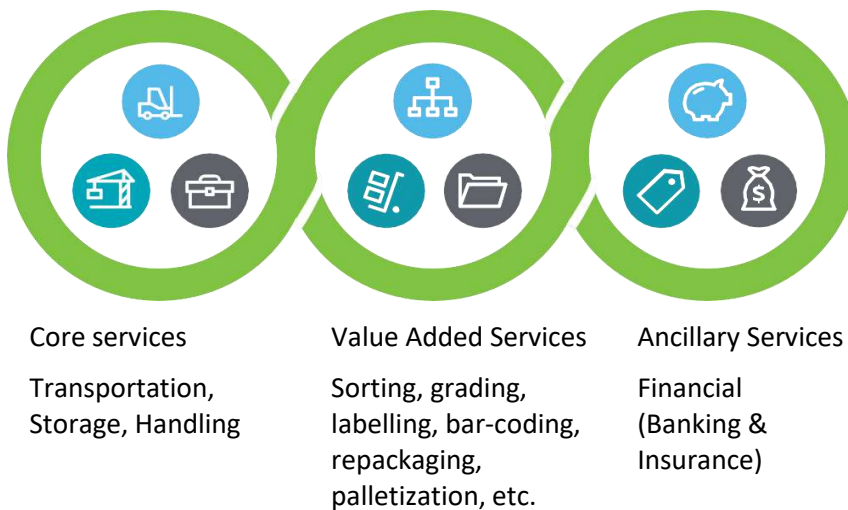
Figure 5: Representation of components of urban freight example Delhi



There are 5 key components of Urban Freight Infrastructure. These are

1. **Network** of rail and road through which the products are brought into the Urban areas and then distributed to end consumers.
2. The **Nodes** i.e. the fixed infrastructure of rail terminals, the road terminals, truck parking, warehouses where the product is finally loaded or unloaded for further processing, storing or distribution. In the urban context large commercial centers and industrial area would also be considered as nodes as freight from outside are often destined for these areas.
3. The **transport infrastructure** i.e. the rolling stock of trains, the trucks, the mini goods vans through which the products/goods are moved from one node to another.

Figure 6: Systems, processes and value-added services



4. The **systems, processes and value-added services** are the soft infrastructure that supports the movement of goods through the hard infrastructure. Following diagram shows the composition of Logistics Service Elements¹⁰.
5. **Stakeholders** that are the actors that use the entire set of infrastructures (hard and soft). An indicative list of stakeholders is:
 - shippers including exporters / importers;
 - transport service providers including rail operators, road haulers/truck operators, container train operators, airlines and shipping lines;
 - terminal service providers including surface transport based terminal operators (CFS/ICD/PFT/AFS), warehouse operators / cold storages, port terminal operators, air cargo terminal operators; and
 - logistics service providers including freight forwarders, express carriers, customs brokers, multimodal transport operators, and air cargo agents

3.2 Composition of urban freight

Characteristics of Urban freight of a city is dependent of three criteria:

1. City Size and population
2. Regional context
3. Economic character - Industrial and agricultural production of the City.

Based on these characteristics of the city, a city can act as a

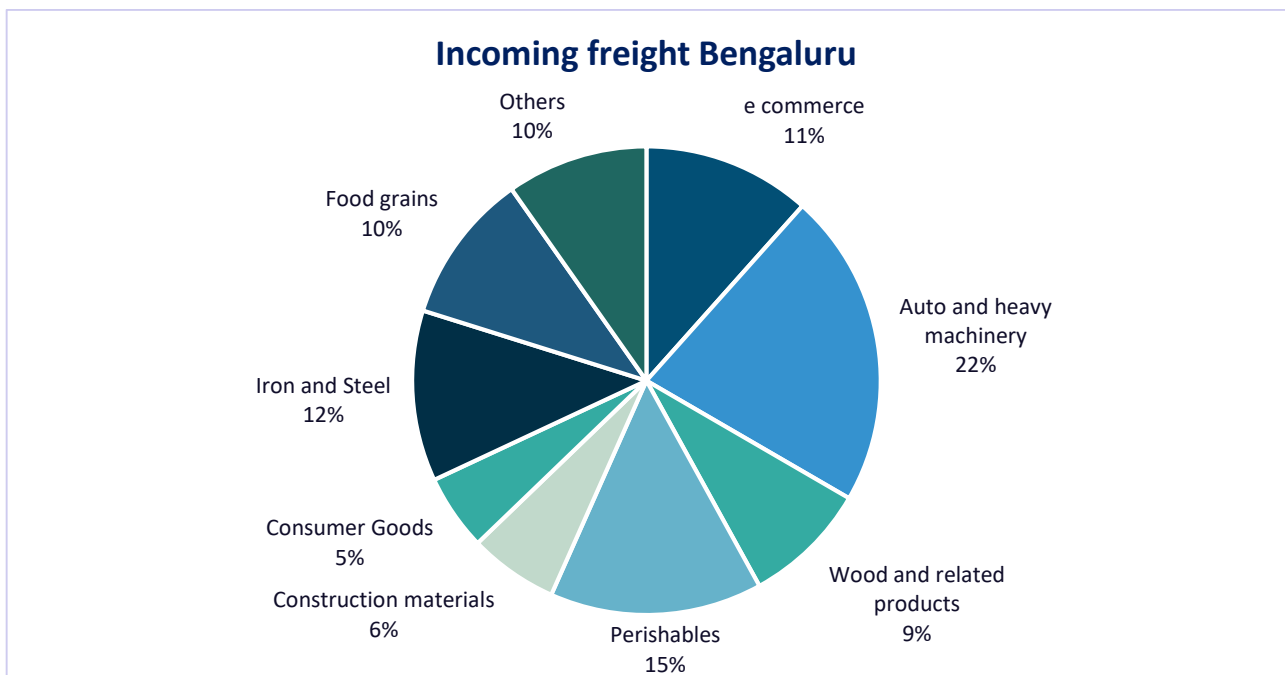
1. production center for goods but the consumption of goods in general in the city is low. This is referred to as a production plus city.
2. consumption center for goods due to its large population and tertiary sector economy.
3. both production and consumption center because the city has a wide economic base and large population, as well as acts as a regional center for goods distribution.

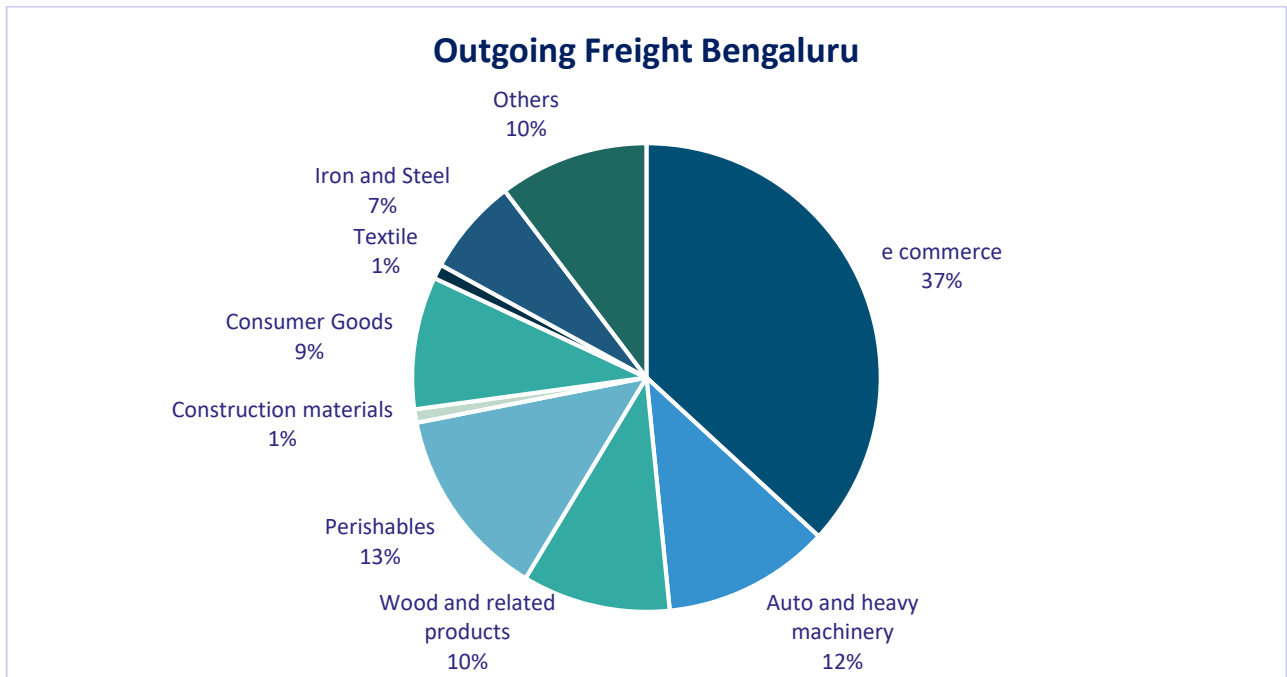
¹⁰ Source: 2018. MoCI & Deloitte, 2018. LEADS - Logistics Ease Across Different States.

This concept has been detailed out further in the next chapter. This concept is used in the national framework to categorize the city and then identify possible solution.

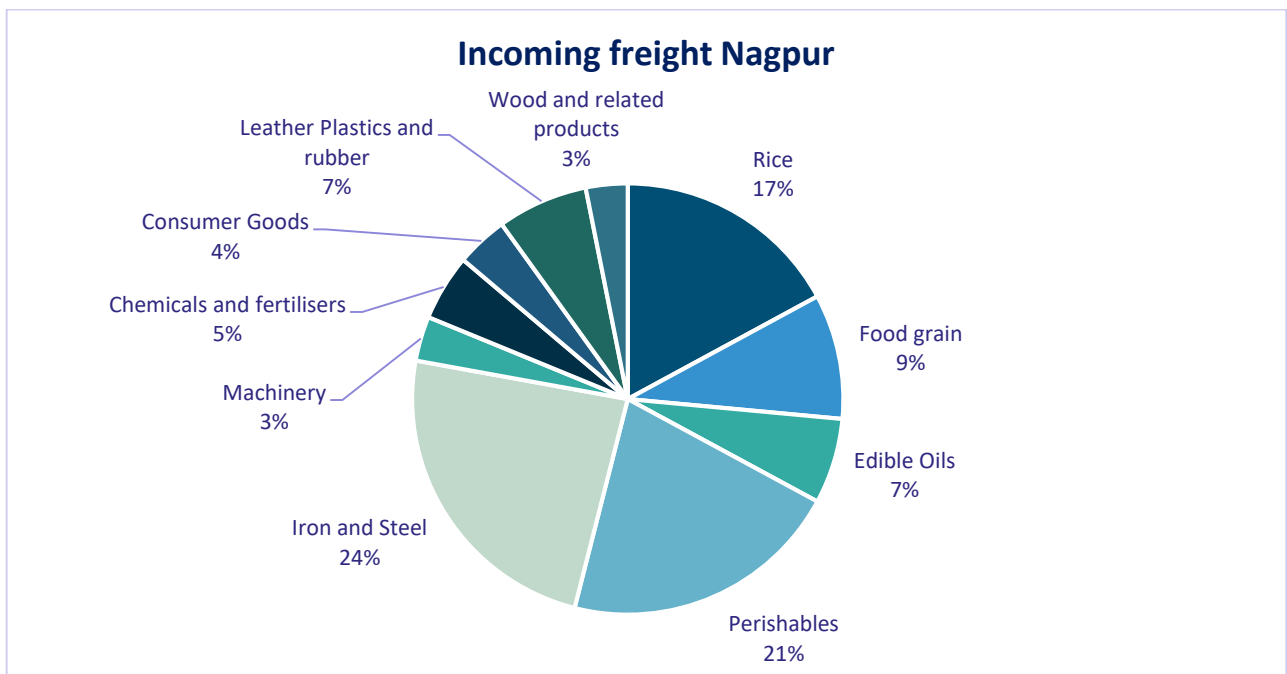
This difference can be seen in the following examples of two cities – Nagpur and Bengaluru. Nagpur is a mid-size city with a population of around 30 lakhs. But it is a major production center with defense, industries, steel industries, plastic industries, power plants. It is also a regional center for export of goods, with goods like rice and pulses coming from as far as Raipur and Hyderabad respectively. Bengaluru on the other hand is a metro with 1 crore plus of population and is a major consumption center in Karnataka. Bengaluru is also a production center with more than 200 large scale industries.

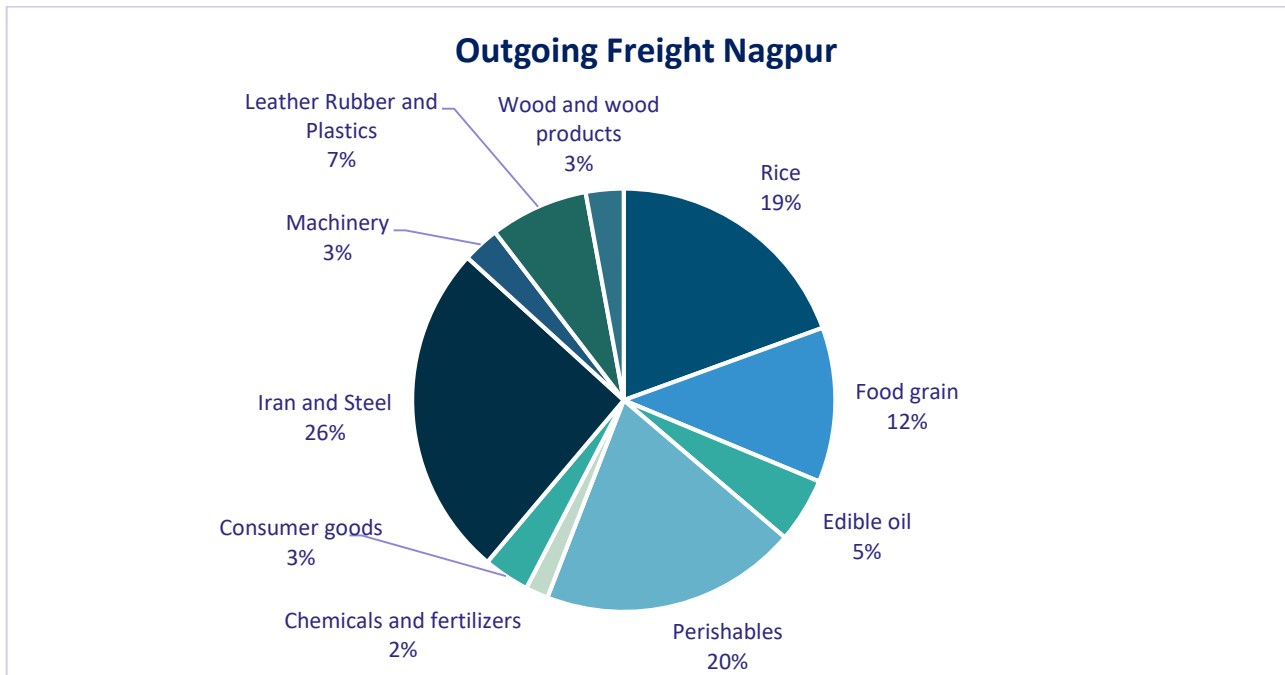
Bengaluru: has around 19 MMT of incoming freight and 13 MMT of outgoing freight. Incoming freight is higher than outgoing freight a clear indication that consumption is higher in the city. The composition of freight by commodity in Bengaluru for incoming and outgoing freight is shown in the following charts.





Nagpur: has around 7 lakh MT of incoming freight and 8.5 lakh MT of outgoing freight. Outgoing freight is higher than incoming freight indicating there is high production and lower consumption in the city. The composition of freight by commodity in Nagpur for incoming and outgoing freight is shown in the following charts. There is a balance of agricultural and industrial products in the city.





Difference between Bengaluru and Nagpur freight volumes clearly indicates the difference in level of consumption and industrialization of the two cities. Bengaluru volumes are almost 10 times that of Nagpur. Being a larger city and larger industrial hub. Nagpur on the other hand is a regional center for export and hence rice from, as far as Raipur, are brought to Nagpur ICD for exports.

These differences in the city size, economy and regional setting leads to change in characteristics of freight and hence the hanging requirement of freight infrastructure.

3.3 Future of urban freight is changing

There are many new concepts that are being introduced that promotes faster and more efficient movement of goods. Market conditions are changing rapidly. Systems and infrastructure need to be geared-up-to this continuous change. Some of the key latest developments in the sector are:

3.3.1 Smart mobility for freight

Government has taken up a huge program for smart city development across 100 cities across the country. One of the components of this is smart mobility. Smart Mobility is about both Passengers and goods. It is about moving goods faster, seamlessly and in a convenient way, both in urban and interurban environments.

Box 2: Smart mobility projects in USA

The U.S. Department of Transportation (DOT) projects that freight volumes in the United States will increase by more than 40% over the next 30 years. Mid-sized cities are expected to grow three times faster than the rest of the country over the next three decades, adding to the pressure to develop better ways to manage logistic flows. US DOT is developing several projects across cities to use smart city systems to promote faster mobility of freight traffic.¹¹

- Seattle project proposes a shared data system that will provides dynamic routing for truck traffic and promote off-peak deliveries.

¹¹ Source: https://www.supplychain247.com/article/smart_mobility_shaping_the_future_of_logistics

- Boston project proposes for “radically programmable” city streets where dynamic markings can change areas from loading zones to thoroughfares depending on the time of day and season.
- A third project proposes use of signaling systems to prioritize the movement of trucks in high-volume freight corridors.

There are three important elements of Smart Mobility in the freight context: Connected Vehicles, Mobility as a Service (MaaS) systems, and Advanced Traffic Management Systems (ATMS).

- **Connected Vehicles:** Smart Vehicles or smart cars as it is often called are equipped with Internet of Things (IoT) devices that allows Vehicles to share real-time data about road conditions and their surroundings, becoming a sensor that can feed the city with valuable traffic data thus enabling traffic optimization and traffic re-routing. They can also receive information from other smart systems like traffic lights, streetlights, lane markers, street signs and smart parking sensors. Google Maps’ navigation uses data from smart phones to project near real-time traffic and travel time on city routes.
- **Mobility as a Service (MaaS) systems:** solutions integrate functions like trip planning, booking and payments, and offer commuters one interface for multiple modes of transport: train, bus, taxi, ride-sharing, bicycle sharing and more. In the freight context it would means a seamless exchange of information and movement of goods from the production center to the final consumers in an uninterrupted. Ride hailing services such as Uber, Ola and other food delivery apps are using somewhat similar solution for faster movement of their vehicles.
- **Advanced Traffic Management Systems (ATMS):** ATMS are systems that combine information from toll booths, traffic lights, car parks etc. to change traffic lights and road signals in real time, adjust rates on toll roads and relay traffic information to city control centers.

In India similar solutions can be adapted when cities have completed their implementation of smart solutions. Some of the cities in the advance stages of planning and implementation includes Pune, Nagpur, and Bhubaneswar.

Box 3: EPA smart way

EPA launched the program with the objective to mitigate the effects of climate change, using technology and other strategies to make the supply chain leaner. The program was in line with The Diesel Emissions Reduction Act (DERA) Program funds grants to protect human health and improve air quality by reducing harmful emissions from diesel engines. With the objective to make freight sustainable the program adopted technology and strategy solutions across cities in US.



The program helps companies monitor their fuel consumption and carbon footprint. The strategies adopted are:

- Adopting designated tractors and trailers
- Aerodynamic truck and trailer designs
- Idling reduction technologies for trucks and large vehicles
- Low rolling resistance new and retread tires.

There have been fuel savings worth \$37.5 billion on fuel costs, reducing dependence on other fuels. The program has also helped in reduction of 134 million tons of air pollution (NOx, PM, and CO2), which have benefited the health and quality of life of the citizens.

3.3.2 Track and trace systems for freight

Tracking and tracing the flow of freight across the value chain is increasingly becoming an important work stream for all stakeholders involved in logistics value chain. Many different types of systems are now being deployed, by various freight operators, to track and trace cargo. There are GPS based systems that can relay real-time data on the location of the cargo. There are RFID or sensor-based data that track the cargo only when it crosses a particular point on the network. Both these types of systems allow freight operators in better route planning and to better manage their fleet. This intern helps them provide on-time delivery service. Sensor systems can also help fleet operators manage the health of their fleet better, promote better fuel efficiency in fleet, in turn reduce emissions.

With the new directive from MoRTH, mandatory use of RFID based entry at all toll plazas on national highways tracking and tracking cargo will become easier. This will also help capture freight data on national

highways. By applying analytics solutions on this data governments-center, state and city- can project future freight flows (commodities and traffic) therefore plan for roads.

3.3.3 Just in time delivery

Just-In-Time (JIT) delivery is a strategy that helps facilitate speedier delivery of material. It is particularly used in delivery of raw material orders and manufacturing. By utilizing Just-in-Time (JIT) logistics services manufacturers can ensure that shipment arrives at its destination right before it's needed. This intern lowers their inventory and storage costs. This model of delivery is critical for freight that is expensive to store as well as freight with a short shelf life. A tracking system on top of this provides for an extra layer of planning and efficiency, to ensure receivers are up-to-date on the location and ETA of their shipment.

3.3.4 Hub and spoke model of warehousing

Hub and Spoke model are complex system of freight movement, where connections are arranged like a wheel. Freight traffic moves along spokes connected to a central hub. It is used when there is sourcing from multiple locations and collection at a central location called the 'Hub'. The Hub provides a single point of distribution which extends into the state or the country, called 'Spokes'. This efficiently moves products out of strategically located distribution centers and shortens travel time. Benefits accrue to all parties by offering consolidated services for both EXIM and Domestic freight.

For rail service provider there are benefits by creating concentrated rail flows with high levels of planning repetition. This provides a stable and consistent operating plan with the high utilization rate required to make rail systems competitive and financially viable. Such a rail system naturally results in the cargo owners receiving better service levels at lower per unit cost.

3.3.5 Mega Warehouses

Mega warehouses are extra-large storage warehouses exceeding 1 million square feet. With the increase in ecommerce in India there has also been an increase in mega warehouses around metro cities. Mother warehouses or the hub warehouses in the hub and spoke model talked about earlier are often mega warehouses. Not only are these warehouses increasing in space per square footage, but they are also increasing in height as technology allows for more densely-packed and higher-stacked products.

Box 4: Example of a mega warehouse Future group warehouse in Nagpur

Future group one of the largest retail chain in the country has its mega warehouse in Nagpur. Products are consolidated from various production centers and are imported from China via JNPT and stored in these mega warehouses in Nagpur. Nagpur being the centrally located in the country offers Future group a strategic advantage of being able to serve all its retail centers through this central location. However, location of these mega warehouses also means large influx and out flux of freight traffic on the periphery of the city leading to other issues in movement of traffic on roads.

Even with advancement in technology and integration of robotics, these mega warehouses are seemingly more difficult to operate when compared to regular warehouses. Mega warehouses tend to employ one employee per thousand square foot, or three times the amount of people it takes a traditional wholesale warehouse shipping in bulk.

This means larger movement of people for work to these warehouses and requirement of planning for public & private transport. This number also translates to more space needed for parking, especially during the peak holiday season when the number of employees often doubles.

3D printing (amazon and looking to develop production centers out-side bid consumption centers (key cities) for delivery of some products/items. This will allow them to 3D print and deliver the products within few hours.

3.3.6 Drones for delivery

A delivery drone is an autonomous vehicle, often an unmanned aerial vehicle (UAV), used to transport packages, food or other goods. Delivery of small packages using drones is already in advanced stages of development. Companies like amazon, uber and google have their own product development centers. Amazon prime air with their new drone delivery system, aims to use drones for delivering packages to their customers in half an hour or less. They claim that their drones are capable of traveling within a 10-mile radius, and carrying packages that are weighing up to 5 pounds. UK branch of Dominos are thinking about the idea of using drones for the delivery of their pizzas.

Ministry of Civil aviation in India is planning to come out with a drone policy in order to regulate the sector in anticipation of more widespread use of this technology by private sector.

Benefits

There are quite a few possible benefits of drone delivery, even when the delivery is for small packages.

- **Reduced road congestion** –shorter delivery trucks or vans on the road will drastically help in reducing the road conjunction.
- **Reduced environmental pollution** –Drones will drastically reduce carbon emission as they are battery driven and hence protecting the environment to some extent.
- **Reduced delivery time** – Delivery drones carry packages to the desired set point without getting affected by road traffic conjunction and on a planned optimized route. Customers will get their delivery in less than 30 mins.
- **Reduced transportation cost** – Drone shipping has several benefits for both businesses and customers. Delivery times are reduced from two to three days, down to a matter of hours, plus there is less chance of a package being damaged during transit and handling as drone flight is pretty smooth.

Challenges

Even though drone delivery resolves many of the issues of last mile connectivity, there are many challenges that are yet to resolved before this is deployed at a commercial scale. Challenges related to landing a drone in a known or unknown environment, dropping packages from the air is security risks, as drones are expensive machinery and customer safety.

3.3.7 EV vehicles for city freight

Government of India has made a commitment to move towards Electric vehicles (EV) for mobility in urban areas. Many schemes that promote use of EV busses public transport, e-bike sharing systems etc. have been launches in many cities in the country.

Considering this use of EV vehicles for the last mile connectivity is not very far. As the infrastructure support for EV vehicles – availability of charging ports, faster charging and longer distance movement on one charge – improve, so will the use of EV vehicles. The entire ecosystem of private and public passenger vehicles may change over the course of next few years.

The white paper on Urban logistics by Transport Decarbonization Alliance (TDA) highlights 4 imperatives to reduce carbon emissions by logistics vehicles in Urban areas.¹²

- Imperative 1: Move away from oil and other fossil fuels to focus on very-low-GHG energy
- Imperative 2: Lower the energy intensity of our mobility patterns (global economy & individual lifestyles)
- Imperative 3: Prepare the physical and IT infrastructure needed to accompany those changes
- Imperative 4: Inform, educate and train populations to embrace the transformation

3.4 Solutions currently prevalent

Planning for freight movement within a city is the responsibility of city/local government or development authorities. Efforts for planning the subset - the Urban freight - have primarily been through restrictive policies such as regulation for vehicle time, vehicle weight and size, and mandatory routes for movement. At city/ state level freight transport (rolling stocks and logistics operations) matters, are largely left to the private sector, while government simply provides the hard infrastructure such as Network -roads, railways systems, and Nodes – CFS, Logistics Hub etc.

Internationally Local governments support logistics by acting on the Multi-Actor Multi-Criteria Analysis. Cases in point are the TFL -Transport for London during Olympics; Beijing green freight study¹³ and Urban Carrying Capacity (UCC) study¹⁴, Berlin – Urban Transportation Development Plan¹⁵; New York – off-hour delivery project; —implemented by the respective local agencies.

Box 5: Beijing green freight and UCC studies

Chinese logistics industry is primarily road based. A report by China's Automotive Technology and Research Center states that 80 % of the freight movement in China is by road, most carriers in the road freight market are private individual operators and Vehicles account for 55% of the total gasoline and diesel consumption in China. Heavy duty vehicles have become the fuel consuming category in China due to greater annual driving mileage. Freight is a key contributor to pollution levels contributing to about 4 % of China's total Co2 emissions. This is projected to grow to 16 % of the total emissions by 2040.

Urban agglomeration of Beijing is - the political capital, the economic capital and the cultural center of China. With a GDP of 25,370 billion USD and population of about 20 million, it is spread over an area of 16,410 sq.km.

According to the report on improving efficiency in Chinese trucking and logistics. The contribution of freight vehicles to PM2.5 emissions in Beijing is about 35% of the total motor vehicle emissions.

Challenges and issues

According to the report on improving efficiency in Chinese trucking and logistics¹⁶, the key challenges in trucking industry in china are:

1. existing fleet is not utilized in an energy and cost-effective manner.

¹² Source: May 2019. Transport Decarbonization Alliance (TDA)., 2019. Zero Emission Urban Freight - A TDA whitepaper on how to reach zero emission urban freight by uniting Countries, Cities/Regions and Companies

¹³ Source: 2018. China Green Freight Assessment Report

¹⁴ Source: Wei.et.al, 2015. Using Urban-Carrying Capacity as a Benchmark for Sustainable Urban Development: An Empirical Study of Beijing

¹⁵ Source: Menge.et.al, 2014. Berlin's Urban Transportation Development Plan 2025 - Sustainable Mobility

¹⁶ Rocky Mountain Institute, 2016. Improving efficiency in Chinese trucking and logistics report.

2. scale of operation is small and the supply chain is fragmented, thereby increasing the supply lead times.
3. truck fleet comprises of old and non-efficient trucks and carriers
4. regulatory and tax regime discourages the operational efficiency and scale of operations.
5. annual fleet utilization of heavy-duty trucks is low as compared to US and Germany.
6. logistics share of GDP is higher as compared to U.S and Germany with higher warehousing and distribution costs and non-optimal vehicle utilization.
7. 70 percent of Trucks and carriers are mostly own vehicle - operators with limited capital for investment and low expertise on operations etc.
8. Enforcement of regulations is low. Market capturing strategies by small firms and enterprises does not cover initial costs.
9. Operations management using ITS and technology enabled solutions is poor.
10. Over loading and poor maintenance reduces vehicle life, fuel efficiency and utilization.
11. Implementation of techniques to build efficiency in terms of fuel technologies, supply chain management and fleet efficiency.

The framework for implementing green freight in China proposes strategies for improving road-based freight efficiency, incentivizing fuel saving technologies, improving trucking operations and changing characteristic of vehicle purchase and operation.

| S. No | Freight strategy adopted | Impediments | Enablers |
|-------|-----------------------------------|--|--|
| 1. | Reduce truck over loading | A large number of non-standard vehicles such as tractor trailers and container tractor trailers are pressurized to be phased out. | A national standard on “limits of dimensions, axle load and masses for motor vehicles, trailers and combination vehicles “ Authorities developed a one –year period against illegal retrofit trucks and non-standard vehicle product category. |
| 2. | Truck broker | The scheme faces issues during the development stage due to multiplicity of tax collecting agencies involved. | Although the mode of truck broker is still in the pilot stage, varieties of service modes already have emerged, such as electronic-business + truck broker, logistics platform + truck broker, and traditional freight + truck broker, the pilot of truck brokerage which has received positive achievement. |
| 3. | Vehicle –cargo matching platforms | Because of the asymmetric information, poor timeliness, and mismatches between vehicles and cargo inherent in traditional transportation modes, the time that vehicles stop and wait is quite long, which reduces transportation efficiency. | Online apps and other systems can be applied to realize information exchange and accurate matching, so as to solve the problem of asymmetric information. |

Solutions adopted:

1. Driver training programs that promote fuel savings require low investment from operators and offer distinct fuel-saving benefits. However, both vehicle fleets and management agencies fail to take advantage of this option.
2. Road transport is expected to remain the primary mode for transportation. Online platforms provide impetus to increase freight efficiency. Promoting Rail freight and large-scale adoption of electric trucks will greatly reduce the energy consumption and reduce the environmental impacts of the sector.

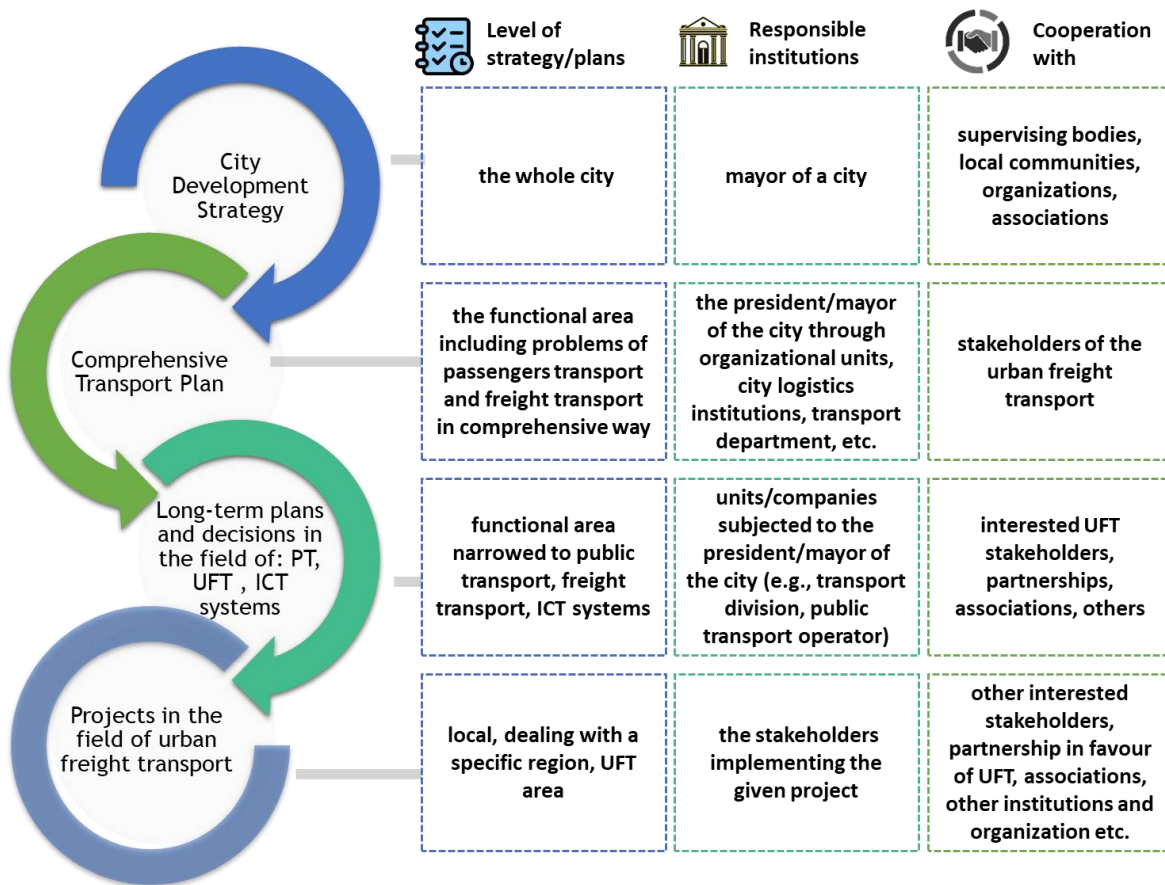
The UCC assessment for Beijing provides solutions to various challenges in urban service provisioning, meeting sustainable development goals and increasing the carrying capacity.

3. **Decentralization Policy** – this policy is being looked upon to relieve congestion as there is a huge influx of people into Beijing which puts a strain on the urban services and infrastructure. This also includes growth control mechanisms which include containing the population growth and business activities.
4. **Investment and resource allocation** – the UCC help in identifying avenues for proactive investment to augment existing services.
5. **Improvement in land use efficiency** –the suggested measures include relocation of habitation and economic centers to relieve the strain on urban facilities.
6. **Preserve environment friendly lifestyles** – encourage the population of the city to adopt a more environmental conscious way of living.

There are various approaches to planning for efficient goods-vehicles operations. These are as listed below. The conditions, challenges for which each approach or strategy should be used is explained in the framework in the next chapter.

3.4.1 Strategies for efficient urban logistics

Figure 7: Strategies for efficient urban logistics



The most ideal way to handle the negative externalities produced at ground level (due to traffic etc.) should be addressed at root-cause level. Two sets of strategies can be considered: the first seeks to modify the nature of freight demand, the second focuses on land use. The freight traffic congestion, pollution etc. can be handled by managing the freight demand and or reforming the land use structure, as opposed to modifying the logistical activities or the vehicle traffic.

3.4.1.1 Freight Demand and Land Use Management

3.4.1.1.1 Land use policy

Integrating Freight in to land use – in order to resolve the most important conflicts between the freight, land use and passenger transport, it is important to do the comprehensive integrated planning. Many spatial models have been developed for efficient freight facility location or blocking the appropriately sized land parcels for future. This ensures that an important economic activity of urban freight and allied land uses are not nudged out of city, rather, integrated comfortably in urban fabric.

Regional plan - Many planning related initiatives are more critical to handle the growing issue of logistics planning and freight management. These include the city and regional level initiatives at the earliest possible. Larger cities and megapolis should ideally focus on the regional plan synergies on freight. The freight hubs or transport nagars along with bypass roads /highways to rid city of through freight traffic etc. can be integrated early on in the project. Additionally, various nearby cities, and dependent towns can plan their freight hubs and key connecting corridors in sync with each other.

City development plan – the most important policy at city level governing the comprehensive sectors, industries and utilities and amenities at the city level. By the simple power invested in this gazetted policy document, it aligns with state government vision and programs. CDP develops the planning and development norms for land uses, buildings and all kinds of infrastructure. It lays out the guidelines for the transport and traffic infrastructure under CMP.

Other initiatives like low emission zone, Relocation of large generators –industries and factories, warehousing facilities and freight hotels or parcels in each ward, UCC in each district, mandating the e-freight vehicles, street guidelines to incorporate freight bays, parking norms, green modal shift for freight (to inland waterways, rail or CRT like NMT etc.) can be mandated as land use and transport policy for respective agencies in city.

Old city and core area reformation - The entire inner-city core is walled and has a vibrant market area where both wholesale and retail activities co-exist. The core city has about 200,000 to 500,000 shops and establishments in million plus cities and megapolis. All the markets near the walled city attract high traffic 1500 to 4000 HGVs and a large number of LCVs on a daily basis, which add to the traffic congestion in and around the city core. Mostly, Agro Produce Market Committee serves as the main distribution center for fresh vegetables to semi- wholesale/ retail markets within the city.

It is noted that excess costs for truck operations viz. increased time costs due to access restrictions on HGVs, road congestion and long turnaround times in old city areas. There are higher distance costs due to extra runs within the city to find a parking space. Miscellaneous costs are noted such as bribes offered to traffic police to escape harassment and legal action for a variety of minor offences (such as driving without valid permits or driving licenses, overloading, illegal parking, and talking on mobile phones while driving).

Strategies such as all deliveries inside the walled city by provision of CRT, bicycles, and e-vehicles and appropriate infrastructure to support these modes. Also, experts suggest to develop freight consolidation centers outside the old city area for shorter and minimal freight trips. Relocating traditional manufacturing, trade and small industry, generating noise, emissions and high traffic to a more industrial environment, and developing pickup stations inside the walled city for end consumers to pick their deliveries. If possible, it is strongly recommended to declare the entire walled city area as an urban heritage center and demarcating it as a pedestrianized zone.

3.4.1.1.2 Demand Management

CMP AND CTTS - Ideally freight and passenger traffic and transport should be dealt together. This is only possible with highest level of transport planning at state or city level. State urban transport policy (such as Draft Maharashtra SUTP, 2019) can ideally lay down the principles and focus to it.

Further comprehensive mobility plans and city traffic and transportation studies offer most appropriate level to collect data, analyze and evaluate strategies that balance the trade off on important roads and infrastructure. Moreover, several facilities and infrastructure can be planned in a way that both share the ancillary facilities.

The bulk of urban truck traffic are produced by small establishments in the food and retail sectors. The restaurants, nano-convenience stores in Indian context and informal establishments produce more freight traffic / trips. Moreover, many industry sectors that produce and consume freight as part of their primary activity have constant freight-trip generation that does not depend on business size. Thus, in proportion to size, small establishments generate proportionally more traffic than large ones.

These effects, which are only now beginning to be understood, could have major implications on Smart Growth and other emerging concepts like Complete Streets. These can only be holistically dealt with a comprehensive mobility plan and transport studies.

Modal Shift Strategies - mode shift program encourages the use of alternative modes to reduce the number of trucks in the city center. Although appealing to many, this initiative faces major obstacles in urban areas, where finding modal alternatives that effectively compete with trucks is not often possible. However, CRT as available freight mode, cheaper, effective for short distance and medium loads offers good potential. This has also been explored in form of cargo-cycles, and other modified forms in European cities. The available rail lines, tram lines etc. can be used for moving freight around the city. More ambitious shift to railways and dedicated freight corridors shall be planned, if possible.

Traffic Governance through UMTA and UTF - it is important to engage stakeholders in PPP initiatives discussed later in freight management section. However, not every time capital investments can be expected from the private sector. With integration of freight early on in CDP and CMP, a common governance framework involving UMTA and UTF can be leveraged for supporting studies, pilots and other incentives, vehicles and ITS related interventions.

For example – CRT or e-vehicles pilots can be initiated by transport authorities in close engagement with stakeholders and a PPP can be explored for growth phases. Additionally, UMTA can develop the CMP and operations plan and UTF can be used to fund the study, pilot and vehicles procurement.

3.4.2 Logistical Management

The main objective of these strategies is to alter the way deliveries are undertaken to reduce the negative externalities produced. However, these strategies can also improve the efficiency of the last mile delivery journey through appropriate fuel and driver management, reducing empty or low volume journeys and consolidation of delivery trips.

3.4.2.1 *Cargo consolidation centers*

Cargo consolidation centers (CCC) are facilities that seek to reduce freight traffic in a target area by consolidating cargo at a terminal. In theory, carriers that might otherwise make separate trips to the target area with relatively low load factors would instead transfer their loads to a neutral carrier that consolidates the cargo and conducts the last leg of the deliveries. The financial model will involve carriers paying the CCC operator a fee per delivery made, and save money by not having to make the final leg of the delivery themselves. This practice has been in place since 1940 in Manhattan and Newark and more recently implemented in a number of European and Japanese cities. The number of truck trips have significantly reduced from 400 per week to 20 per week. The major challenges being the availability of large land parcels and cost associated with acquiring one. Alternatively, the consolidation can be done at shippers' facility.

In the Indian context, this strategy poses significant challenges in mega cities but to limited availability of large land parcels and high cost associated with it, however, there is still significant scope of this strategy being implemented in million plus and less than million plus cities. Involvement of land-owning government agencies will be an important factor in the success of this strategy.

3.4.2.2 *ITES*

Information technology enabled services form an important part of facilitating and improving logistical management and have already a number of proven as well as experimental initiative that can help. Some of

these strategies provided below provides an insight on the type of technology and its validity in the Indian context.

Real time information management

With the availability of cheap and reliable real time information and computing speeds, multiple real time parameters like road conditions (accidents, speeds, congestions etc.), vehicular parameters, planners can provide stakeholders and users the optimum solutions for multiple and different problems e.g. the real time vehicle movement combined with the distance to be travelled and road conditions can predict the actual time of arrival of a consignment in the hub. A number of stakeholders have already used and still improving the services provided by real time information.

In the Indian context, this strategy provides exciting opportunities for logistics management. India has one of the cheapest data and low cost of ownership of devices that can provide such real time information. India has also one of the largest talent pools in terms of IT enabled skills. The challenge is having a consolidated approach to the solution development in a holistic manner. Until now the solutions have been largely been customized to the immediate problem and developed by stakeholders who have significant budgets for such solution development. A comprehensive off the shelf solution for logistics management is still a challenge. However, this should not limit the potential of real time information usage in logistics management.

3.4.2.3 Artificial Intelligence and Fuzzy Logics

Artificial intelligence and fuzzy logics are technologies that are still in experimental stages but have a good potential to help logistics management in areas like dynamic routing, delivery sequencing etc. AI and fuzzy logic programming using real time data can suggest optimal routes for last mile deliveries improving efficiencies of the logistic chain. It can prioritize/ deprioritize selective goods in the delivery chain based on condition or user specification e.g. faster routing of perishable or essential goods in case of emergencies. Typically, a decision that will take hours for a human to process can be processed almost real time by use of AI and fuzzy logics.

In the Indian context with the availability of more and more real time data and availability of historical data, AI and fuzzy logics are still taking experimental steps. Big Data technology is still evolving, except for some big players in logistics management; smaller stakeholders are still to harness the potential of this strategy.

3.4.2.4 Custom solutions

Information technology and associated devices can be used to deliver customized solution to a unique problem for e.g. vertical height detection systems. The system can warn truck drivers if they exceed the vertical height limits on the road well in advance, so that they can take alternate routes. This system helps in prevention of collisions as well as can prevent traffic snarls due to a high truck.

In the Indian context, these custom solutions are possible but may involve high costs due to the cost of development and implementation.

3.4.2.5 Last mile deliveries

Last mile delivery are a critical part of logistics management and any improvements in the last mile delivery management can have a significant impact on overall logistics management. The mentioned strategies can help streamline and improve last mile deliveries. A concerted effort of multiple stakeholders is required for the success of these strategies.

Staggered or dedicated time slotting

Introducing dedicated time slots or staggered day deliveries specifically in high-density zones have proved to provide good results. This has been implemented in a number of cities across the world albeit for multiple reasons like congestion management or reducing pollution. Managing time for when the deliveries can be made can reduce congestions as well as provide the companies doing last mile delivery an incentive to streamline their operations across the time slot.

This practice has already been implemented in New Delhi with restrictions on certain type of vehicular movement in Delhi. No trucks or large vehicles are allowed to enter Delhi during the daytime.

3.4.2.6 Training and Awareness

Training and awareness programs for last mile drivers can also help sensitize them on the problems rising due to last mile deliveries and train them in best possible solutions to avoiding them. The training programs can focus on:

- Fuel efficient driving practices
- Maintenance of vehicles
- Parking management
- Ergonomics
- Handling of goods and carrying & lifting techniques

3.4.2.7 Alternate choices

Last mile agencies can provide alternate options other than door deliveries. This can be in the form of collection centers or e-kiosks for collection of deliveries by the end user. Societies and RWA's can provide collection points where the last mile delivery partner can deliver goods for a defined area at one point and the end users can collect them at their convenience.

3.4.3 Urban freight management strategies

Urban freight management requires a comprehensive stakeholder involvement for its success. Government agencies have the most critical role to play as an important and influential stakeholder. The strategies and initiative proposed in this section are primarily to be driven by government agencies. A PPP approach are also suitable for some of the initiatives.

3.4.3.1 Infrastructure management

Infrastructure is the most critical part of improving the overall efficiency of logistics management. Typically, a country with good roads and associated infrastructure sees efficient logistic practices. Some of the initiative mentions requires a significant capital spend and also have associated benefits other than improving logistics and freight management.

3.4.3.1.1 Ring roads

Ring roads or bypass roads are an important way of reducing traffic in the city that is not destined for the city. This significantly reduces congestion through the central part of an urban center that is typically a high-density zone and with limited road density and width. Ring roads or by-pass roads are proven to reduce congestion as well as have environmental benefits in terms of reduced pollution, idling times of vehicles, time and fuel savings and many more.

Many Indian cities have adopted the practice of building by-pass and ring roads in the city. Delhi recently has a third ring road in the form of EPE and WPE which has significantly reduced truck movement which otherwise would have just passed through the city. NHAI has also incorporated by-pass roads as part of its

design guidelines for new expressway and highways. Typically, land acquisition has been a major roadblock in terms of creation of such infrastructure.

3.4.3.1.2 Upgradation of existing infrastructure

It is not always necessary to create new infrastructure, upgradation or retrofitting of existing infrastructure is also a cost-effective option. This typically will be available in a condensed period for use. However, there can be limitations and not all modern and new facilities can be incorporated. Some of the upgradation opportunities can be:

- Creation of multiple lane highways / roads on existing alignments
- Upgradation of road furniture like reflectors, barriers, traffic islands, installation of traffic lights etc.
- Relaying of road surface
- Lane dedications and lane enforcements

There are many other opportunities available for upgradation of existing infrastructure; however, a concerted effort by the civic agencies is required along with qualified advice from technical consultants and road planners.

3.4.3.1.3 Cluster development

A grouped or cluster approach for a specific type of activity is typically the most efficient way of improving benefits for that particular sector. In the case of freight and logistics, development of clustered facilities like distribution centers, manufacturing, truck terminals and inter-modal facilities can bring benefits to this sector. This is being practiced in a number of cities like development of transport nagars or anaj/subji mandis that bring activities of similar nature in a concentrated area. This can be outside the city or within the city depending on factors like land availability and associated infrastructure. This concept is already quite popular in Europe and is a proven land planning / zoning practice. However, the noise and other negative effects generated inside and around these clusters can be a great disadvantage for local communities.

Civic bodies can play a part in cluster approach by incentivizing or defining policy for primary users of the cluster to include their ancillaries and associated stakeholders within the cluster.

3.4.3.1.4 Building byelaws

Changes in existing building bye laws to incorporate facilities like building ramps on sidewalks or having dedicated loading/unloading facilities for commercial centers or high-end use areas can significantly improve efficiencies in the last mile delivery of freight. This may entail increased land use but provision of these facilities at the design stage itself can negate problems faced at a later stage.

3.4.4 Parking / loading area management

Parking is a precious commodity in city scenarios and especially Indian cities. Logistics and freight management is dependent on parking space for a number of its activities. Lack of parking space can compel vehicles to park illegally as well as haphazardly that can result in traffic snarls and reduced efficiencies in freight and logistics management.

A number of initiatives can be taken up civic bodies in the city to ease out issues related to parking. They have been provided below broadly classified in two categories:

3.4.4.1 On street parking and loading

Dedicated freight parking and loading zones

Cities or centers that have a good supply of parking can dedicate parking areas marked only for freight vehicles and to be used for loading / unloading. A premium can be put up by civic agencies for use of such dedicated parking zones.

Loading and parking restrictions

Depending on the characteristics of city traffic, customized loading and parking restrictions can be proposed by civic agencies, for e.g. in congested areas, parking and loading / unloading can only be permitted in specific time durations of the day or price of the parking can exponentially increase with the duration of the parking. The civic bodies can collaboratively work with the users and stakeholders of the area to define restrictions that are best suited for an area.

An interesting concept involves prohibition of roadside parking during rush hours and once the rush hours have passed the parking restrictions can be eased to allow roadside parking. The restrictions will be back in place once the rush hours are due again.

Parking reservation system

Big cities can also explore the use of integrated parking reservation systems, where the users can block their parking spaces in advance for a specific duration of time. Strict penalties can be imposed to deter parking without reservations or unattended parking.

3.4.4.2 Off-street parking and loading

Strategies under off-street parking and loading is also important in the Indian context as typically zoning in Indian cities is mostly mixed. Very few cities have dedicated residential or commercial zones. Thus, initiatives in off-street also becomes an important factor in improving efficiencies of urban freight management. Some of the initiatives involve:

Shared parking

Private parking during the day time can be shared with commercial establishments as typically it will remain unoccupied during the day. This can be practiced in lanes behind the main streets.

Dedicated parking in non-congested area

Dedicated parking for urban freight vehicles can be provided in non-congested areas within the city that can be accessed through foot or through smaller vehicles for last mile.

3.4.5 Vehicle initiatives

Vehicles are an integral part as the freight and delivery. They can range from articulated trucks to bicycles for last mile delivery. The Indian scenario in case of vehicular management still offers potential for improvement in this area specifically in the area of vehicular safety and emission norms.

India has recently introduced Bharat VI emission norms for vehicles. The focus of the stakeholders should be to adopt and replace their vehicles complying with the latest norms.

Safety features in the vehicle like ABS, EBD, SRS, etc. are not only important for driver of the vehicle and the cargo it carries but also for other users of road. Equipping the fleet, with the latest safety features can improve the reliability and efficiencies of the system.

3.4.6 Traffic management

Traffic management combined with infrastructure are critical components of freight and delivery management. They are both complementary to each other. Traffic management practices are to be defined in conjunction with the available infrastructure. To reduce congestion and pollution during daytime hours, this program induces a shift to deliveries made during the off-hours (night hours), or to accept off-hours deliveries (OHD) or staggering the receivers' delivery hours, which could lead to reductions in truck traffic during peak periods.

This concept is voluntary in nature and guarantees an increase in economic welfare, simply because of its benefit to businesses. Second, it focuses on the receivers as the key decision makers. Although, the incentives have been a tricky issue amongst the city authorities. A number of traffic management practices have been implemented in Indian cities and most of them have proved successful. Some of the practices include:

- Vehicle type and weight restrictions
- Low emission / noise zones
- Load factor restrictions
- Lane management
- Time based restrictions such as off-hour deliveries, staggered delivery hours

Civic bodies based on needs and requirements can implement such traffic management practices with the support of enforcement agencies.

3.4.7 Financial incentives

Pricing, incentives and taxation can be used to encourage or discourage certain practices for effective freight and logistics management. For example, incentives on e-vehicles can encourage the stakeholders to switch from conventional vehicles to electric thus reducing air pollution especially in congested areas. Last mile delivery companies can also provide incentive to its customers for not opting for doorstep delivery rather picking their ordered goods from a common pick up location. A number of Indian cities as well as state and national government have used this strategy to good impact.

The costs associated with freight transport represent a significant proportion of the total cost of production for some commodities. These are costs supported by the shipper, receiver (retailer), and transport and logistics operator, and include such components as drivers' wages, vehicle operating costs, vehicle depreciation and registration charges, as well as the terminal costs of packaging, storing, loading, unloading, recording, and insuring the goods.

In this context, city logistics aim to minimize or at least to reduce transport operational costs. Of course, there are varied aspects of transport costs to be considered when city logistics is implemented, which can be pushed to more use of the resources: costs incurred enroute (mainly due to congestion), costs incurred at customer point (loading and unloading operations), and energy issues.

In fact, city logistics measures implementation rarely deals with business models to show how such actions can create new value for involved stakeholders (i.e., city users, retailers, transport and logistics operators, public administrations).

4 National Framework for planning for Urban Freight

Urban freight should not be dealt with as a separate exercise in planning, but should be an important part of the larger city planning exercise. This chapter, proposes a framework that will help city planners to plan for urban freight in conjunction with their other transportation plans. **It is proposed that this framework should be a part of the CMP toolkit and urban freight plan should become a part of comprehensive mobility plan in every city.**

Most of the issues that plague the urban freight and logistics systems remain complex and there are no perfect solutions. Almost all the decisions or interventions result in multifold and divergent impacts. Some of them remain unpredictable, or unintended impacts. For example, if ULB intends to build the bypass, there will be negative trade-off for the local businesses and there may be unintended relocation of business towards highways.

As mentioned earlier urban freight management strategies tend to be restrictive or retrofit in nature. It is proposed that these strategies need to be based on larger planning principles of good for masses, and should be arrived at after evaluating diverse set of options. Therefore, “this National Framework for planning for Urban Freight” has been based on five key tenets:

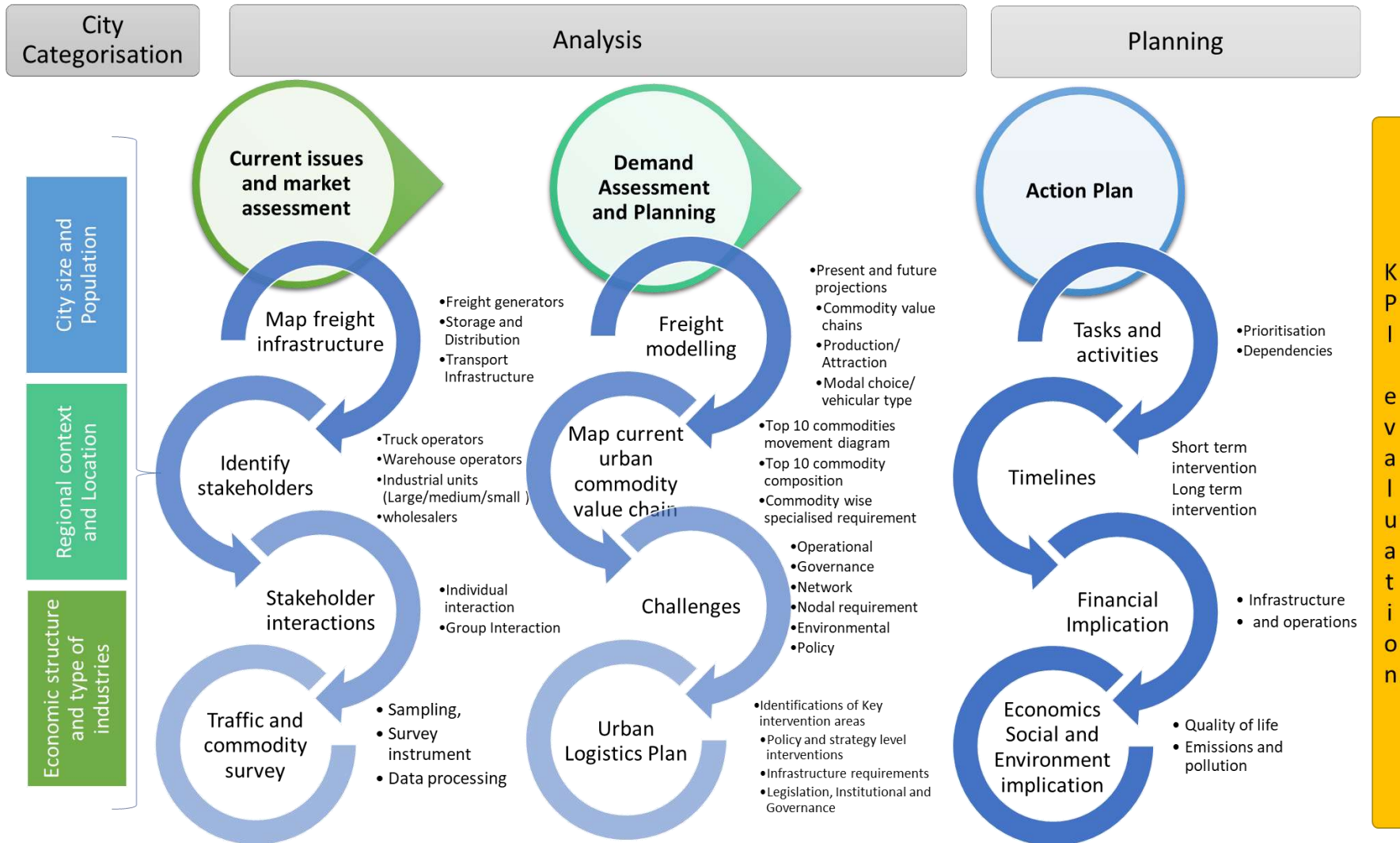
6. Understanding logistics issues from different stakeholder groups perspectives thereby developing a partnership for the processes from all involved stakeholder groups at the onset of planning process
7. Comprehensive data and insights in all aspects of trade and logistics
8. Clear roadmap to follow with clear role and responsibility allocation. Short term, medium- and long-term strategies for urban freight management in typical city by size, type of economic activities and its geographical location in critical macro-logistics chain.
9. Financial support, institutional support and capacity building.
10. Forward and backward linkage of the urban freight plan i.e. linkage with state and national policy as well as the CMP of the city.

The underlying objectives of this framework is to achieve:

- **Mobility:** ease of movement, goods ideally delivered Just-In-Time. Therefore, the balance between sufficient road Transport network capacity and reduced traffic congestion is the main issue.
- **Sustainability:** Environmental issues and energy conservation (through use of cycles, rickshaws and e-bikes) would need to be taken into account.
- **Liveability:** For the residents, individual safety, security (restricted timings, corridors and modes for delivery) etc.

The framework described below would help planners to develop strategies, to overcome challenges in urban freight management, all the while keeping the above requirements as a base. This framework provides an understanding of the nuances of urban freight from different perspectives with examples and data. Following image depicts the overall framework for planning for urban freight in a city:

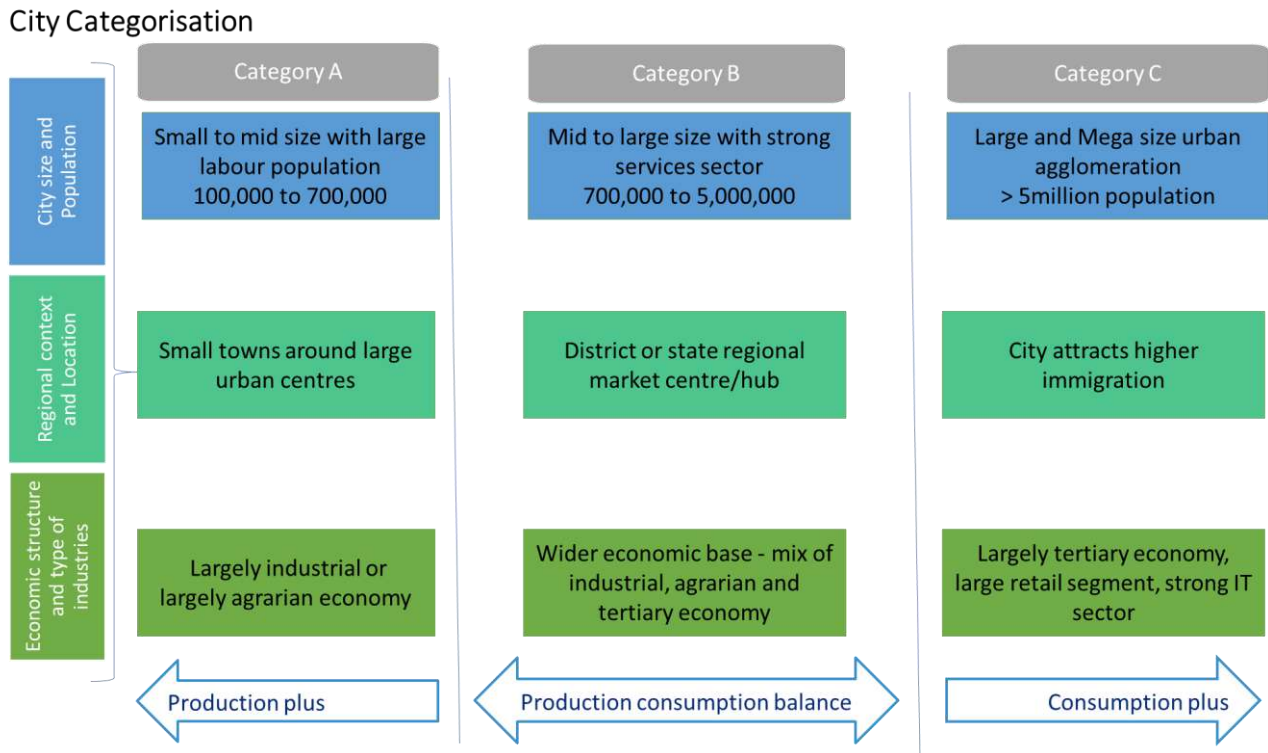
Figure 8: Framework



4.1 City Categorization

First step in starting with implementation of the framework is categorizing the city. All cities exhibit different degrees of characteristics of production center and consumption center. These characteristics depend on three factors- the population of the city, its economic structure and its regional setting. It is evident from many studies that complexities of logistics issues change in tandem with these factors. This has direct impact on data collection techniques, type of stakeholders, locational aspects and even the type of interventions to be deployed.

Figure 9: City categorization framework



As depicted in the diagram above there are three distinct categories that are proposed to be dealt with separately in this framework are depicted in the diagram above.

1. **Category A (production plus)** – This category of towns are those towns that tend towards being a production center and has a smaller component of consumption-based freight. These can be Small and medium cities (population in range of 100,000 to 700,000) developing around large production units and or around the regional agricultural centers, well connected with rail and road. These have concentrated wholesale markets or warehouses and industrial clusters. The freight patterns and logistics needs are comparatively concentrated to few corridors and nodes.

Comparatively smaller cities - 0.05 to 0.5 million population - do not necessarily feel the brunt of freight traffic issues. It will be prudent to take some early steps in order to leap frog to more sustainable logistics development.

2. **Category B (production and consumption balance)** - Million plus cities and other larger cities (population of 700,000 to 5,000,000) often develop as state/regional freight hubs for both agricultural and industrial production. This demands dual roles in storage, consolidation and distribution. Also, there are large

amount of incoming freight as raw materials for industries and finished / value added products being distribution in region. This tends to somewhat equate the production and consumption in the city.

There has been growth in warehousing in many of the selected areas over the last decade compared to the national average as well sub-urbanization of warehousing in these cities. This affects the origin and destination of journeys visiting these facilities and typically increases the distance of such journeys.

This category will also include the categories of twin cities such as Pune and Pimpri Chinchwad; Hubli Dharwad; Ahmedabad and Gandhi Nagar, Metropolitan region of Mumbai, Chennai and National capital region of Delhi consisting of several towns and million plus cities, etc. Though in themselves they might be smaller than the large metros like Delhi, Mumbai, Bangalore, but together they generate significant traffic.

3. **Category C (consumption plus)**– Mega cities (> 5million population) however have evolved into tertiary and services sector. There are fewer industries and those for want of competitive land and utilities tend to shift to outskirts of the designated urban areas. Additionally, the city attracts higher immigration, nano-stores (few sq. m.), informal eateries and restaurants, larger formal hospitality sector and mostly more IT related development. Such cities have larger geographical sprawl, and become large consumption hubs. Thereby their economy drives strong retail segment and larger shares of e-commerce.

A greater proportion of road freight has been shown to be undertaking intra city journeys in large urban areas when compared to smaller urban areas. Journeys within urban areas have been shown to be less efficient (more travel time and fuel usage) than journeys to and from the urban area. This results in more complex freight issues of having discrete destinations (all over the residential areas).

4.2 Map freight infrastructure

Spatial layout and urban land use fabric of the city has several logistics implications in citing of industries, CBD, wholesale markets and hence the freight movement to retail and businesses. Additionally, historical evolution and city culture has a strong role to play besides Development planning regulations, in determining the type of eateries, hospitality business, industries and factories locational preferences.

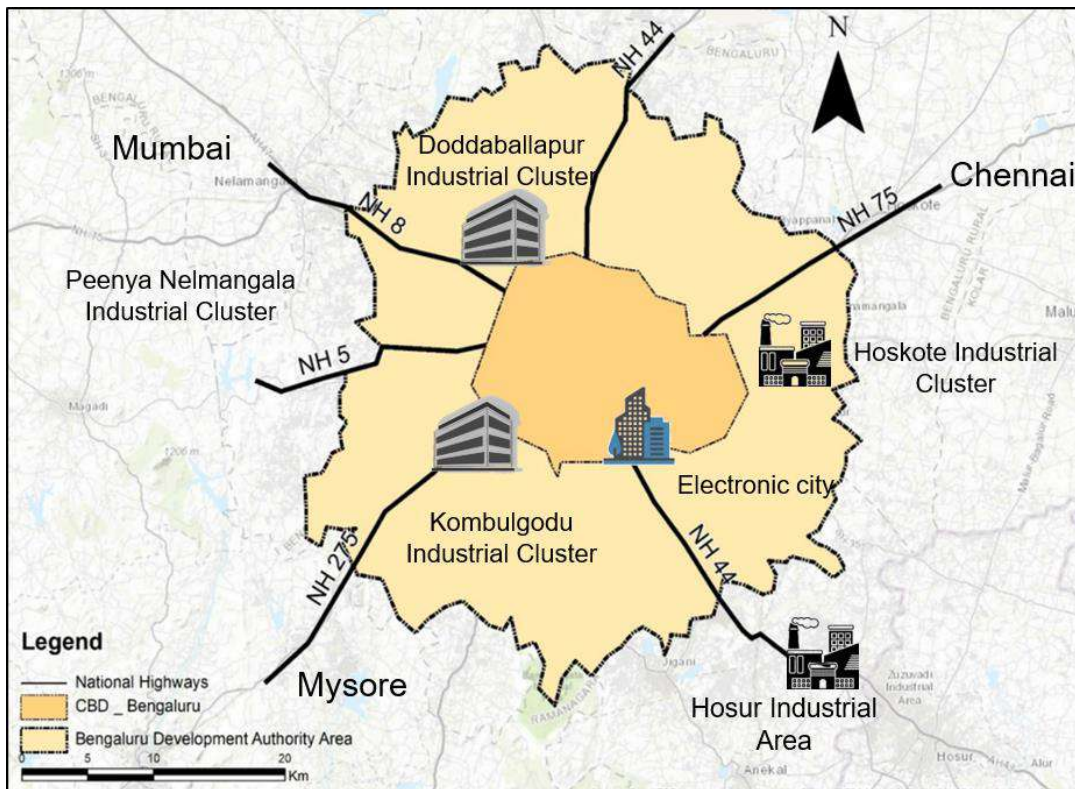
Therefore, as the next step to planning for freight is capturing detailed information about the 5 key urban logistics infrastructure components - Network of rail and road, transport infrastructure systems, processes and value-added services and list out the Stakeholders and correlate their characteristics into Freight generators, storage and distribution infrastructure and transport infrastructure.

4.2.1.1 Urban freight generators

Urban freight generators can be summed up as entities and land uses that produces freight or attracts freight at disaggregate level. Urban freight transport is required for the delivery of raw materials and goods to shops, factories, offices, etc. constitutes a large share of road traffic. From air pollution, noise, and congestion to tight delivery time slots and access restrictions – these complex issues show us how important it is to make urban logistics more efficient and to develop sustainable solutions that help reduce emissions. E-commerce and home deliveries contribute to a further increase in goods transport.

Following map depicts the mapping of freight generators in Bengaluru market:

Figure 10: Freight generators Bengaluru



The key freight producing and attracting land uses include -

- Industrial units, hubs, SEZ
- Whole sale markets and CBDs
- Old city core areas
- Construction sites, Hospitals and larger amenities
- Weekly hats, Mandi
- Eateries, restaurants and hotels
- Retail markets and shopping hubs
- Household factories
- corporate hubs and institutional areas of city
- Local shops, Nano-stores, informal units
- Residential areas, (in category B and C)

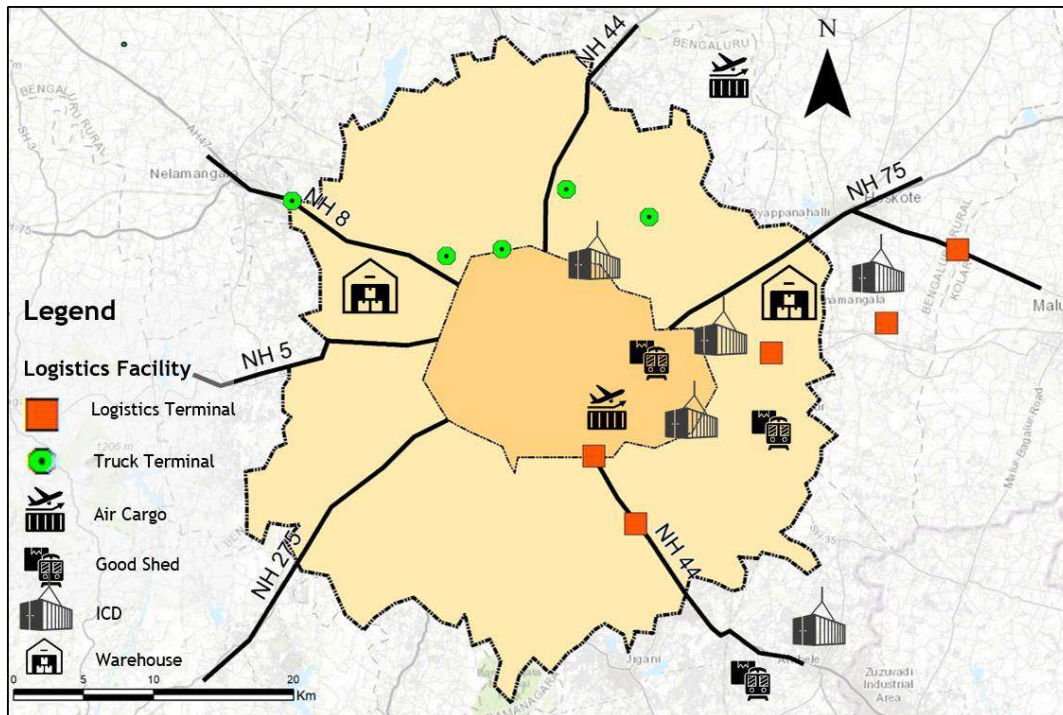
it's paramount that '**urban freight generators**' are mapped on the city land use plans. A deeper geographical understanding can be developed by mapping the value chains of key commodities. Further, the value chain shall include the ancillary service partners, product management and related business partners. Geographically mapping these critical product value chains shall further enhance the understanding of the geographical coverage of the logistics problems and extent of pain points of freight movement.

Commercial and industrial land use patterns affect the types and quantities of goods produced, consumed, and hence the total quantity of freight transport handled. This also influences the distances over which goods are moved and by what specific mode.

4.2.1.2 Storage and distribution Infrastructure

Storage and distribution are important aspects of the freight and logistics. Raw material, semi-finished products, final products all move in and out of large stores and warehouses. Additionally, following entities also provide similar functions-

Figure 11: Logistics facilities Bengaluru



However, in many fast growing million plus cities and mega cities - rapidly rising land prices and increasing traffic congestion in urban areas have forced companies to relocate warehouses to locations with relatively lower prices, which are often not hindered by planning law. In addition, high urban land prices have encouraged retailers and other users of commercial floor-space to limit storage space in their premises, converting for activities which will provide better financial returns (e.g. increased sales areas). Partially, development plans are also responsible for nudging the factories to periphery owing to pollution and other externalities. The mentioned reasons have led to the sub-urbanization of warehousing (being relocated to the edge of the urban area or even outside the city).

Whereas the smaller and medium cities are currently integrated with industrial land use and its related freight functions. However, an early intervention towards securing land (in reference to robust long-term urban planning) will be beneficial in efficient logistics and freight management in future too.

It is important to not only geographically map these part of value chains, but to also gather land costs, size evolvment in relation to freight generators areas, employees hired and vehicle km operated. This provides deeper insights in the complex interactions and interdependencies in value chain.

4.2.1.3 Transport infrastructure

One of the key components of city logistics is efficient freight movement between value chains. Road freight transport distance have increased substantially over recent decades. This has been achieved due to vehicles being able to carry increasingly heavier loads, and the speed of travel increasing substantially (as a result of improved road engineering).

Hence analysis also need to account for multiple vehicle classes, including the delivery vans and small trucks that produce about 80% of urban freight traffic, and the complex interactions between freight activities in the urban core (old city areas mostly) and those in the suburbs, where most deliveries originate. Limited detailed urban freight studies from Delhi, Ahmedabad, Chennai and Kerala cities, Jaipur and few other examples add to the useful insights on urban freight statistics and issues therein. The key components for freight mobility include - bypass, highways, access and connecting freight routes / roads, railway and air freight hubs, other freight vehicle infra, freight vehicles, freight NMT modes, freight parking and loading bays. Freight system also produces some undesired or negative effects. Freight-vehicles and traffic creates congestion, pollution, noise, and require infrastructure especially in old city /core areas. It is prudent that the public policy shall strive to maximize the net social benefits of freight activity, maximizing the benefits of reliable freight flows while minimizing the negative externalities of freight-vehicle traffic. Hence, it is important to consider all available freight modes, as well as the infrastructure and operations carried by each of them.

Urban freight in mega cities and million plus cities ranges from full truckloads to individual parcels and letters, and from large combination vehicles to small passenger-type vehicles like motorized two wheelers in Indian cities. Inevitably, there are enormous variations in productivity across activities, particularly involving pick-up and delivery rounds, capacity utilization, average truck speed, and average shipment size.

The freight flow planning and management process is greatly influenced by some of the key factors such as geographic area and size of the population base, jurisdiction, or specific location (e.g., statewide, regional, metropolitan, or site specific) and the complex economic structure of the region. While land use planning and logistics plan of the city will take care of most of the connectivity issues, freight management plan and freight projects will be essential to solve the nodes and corridors issues.

4.3 Identify stakeholders

The end-users of the logistics value chain, as depicted in figure below, consist of cargo consigners/consignees (Industries), freight forwarders, Logistics Transportation Providers and 3PL/4PL logistics players etc.

Industries (Cargo consigners and consignees) generally trigger or initiate the logistics value chain. These consist of all major industries in the city and adjoining areas whose operations (by way of production, consumption, distribution etc.) would require significant movement of freight.

Logistics Transportation providers often provide end to end transportation services to any of the parties involved in supply chain management. Transporters such as Shipping lines, Road transporters, Airlines and Container Train Operators (CTOs) are responsible for the movement of freight through modes. These players are an integral part of the logistics eco system and it's essential that their point of view is accounted for in the planning process.

Figure 12: End-users of the logistics value chain



Logistics Facilitators include entities such as Customs brokers. Customs brokers are agents for importers/exporters who prepare and submit all documents for clearing goods from the Customs Department. Customs brokers have an aggregated understanding of cargo flows in a region (especially EXIM cargo) as they interact with the customs on behalf of exporters/importers and are an important stakeholder in the logistics eco-system. **Freight Forwarders** arrange for cargo to travel from an origin to a destination within a specific time frame. Freight Forwarders are required to arrange and monitor all of the fine details so that shipments flow across international borders with compliance and efficiency, mitigating delays. Freight forwarders advise shippers on estimated freight costs, port charges, costs of special documents, insurance costs and terminal handling fees etc. A **third-party logistics company** is one that works with shippers in order to manage another company’s logistics operations department.

Terminal Logistics Operators such as ICD/CFS/PFT Operators, Air cargo terminal operators, Warehouse Operators, Cold Storage Operators etc. are primary stakeholders in relation to this assignment. Terminal logistics operators have a comprehensive understanding of the market for terminal logistics services/facilities, are potential bidders for the proposed facility as well as competition for the proposed MMLP facility in Dabaspete. Detailed interactions shall be undertaken with Terminal logistics operators by the engagement team on various aspects of the development of MMLP facilities including their willingness to shift, kind of facilities that will be needed at the MMLP and market price for the services provided by them.

Real Estate Developers often have the ability to provide expertise, knowledge and raise capital about the said region to facilitate construction of a node or facility. They can also give us information about the upcoming infrastructure developments in the region and have vested interest in the development of the facility.

Government agencies- Interaction with Central and State governments along with cargo facilitation agencies (Customs, Plant and Animal Quarantine etc.), Developmental agencies and municipal authorities, Export Promotion Board etc. are also necessary to understand various policies, programs and protocols that drive cargo movements and demand for logistics facilities.

Industry and Trade Associations have complete knowledge about industries in the area, all the requirements related to industries and challenges associated with it. Interactions with them will help us understand their field of operation and get an insight in to their industries.

It is important to list our key stakeholders under each category and conduct interviews or discussion to understand real aspects of freight value chain in the city

A typical stakeholder list for Bengaluru is presented below:

| # | Stakeholder category | Representative list of stakeholders |
|----|--|--|
| 1. | Potential users of logistics facility | <p>Industries</p> <ul style="list-style-type: none"> • Tata Steel • JSW Steel • SAIL • Volvo • TVS Motors • Ashok Leyland • JK Tyres • HAL • SAI Apparels • Surya Steel • BIRLA Cement • Flipkart • Amazon • Arvind Limited • Indo Spanish Tasty Foods Pvt. Ltd. • Reitzel India • Vizag Steel • Decathlon • Kirloskar <p>Freight Forwarders</p> <ul style="list-style-type: none"> • EXPO Freight • D.B Schenker • AVT Logistics • VRL Logistics • INDEV Logistics • Jeena & Company • Kuehne Nagel <p>3PL Logistics Players</p> <ul style="list-style-type: none"> • Unity 3PL Services • Jayem Warehousing Pvt Ltd • Indelox Services • GIR Logistics • Uniworld Logistics • 3PL Kart Logistics • Mahindra Logistics |

| | | |
|------------------|---|---|
| | | <ul style="list-style-type: none"> • AAJ Enterprises • Snowman Logistics Ltd <p>Logistics transportation providers</p> <ul style="list-style-type: none"> • Shreeji Transport Services • Vishal Cargo Transport • Unison Logistics and Packers Pvt Ltd • Globe Logistics & Packers • Agility Logistics • Bright Cargo Mover • LCL Logistix India • Nitco Logistics Pvt Ltd <p>Logistics facilitators / Exporters</p> <ul style="list-style-type: none"> • Rao Clearing Agency • Shahi Exports • Texport Syndicate • Gokaldas Exports Ltd. • Varsha Logistics • Naman EXIM |
| <p>2.</p> | <p>Potential Investors in logistics facility</p> | <p>Terminal Logistics operators</p> <p>CFS</p> <ul style="list-style-type: none"> • Marigold Logistics • Central Warehousing Corporation – Whitefield • Pearl Logistics <p>ICD</p> <ul style="list-style-type: none"> • Container Corporation of India Ltd (CONCOR) • Pearl Shipping • Pristine • SATTVA <p>PFT / Railway Terminals</p> <ul style="list-style-type: none"> • M/s Kesar Multimodal Logistic Ltd. • Railways Good Shed <p>Warehouse</p> <ul style="list-style-type: none"> • Safe Shipping • Expeditors • Expo Freight • Seagull Shipping |

| | | |
|------------------|--|---|
| | | <ul style="list-style-type: none"> • Sattva <p>Cold Storage</p> <ul style="list-style-type: none"> • Imentrix Marketing & Logistics • Marco Services • Isiri Cold Storage • Chetana Cold Storage • Ablecold Logistics Whitefield Cold Storage <p>Real Estate Developers</p> <ul style="list-style-type: none"> • SRI City • Raja Housing Ltd • Prestige Group • Brigade Group • Sobha Group |
| <p>3.</p> | <p>Governments, regulatory, modal authorities and other agencies</p> | <ul style="list-style-type: none"> • Central Government – <ul style="list-style-type: none"> ○ Ministry of Commerce and Industry ○ Ministry of Road Transport and Highways ○ Central Board of Indirect Taxes and Customs ○ Indian Railways (CTPM-South West) • State government <ul style="list-style-type: none"> ○ Karnataka Industrial Area Development Board (KIADB) • Bengaluru Metropolitan Region Development Authority (BMRDA) • Bruhat Bengaluru Mahanagara Palike (BBMP) • Karnataka State Industrial and Infrastructure Development Corporation (KSIIDC) • Karnataka Udyog Mitra (KUM) • Visvesvaraya Trade Promotion Centre (VTPC) • Department of Industries and Commerce <p>Modal Authorities/Operators</p> <ul style="list-style-type: none"> • Airports Authority of India (AAI) • Bengaluru International Airport Area Planning Authority • Karnataka Road Development Corporation Ltd. (KRDC) • Relevant departments of National Highways Authority of India (NHAI) • Jawaharlal Nehru Port Trust (JNPT) • Mumbai Port Trust • Chennai Port Trust • Various Minor Ports • Indian Railways (Southern railways) <p>Industry Associations</p> <ul style="list-style-type: none"> • Federation of Indian Chambers of Commerce and Industry (FICCI), Karnataka State Council • Confederation of Indian Industry (CII), • Bengaluru Chamber of Industry and Commerce |

| | |
|--|--|
| | <ul style="list-style-type: none"> • ASSOCHAM, Karnataka State Council • Karnataka Drugs and Pharma Association • Aluminum Association of India • Indian Machine Tool Manufacturing Association • Karnataka Goods Transporters' Association • Bengaluru City Lorry Transporting Agents Association • M/s. Federation of Karnataka Lorry Owners Association • Karnataka Small Scale Industries Association • Peenya Industries Association • Electronics City Industries Association • Doddaballapur Industries Association • Whitefield Area Commerce and Industries as • Bidadi Industries Association • Automotive Component Manufacturers A • India Electronics & Semiconductor Association • Mysore Industries Association |
|--|--|

4.4 Stakeholder Interactions

It is critical to do robust outreach to the relevant stakeholder during the whole process of the planning, designing and implementation of the interventions. The public sector cannot address freight issues without understanding the underlying phenomena involved. Often policy decisions relating to zoning, urban design concepts, parking regulations, and restrictions on truck routes can result in unintended problems (due to different perspective and business issue faced by the industry or business community).

An initial list of stakeholders may be further refined based on their size of operations, type of cargo handled and position in the freight value chain. It is important to interact with stakeholders to cover a wide range of commodities. This will help city planners to understand the value chain of key large commodities moving in the city. It is also important to cover a sample of each category of stakeholders such that issues and challenges faced by each stakeholder is understood.

Stakeholder discussions can either be done through individual interactions or through group interactions.

4.4.1 Individual interactions

Such individual discussions can be conducted using discussion guides. A typical discussion guide for a terminal operator is presented below for reference. Similar guides should be prepared for other category of stakeholders for conducting individual interactions.

Table 4: Discussion Guides Terminal Operator

| Broad Topics | Questions/Issues |
|---|---|
| Scale and size of cargo terminal operations | <ul style="list-style-type: none"> • What is the number of facilities your company operates in India and Abroad? • What are the broad annual cargo volumes handled at group/company level? • Aggregate annual revenues at a country level for this line of business? |

| | |
|--|--|
| | <p>Has the operator ever operated/owned a MMLP before?</p> |
| <p>Scale and size of current Bengaluru market</p> | <ul style="list-style-type: none"> • What are the key industries in surrounding vicinity and hinterland? • Broad understanding of the hinterland of Bengaluru <ul style="list-style-type: none"> ○ Area, ○ Key customers and ○ commodities • Broad origin-destination of cargo, • Import-export split by commodity (Top three) incoming and outgoing cargo commodities for Domestic and EXIM cargo. • The list and volume trends of high growth commodities • Broad overview of cargo that are in transit (but not funneled out through) the Bengaluru region/hinterland <p>What is the status of upcoming /announced developments such as SEZ's, industrial parks/corridors etc. around the area? (Details regarding when they are expected to come into being etc.)</p> |
| <p>Current operations of cargo terminal operator</p> | <p>Overview of operations</p> <ul style="list-style-type: none"> • Traffic - Existing cargo profile of the Terminal and its hinterland including broad <ul style="list-style-type: none"> ○ origin -destination of cargo, ○ import-export split and by commodity wise split of major ○ (Top five) incoming and outgoing cargo commodities for Domestic and EXIM cargo? ○ The list and volume/value trends of high growth commodities ○ Are there any regulatory requirements for the products handled by them? • Customers <ul style="list-style-type: none"> ○ Key client groups and their share of cargo volumes and values ○ Contact details of freight forwarders, transporters, logistics service providers, container train operators, airlines, cargo handling agents and end users of the terminal • Facilities <ul style="list-style-type: none"> ○ What are the key facilities/services/infrastructure and services being offered or envisaged to be offered at Cargo terminal? ○ What are the current levels of utilization of the terminal's facilities? (Details such as dwell time for cargo, extent of space utilization at warehouses and container terminal etc.) <p>Revenues</p> <ul style="list-style-type: none"> • Charges for each service/facility that is provided? • Details of aggregate revenue and revenue by each operational revenue stream. <p>Expenditures</p> <p>What are the broad estimates of block costs for capex and opex for terminal operations?</p> |
| <p>Competing facilities</p> | <ul style="list-style-type: none"> • What are the nearby terminals that compete with your terminal? How is their cargo mix different from yours? |

| | Do nearby terminals offer any distinct services/infra vis-à-vis yours? |
|---|--|
| <p>Future operations of cargo terminal operator</p> | <ul style="list-style-type: none"> • Envisaged changes in cargo commodity base in the surrounding vicinity and hinterland • Traffic <ul style="list-style-type: none"> ○ What are the broad projections for future cargo traffic? ○ The list and projected volume/value trends of potential commodity groups • Customers <ul style="list-style-type: none"> ○ What are the new client groups that the cargo terminal could potentially attract? • Facilities <ul style="list-style-type: none"> ○ What is the envisaged augmentation of key facilities/services/infrastructure and services being offered or envisaged to be offered at Cargo terminal? ○ What is the envisaged augmentation in the connectivity and frequencies offered by the Bengaluru airport? ○ What are the expansion plans of the terminal? <p>Revenues</p> <ul style="list-style-type: none"> • Details of escalation of aggregate revenue and revenue by each operational revenue stream. • Details of escalation of charges for each service/facility that is provided? • Details of new revenue streams that can be added by cargo terminal operator? <p>Expenditures</p> <p>What are the broad escalations in the estimates of block costs for capex and opex for terminal operations?</p> |
| <p>Key inhibitors and facilitators</p> | <p>Inhibitors</p> <p>Key challenges pertaining to</p> <ul style="list-style-type: none"> • Infrastructure • Industrial policies/regulations • Land related policies regulation <p>Facilitators</p> <p>Key advantages pertaining to</p> <ul style="list-style-type: none"> • Infrastructure • Industrial policies/regulations <p>Land related policies regulation</p> |

4.4.2 Group interactions

Effective engagement of the private sector requires creating mechanisms to discuss freight issues with the private sector and communities, both to identify potential solutions and the role of the various stakeholders, and to secure commitments to a strategy of improvements. There can be many mechanisms for engaging

private sector in freight transportation planning. Although there are multiple ways to accomplish these goals, the following steps could be useful:

1. Designating a freight official at stakeholder agencies and they can coordinate frequently to resolve the issues. They represent not only their organization but also the cluster or community they belong to. It increases the outreach greatly and such a person understands freight and business issues and effectively communicates to agencies and business.
2. Freight committee can initiate a forum/ platform for discussion of freight issues to enhance relationship between public and private sectors. Additionally, it will facilitate implementation. Committee can also be responsible for educating elected and appointed officials. officials in freight planning can effectively contribute to enhancing system performance

Box 6: Case Study: Central London Freight Quality Partnership ¹⁷

The Central London Freight Quality Partnership (CLFQP) is a partnership between local governments (the seven boroughs of: City of London, Westminster, Camden, Islington, Southwark, Kensington and Chelsea and Lambeth), local businesses, freight industry and others with an interest in freight issues within central London. The aim of the partnership is to develop an understanding of freight transport problems and to develop constructive solutions. The partnership was initiated in 2005 after a recommendation from a public-private collaboration. Membership is free of charge and has no formal responsibility or mission from the government (either local or national).

The partnership has ordinary meetings four times per year plus 4-5 meetings regarding special issues. The meetings are open to anyone with an interest (normally attendance is about 20-25 people, divided more or less equally between public and private-sector participants). After each ordinary partnership meeting there is a steering group meeting that consists of a total of 12 people (six from the boroughs and six key stakeholders from industry). The partnership and the steering group is managed and chaired by the University of Westminster. The central London partnership (and the other FQPs in London) was initially funded by Transport for London (TfL) but the TfL funding ceased in 2011 and funding has been replaced by a mix of support from the public and private sectors. Operating costs are low and it is seen as a good way to ensure an exchange of information as well as ideas regarding freight transport initiatives in central London.

The members of the partnership welcome the opportunity to interact and exchange information with other stakeholders, and the regular meetings make this possible. The authorities and the different stakeholder groups cite the opportunity to discuss problems and possibilities with others as the main reason for attending the meetings. The most important outputs from the meetings, according to the participants, have been specific projects, such as: a loading and unloading code of practice, reduction in penalty charges for loading offences and an electric vehicle charging point initiative.

4.4.3 Analysis and inferences from stakeholder discussion

Inputs sought from stakeholders should further be categorized into four broad categories

1. **Current trends:** Discussions on current trends help planners to understand where the current freight traffic is moving these discussions should ideally highlight the Network implications, Nodal requirement, Policy implications and Environmental Implications.

¹⁷ Source: Taniguchi and Thompson, 2014. City Logistics: Mapping The Future, CRC Press.

2. **Future trends:** Discussions on these categories will highlight what direction will the industry take in the future. It is important to understand the future perception of the stakeholder and factor them in the final freight management plan.
3. **Challenges faced:** challenges highlighted by stakeholders can be further divided into operational challenges and governance challenges. Planners would have to devise strategies to address these challenges in the action plan.
4. **Solutions sought:** by virtue of operating in the business for many years, stakeholder often have also had their own ideas of the solutions that will work. It is important to capture these ideas for further investigation and detailing in the action plan.

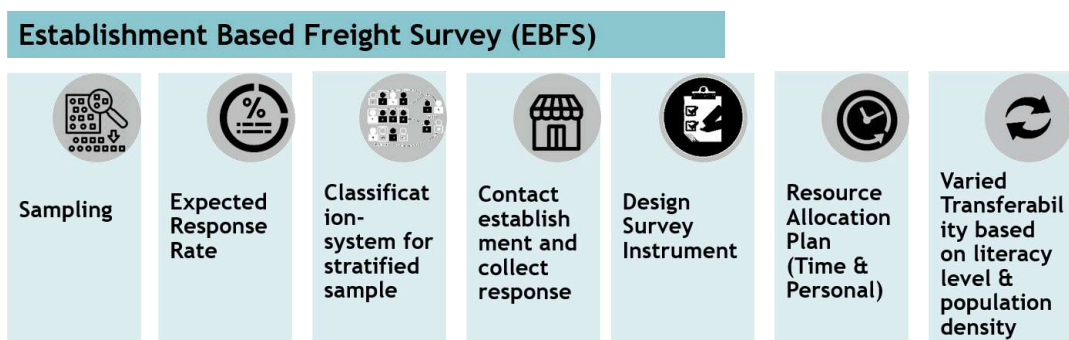
4.5 Traffic and commodity survey

Urban Freight Transport Planning and Management toolkit, MoHUA (2016) details out the various survey techniques to be used to collect the urban freight data. These are listed below-

- Road Side Interview Survey
- Vehicle Traffic Count Survey
- Establishment Survey
- Parking Survey
- Truck Driver Survey
- Truck operator Survey
- Truck Terminal Survey

Out of the above survey techniques, Establishment based freight surveys (EBFS) has been found to be the most explanatory technique to understand the logistics in a city. The survey provides both goods flow and vehicle activity data besides linking goods flow and vehicle activity to business sector/land use/supply chain.

Figure 13 Establishment Freight Survey

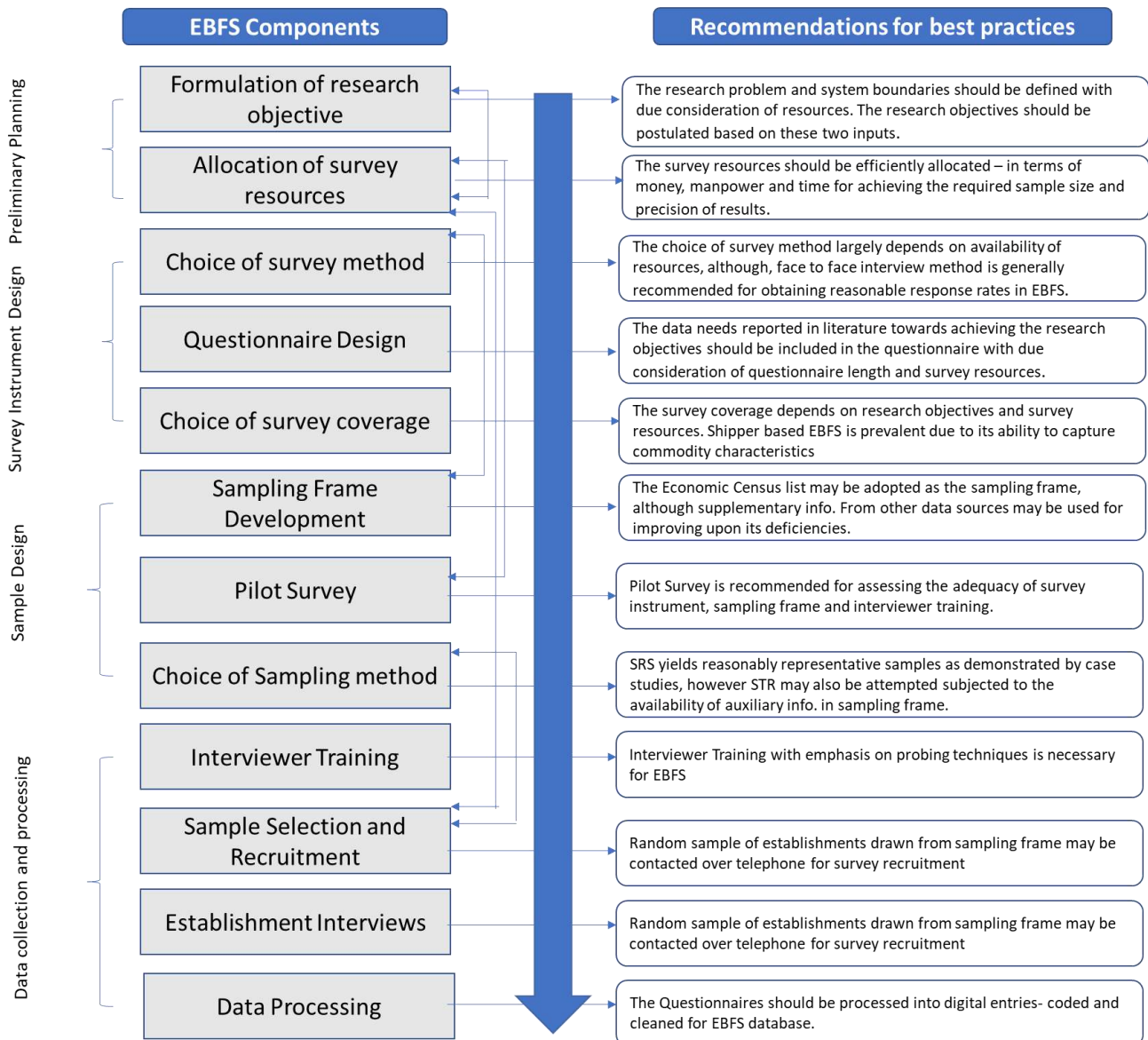


Pani, A. and Sahu, P.K. (2019)¹⁸ provided an integrated framework for establishment-based freight survey design and implementation depicted in the figure 4-1 below. Paper demonstrates the application of the proposed framework by implementing it in eight cities across two geographically dissimilar states of India. The framework talks about the key aspects which should be considered while conducting the establishment-based freight survey exercise.

Figure 14: Integrated Framework for design and implementation of EBFS¹⁹

¹⁸ Source: Pani, A. and Sahu, P.K., 2019. Planning, designing and conducting establishment-based freight surveys.

¹⁹ Source: Pani, A. and Sahu, P.K., 2019. Planning, designing and conducting establishment-based freight surveys.



Present study, gives a comprehensive methodology for conducting EBFS taking reference from the available literature. Various aspects involved in EBFS data collection exercise are listed below-

4.5.1.1 Data collection and assessment

Sample of data collection needs and assessment tasks that may be associated by type of problems and or planned initiatives. The initiatives vary from Logistic planning, pricing and taxation, freight infrastructural management, freight parking and loading areas management, land-use and freight demand management, traffic management and other vehicle related strategies. The data collection & analysis required for each is described below-

Figure 15: Survey instruments and their enquiry themes

Logistics Planning

Problem Area/Initiative **Data Collection Needed** **Assessment and Analysis**

Logistic planning

Location and volume of freight coming from and going to business, industries and manufacturing in the region.
Summary of current ITS programs operating in the region

- Freight Trip Generation
- Locational Analysis
- O-D Analysis
- Congestion & Mobility study, including time of day analysis

Pricing, Incentives and Taxation

Current land use map and regulations. Locations and volume of freight coming from and going to business, industries and manufacturing in the region

Freight Demand & Land-use management

Current freight related regulations, taxation and incentive programs in the region

Analysis (Possibly through private sector interviews/surveys) of the impact of these to local businesses

Infrastructure Management

Roadway, intermodal and modal facilities inventory, including traffic counts and capacity.
Origin/Destination of travel.
Condition of infrastructure, including related roadway geometrics.

Level of Service, Volume to Capacity by time of day; pavement ratings; types of vehicles using the facility
Infrastructure condition
Locations of freight generators (shippers and receivers)

Freight Management

Parking/Loading Areas Management

Number and locations of on- and off-street parking spaces and use.
Number and location dedicated to trucks and delivery zones, including time restrictions.
Number of parking violations
Design and access to loading docks
Parking-related regulations and enforcement.
Freight Trip Generation

Parking analysis: needs and availability.
Focus on freight generator and receivers, such as retail establishments

Vehicle Related Strategies

Vehicle emissions and noise regulations.
Number of low-emission freight vehicles registered in region.
Air quality data/Noise data

Comparison of air and noise regulations and incentives to other parts of US and abroad.
Analysis of incentive programs available

Traffic Management

Summary of freight vehicle restrictions in the region.
Location of truck routes.
Location of roadways with and without signal timing

Congestion analysis including intermodal connection access issues, and identification of problem locations.

4.5.2 Freight survey coverage

Freight is a combination of multiple stakeholders/agents with numerous connected activities and each having limited information about the freight movement²⁰. Hence, freight data collection requires capturing details considering all the agents i.e. shippers, carriers, receivers.

The freight data requirements and survey coverage of EBFS vary widely depending on research problem, planning level, and elements of policy framework. The examples below highlights some of the most common initiatives for EBFS surveys.

- EBFS conducted at mega polis level or million plus cities have been focused on retail establishments and e-commerce in recent years, (i.e., receivers where commodities are sold to end-consumers in small quantities) for modelling freight parking demand.
- In industrial towns and cities - commercial establishments inclusive of industrial and whole-sale units have been considered for the EBFS. While the retail and e-commerce have been negated for estimated smaller impact.
- When exploring small and medium cities - agricultural sector and allied sector has been main focus while conducting EBFS.
- When the focus of survey has been to look at the large quantities flow, dealing with HDV and LDV freight vehicles, all establishments of less than 8 people, retail centers and shops have been avoided.
- While doing the logistics plan related surveys - a comprehensive survey coverage is desired considering different combinations of shippers, receivers, and carriers.

The other set of data that needs to be collected pertains to the flow of commodity and type of vehicles used in three different aspects –

1. External flows (External–External (E–E)) include movements which have both origin and destination outside the urban/study area.
2. Inter-urban flows (External–Internal (E–I) Or Internal–External (I–E)) include movements which have either origin or destination outside the urban/study area.
3. Intra-urban flows (Internal–Internal (I–I)) include movements which have both origin and destination within the urban/study area.

Ideally the data collection shall attempt to investigate and map the existing freight activity centers and movement of freight vehicles within the city in order to identify the major congestion points in the urban transportation network. It shall also seek to identify major barriers to the smooth movement of urban freight traffic to be able to resolve and develop remedial measures in mitigating the urban logistics inefficiencies and road safety related issues around the freight activity centers in the city.

4.5.3 Mode of data collection

Value chain data needs to be collected through EBFS surveys and through traffic data collection.

- EBFS surveys can be conducted via questionnaire, interviews and hybrid system which includes both to gain edge on qualitative aspects too.

²⁰ (Source: Holguín-Veras, J. and Jaller, M., . (2014)

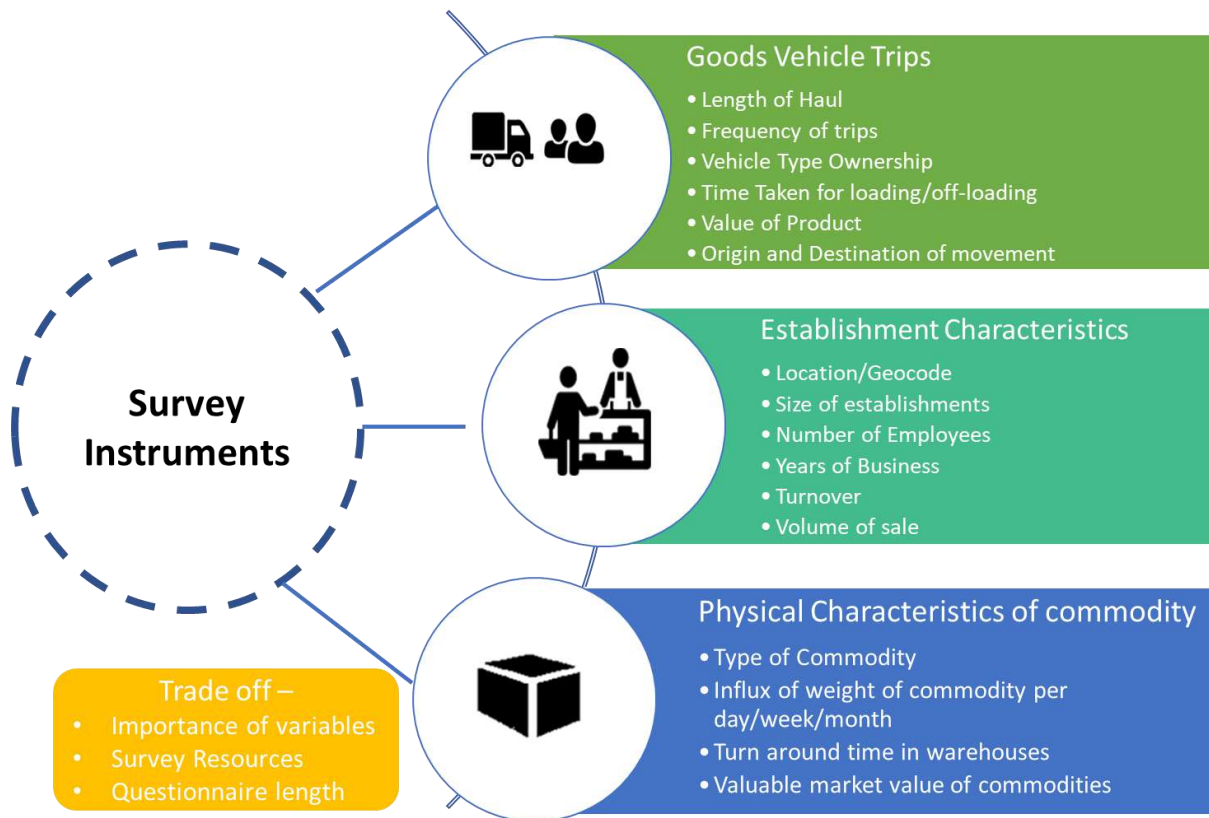
While the transport surveys are fairly well understood, EBFS survey design and conduct require experience. Next few sections carry details and tips to conduct the EBFS in Indian context.

- The scope of data collection shall include assessment of goods flows and identification of salient issues related to goods flows and freight activity centers. These assessments are based on following data sources —
 - Classified volume count (CVC) survey, (CVC surveys of freight vehicles by type, time and direction shall be carried out the key highway or main roads that enter the city. It shall include information related to full load/ half load and empty runs)
 - Roadside interviews of truck drivers at loading/unloading locations at the city (5-10% of freight vehicles by type and direction) to understand the frequency, purpose of city visits and amenities (such as driver lodging, vehicle repair and parking)
 - Field visits to traffic generators of in the city (assess surrounding land use, available transport infrastructure and built form of three types of urban freight generating centers—industrial estates, warehousing centers, and markets in the historic inner city)
 - Semi-structured interviews with various stakeholders at these freight generating areas for effective stakeholder engagement (for gaining business perspectives and operating margins)
- Additionally, in mega polis and million plus cities – reviewing the existing practices of time, location and other restraints shall be periodically reviewed to assess the impact.
 - Description of restrictions: Describe the regulatory documents (e.g. decree, act, law) explaining the restrictions. Include: Geographic area covered, Types of vehicles involved, Time of day restrictions take place, Exceptions (if any)
 - Public sector rationale: Interview public sector officials and ask the reasons that led them to impose restrictions.
 - Implementation: Describe the process leading to the implementation of the restriction(s).
 - Impacts on carriers: Select a sample of companies and interview (Discuss script) them about their operations before and after the restrictions took place. Discuss sample design with team members and what to include (economic sector, type of business, size, and employment, among others).
 - Impacts on receivers: Select a sample of companies and interview (Discuss script) them about their operations before and after the restrictions took place. Discuss sample design with team members and what to include (economic sector, type of business, size).
 - Analysis: Analyze the data collected and summarize your conclusions about the restriction(s) and its impacts.
 - Summarize the quantitative impacts of the restriction. Estimate (Discuss performance measures) changes in: Vehicle miles travelled / Vehicle kilometers travelled, Operational Costs, Fleet composition, Staff, Hours of operations, Shipment sizes and frequencies of distribution, Logistics activities, Summarize the qualitative impacts of the restriction

4.5.4 Survey instruments

EBFS survey questionnaire shall consist of the three different sets of themes for data collection, as described in the figure below –

Figure 16: Themes for data collection in EBFS Survey



4.5.4.1 Sampling –sampling frame, type of sample, classification system, costs of surveys

Sampling frames are lists or directories used for identifying, locating and contacting units of the target population. The availability and quality of sampling frames have direct implications on sampling design and choice of survey method. Limitations of sampling frames often restrict the survey designers to adopt non-probabilistic approaches such as purposive sampling. In addition, if the sampling frame does not contain updated telephone listings, then the choice of survey method may get limited to postal survey or face-to-face interviews.

Given the availability of sampling frame, probabilistic approach is preferred since it avoids selection bias and generates samples that can be used for drawing statistically valid inferences about the population.

Economic census (Central Statistics Office database, GoI) can provide the initial database of industrial establishments in India. The missing auxiliary information (industry classification, employment category) and the establishment addresses, economic census list etc. needs to be supplemented with information from other data sources such as annual reports prepared by District Industries Centre, registry access provided by the Commercial Tax Departments and local search websites.

During sampling frame development, it should be acknowledged that a certain portion of establishments in economic census list are not operative and several missing records are present. The final sampling frame thus can offer the probabilistic sampling options consisting of either of the following:

Figure 17: Probabilistic sampling options

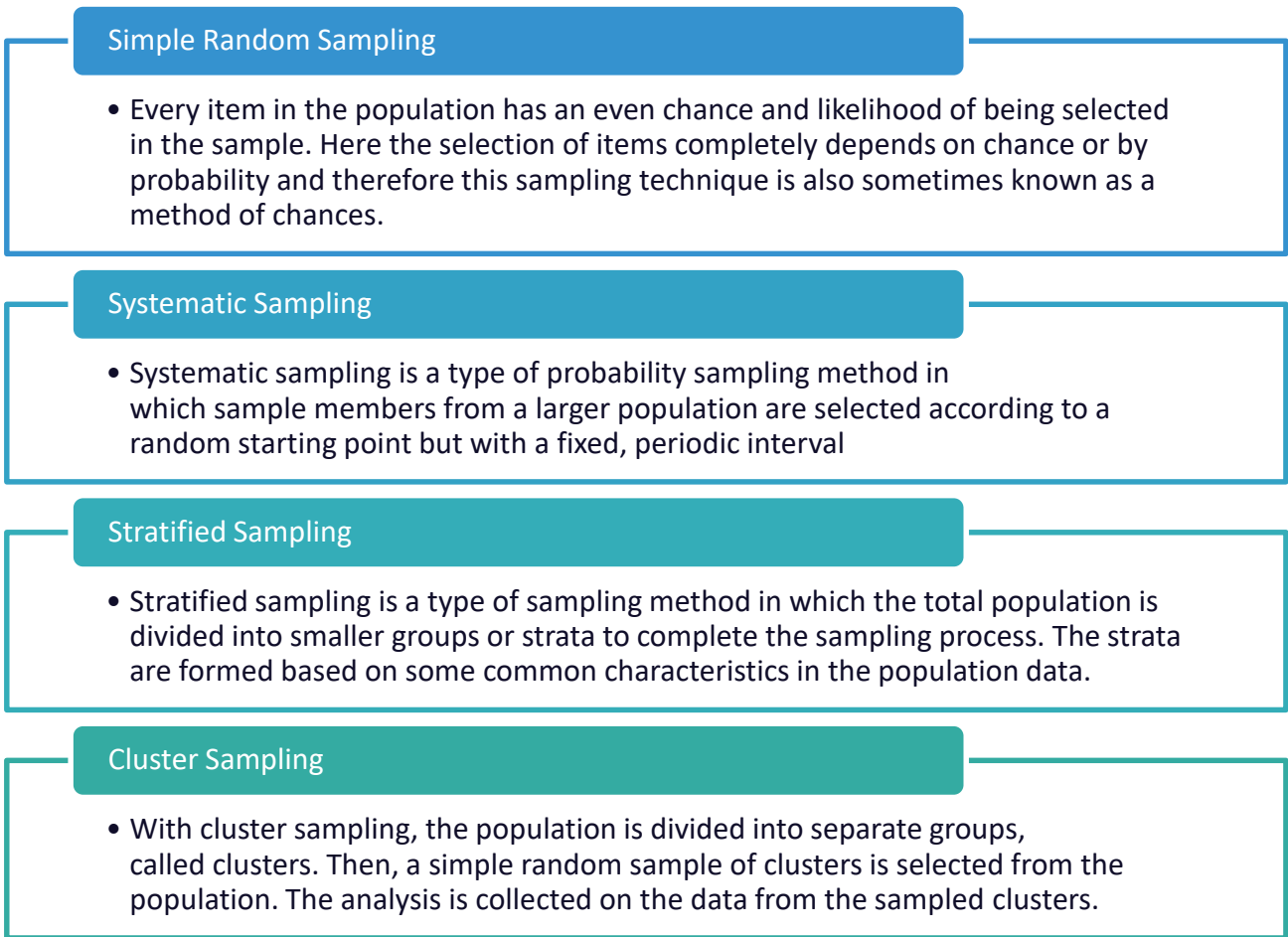


Table 5 EBFS Sample Size for different margin of errors at 95% confidence

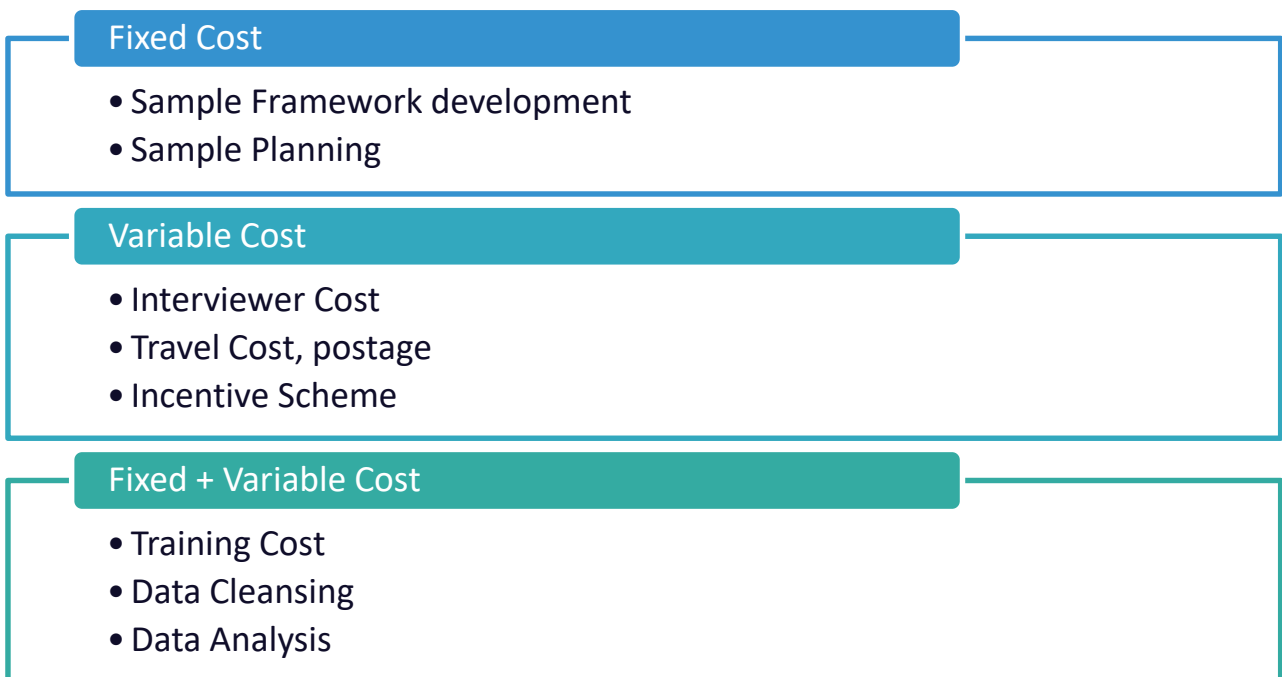
| Population size (Establishment) | Cities (Example) | Margin of Error | | | |
|---------------------------------|--|-----------------|---------|---------|--------|
| | | +/-3% | +/-4% | +/-5% | +/-10% |
| 2500 | Agartala, Silchar, Jammu, Amravati, Chandigarh, Darjeeling, Imphal (India) | 749 | 485 | 334 | 93 |
| 2501-5000 | Kannur, Kottayam, Bhubaneshwar, Ranchi, Roorkee, Kocaeli (Turkey) | 749-880 | 485-536 | 334-357 | 93-95 |
| 5001-10000 | Calicut, | 880-965 | 536-566 | 357-370 | 96 |
| 10001-20000 | Cochin, Malappuram, Calgary (Canada), Lisbon (Portugal), Gothenburg (Sweden) | 965-1014 | 566-583 | 370-377 | 96 |

| | | | | | |
|-------------|--|-----------|---------|---------|----|
| 20001-50000 | Delhi, Mumbai, Jaipur, Bengaluru, New York, Bordeaux (France), Edmonton (Canada) | 1014-1045 | 583-594 | 377-382 | 96 |
|-------------|--|-----------|---------|---------|----|

²¹A robust sampling size (approximately 450 complete responses– inclusive of 10-15% sample for validation) shall have even response distribution (50% at least in typical case) at least 95% confidence interval. The classification system of captured data shall have international industrial and economic product categories (ISIC, NACE, NIC). While commodity and products shall follow CPC system for standard protocols and easy comparisons. While land use does not have any international standards for category etc., the TCPO norms prevalent at state level should be followed in Indian cities context.

Costs of surveys vary across components as shown in the figure below. These are estimated to be 50 INR per commercial vehicle to 150 INR per establishment survey. The survey costs are function of geographical spread of city, extent of non-response, length of questionnaire and no of teams, supervisors and training etc. involved.

Figure 18: Type of survey cost



The staff training needs to be conducted for briefing on purpose and contents of questionnaire and survey. Developing robust survey administrator and monitoring team. Developing the survey procedure with team and bracing for ground issues and training on probing techniques to increase response rates.

EBFS was conducted in a research study for seven cities of Kerala²² and A Pilot survey was conducted on various key aspects and the insights received were used by the researchers to modify their survey design. of EBFS. EBFS was also conducted in cities of Nagpur and Bengaluru (NHAI MMLP study). The findings from the survey as listed should be considered into account by various cities during the conduct of the survey.

²¹ Source: Pani, A. and Sahu, P.K., (2019)

²² Pani et.al. (2018)

| EBFS Aspects | Insights from the pilot survey – research study (Kerala) | Tips for various cities for conducting EBFS. |
|-----------------------|--|---|
| Sampling Frame | <ul style="list-style-type: none"> Pilot Survey Confirmed the presence of many non-freight generating establishments in the sample frame Presence of backdated records in the sampling frame caused moderate levels of sample loss | <ul style="list-style-type: none"> Few Screening Questions should be placed at the start of questionnaire to avoid non-freight generating establishments in the sampling frame Backdated information should be identified and corrected. |
| Questionnaire Context | <ul style="list-style-type: none"> Few Questions (eg. Company turnover, product value) were found to lead the diminution of rapport between respondents and the interviewers Few Exploratory questions (eg. Shipment and modal characteristics) were found to lead to scant responses There were clear indications that few respondents were not understanding the meaning and intent of some questions The questionnaire sequencing was found to have scope for improvement. It was observed that the first few questions played an important role in determining the attitude of respondents to the rest of survey The attentiveness and interest of respondents dropped after a series of questions. | <ul style="list-style-type: none"> Remove questions causing burden to the respondents Language used in survey should be simple and direct in nature Logical Sequencing of the questions should be in such a way that it should keep the respondents engaged. Also, questionnaire structure should be streamlined to improve the brevity by making few questions optional |
| Data Collection | <ul style="list-style-type: none"> The interviewers were often met with difficulties regarding whom to contact once they reach the establishments for survey. When the respondents were asked to recall their tonnage diaries the resultant responses were often limited and several possible errors were observed to be associated with them | <ul style="list-style-type: none"> Prior Appointment with the contact person at a managerial position should be confirmed. Arrangement of shipment/tonnage diaries should be requested in advance from the contact person. |
| Interviewer Training | <ul style="list-style-type: none"> The interviewers were found to require substantial training in terms of administrative aspects of survey, survey conduct etc. Limited awareness about the survey background and freight studies were observed amongst the establishment respondents | <ul style="list-style-type: none"> Training Session should be conducted with the interviewers. |
| Survey Sponsorship | <ul style="list-style-type: none"> It was observed that the establishments required assurances about the confidentiality of the shared data The establishments were observed to respond positively to authority, particularly the govt. departments and administrative offices It was found that going through the Industry Associations helped get better response. | <ul style="list-style-type: none"> A Cover letter should be prepared for disseminating the survey purpose and for maintaining the confidentiality of responses Forwarding letter should be made arranged from the district industrial centres for requesting the establishment participation |
| Data entry and coding | <ul style="list-style-type: none"> Given the wide range of outcomes in EBFS, survey documentation was found to be challenging Survey data once captured had many errors and redundant, incomprehensible data. Prior training of the interviewer and recording of the interview with permission from the interviewer helped reduce incomprehensibility | <ul style="list-style-type: none"> A suitable coding procedure should be devised for labelling the survey outcomes during the field data collection effort |
| Response Rates | <ul style="list-style-type: none"> The number of refusals and sample loses were recorded in an effort to understand the magnitude of non- response | <ul style="list-style-type: none"> A Pilot survey should be conducted so as to estimate the required number of sampling units needed to be collected from the population |

4.5.5 Data processing – data stratification, addressing non response

Sample stratification needs categorizing survey response using the ISIC categories and further separating the food products and perishables. It is important to check against the %sample in survey with % in sector. AEL for EP (using the DIC database) helps in checking the sample mean with population mean and thus will help in extrapolation of survey findings to the whole freight sector.

Sample loss is an important aspect to deal with in EBFS survey. The sample loss (14-20%) in the sampling frame is an aspect to deal with early in survey design. Further the average response rate in Indian cities is noted to be 22% to 30% only on account of non-cooperation (68%) and incomplete surveys (2%).

The variation across sectors is noted to vary as much as 265 sample collection for 100 responses in mineral sector as compared to 650 sample for 100 responses in machinery sector in Indian context.

The non-response needs to be statistically addressed in the analysis. However, consistent non-cooperation can be detrimental in long term and this needs to be addressed based on the targeted incentive schemes to arrest trends and will also ensure validity of responses.

Further Delphi techniques and FGD can help in creating synergies with stakeholder groups.

4.5.6 Recommendations to increase the effectiveness of survey –

Taking coherence with the available literature the following strategies are found to be efficient to increase the response rates in face to face interviews.

Figure 19: Strategies found to increase the response rate in face to face interview



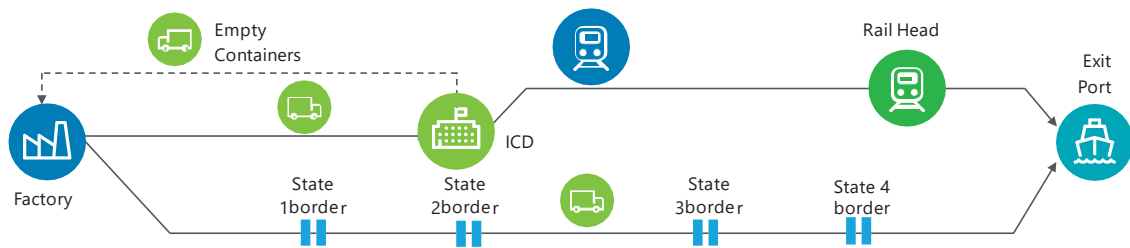
- Prior appointment with the contact person at the managerial position should be confirmed. In brief the survey purpose should be discussed with the concerned person so as to facilitate the respondent to be well prepared with the relevant details including shipment/tonnage diaries.
- Questionnaire should be concise, as it has been observed the attentiveness and interest of the respondents often drops after a series of questions.
- It has been observed that the respondents/establishments are affirmative towards the govt. departments and administrative offices. Hence, a covering letter should be made arranged from the administrative departments, industrial associations. Covering letter should also include details such as the survey purpose and can be used to assure the respondents about the confidentiality of the data.
- Moreover, it has been observed that the respondents often fail to understand the terminologies and intent behind a few questions. The questionnaire framed should be direct and simple, the sequencing of the questions should be such that it keeps the respondents engaged.

4.6 Map current urban commodity value chain

It is important to capture data on top 10 commodities moving in the cities. Source of this information would largely be stakeholder discussions who will talk about their specific commodities and explain the entire value chain of commodities.

Capturing of the value chain of top commodities helps in understanding the nature of movement of commodities. A typical value chain²³ of commodity can look like as shown in the figure below:

Figure 20: Typical value chain of a commodity



For example: in Nagpur large proportion of rice come from the north eastern region around Chhattisgarh. And moves directly toward the container terminal for exports. Container terminal is towards the south of the city thereby increasing traffic within the city or on the ring road.

Therefore, mapping these value chains will help planners understand the challenges specific to commodities moving in the city.

Further **commodity composition** plays an important role in defining the needs for logistics infrastructure. For example, there is a very large movement of cotton in the three months when it is produced in and around Nagpur. Cotton doesn't have a very specialized warehousing requirement. A well-ventilated covered shed would be enough for the its requirement. Plus, it is a seasonal commodity moving in high volume. Therefore, planning for storage facilities for this commodity has to be on low value land in the city.

Commodity specific specialized requirements is another category of information that is usually captured through stakeholder discussions. For examples wheat in Madhya Pradesh is often stored in Silos (large drum like structures) while Rice can only be stored in bags not Silos. Storing rice in silos causes breakage and caking at the surface leading to damage of the product. Such specialized understanding will also help in planning for logistics infrastructure both nodes and network.

4.7 Challenges and solutions into a Logistics Plan

The most important aspect of the strategy basket is to help the city understand the various options to tackle the problems faced and select the appropriate strategy in city. City authorities /agencies as a preliminary

²³ Source: 2018 & 2019. MoCI. LEADS - Logistics Ease Across States

discussion can set off the options with relevant stakeholder (both public and private) and gauge interest and support.

SUTP toolkit²⁴ draws upon popular urban freight management strategies from international practices. Further best practices are compiled by GIZ²⁵, Rocky Mountain Institute (RMI)²⁶ and several others. CoE-SUFS also developed a tool to assist cities internationally choose appropriate alternatives for intervention.

This study has adapted from various international tools and developed a comprehensive catalogue of 26 critical measures suitable in Indian context. Based on these, the following section simplifies the catalogue to include the practices that have high probable transferability to the ‘production plus’, ‘production – consumption balanced’ or ‘consumption plus’ cities.

Table 6: 'Strategy basket' for different type of cities to develop solution alternatives for various problems and challenges faced²⁷

| Solutions | Category A city (Production plus) | Category B city (Production consumption balance) | Category C city (Consumption plus) | Checks or considerations |
|--|---|---|---|---|
| Land use policy | | | | |
| Integrating Freight into land-use | Ensuring adequate perspective for freight and planning | Balanced perspective, resources and priorities to freight | Securing land use for future, Balance freight and passenger | <ul style="list-style-type: none"> Private sector engagement Engage and coordinate with public agencies |
| Regional plan | | | To address the dependencies of smaller towns cities around | <ul style="list-style-type: none"> Locational issues Desired size, capacity, and connectivity Lead agency Resources needed to operate the project |
| City development plan | Addressing comprehensive analysis of problems and solutions | Addressing comprehensive analysis of problems and solutions | Addressing comprehensive analysis of problems and solutions | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project Engage and coordinate with public agencies |

²⁴ Source: MoHUA, 2017. Toolkit on Environmental Analysis – Strategic Environmental Assessment and Environmental Impact Assessment.

²⁵ Source: GIZ, 2016. Urban Freight and Logistics: The State of Practices in India.

²⁶ Source: MoHUA & Rocky Mountain Institute, 2019. Efficient Urban Freight: Best Case Practices.

²⁷ Source: structure and clustering adapted from CoE SUFS toolkit and collection of best practices.

| | | | | |
|---|---|--|--|--|
| Old city and core area reforms | Whole city has focus and dependency on it | Old city and core have road safety issues, congestion in wholesale markets | Most complex to delink wholesale, freight from core city areas | <ul style="list-style-type: none"> • Enough right-of-way available • Other projects required to fully complete the project |
| Demand Management | | | | |
| CMP and CTTS | | Integrated planning of passenger and freight | Integrated planning of passenger and freight | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project • Engage and coordinate with public agencies |
| Modal shift | | Congestion and pollution issues | Congestion and pollution issues | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project • Engage and coordinate with public agencies |
| Traffic governance through UMTA and UTF | | | Governance and funding gaps | <ul style="list-style-type: none"> • Lead agency • Engage and coordinate with public agencies |
| Cargo consolidation centers | | | At each district or wards gaps in freight distribution | <ul style="list-style-type: none"> • Private sector engagement • Engage and coordinate with public agencies |
| ITES | | | | |
| Real time information management | | Quick information and variable charging | Quick information and variable charging | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project • Risk of the technology/project becoming obsolete |
| Artificial intelligence and fuzzy logic | | | Complex interaction needs modelling | |
| Custom IT solutions | | | | |

| Last mile deliveries | | | | |
|---|---|---|---|--|
| Staggered or dedicated slotting | Congestion and delay in freight delivery | Congestion and delay in freight delivery | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Private sector engagement |
| Training and awareness | | | | <ul style="list-style-type: none"> Private sector engagement |
| Alternate choice for last mile delivery | | | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Desired size, capacity, and connectivity Resources needed to operate the project |
| Infrastructure management | | | | |
| Ring road development | | Through traffic bypass | Congestion and delay in freight delivery | <ul style="list-style-type: none"> Enough right-of-way available Locational issues |
| Upgradation of existing infrastructure | Congestion, pollution, loading offloading | Congestion, pollution, loading offloading | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> Enough right-of-way available Desired size, capacity, and connectivity |
| Cluster development | | Hub for Aggregation of freight | Hub for Aggregation of freight | <ul style="list-style-type: none"> Lead agency Resources needed to operate the project |
| Building bye-laws | Norms for controlled development | Norms for controlled development | Norms for controlled development | |
| Dedicated freight parking and loading zones | | | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> Enough right-of-way available Locational issues <p>Desired size, capacity, and connectivity</p> |
| Parking management | | | | |

| | | | | |
|--|--|--|--|--|
| <p>Loading and parking restrictions</p> | | <p>Congestion, pollution, loading offloading cause passenger inconvenience</p> | <p>Congestion, pollution, loading offloading cause passenger inconvenience</p> | <ul style="list-style-type: none"> • Enough right-of-way available • Desired size, capacity, and connectivity |
| <p>Parking reservation system</p> | | | <p>Congestion, pollution, loading offloading</p> | <ul style="list-style-type: none"> • Desired size, capacity, and connectivity |
| <p>Shared parking</p> | | | <p>Congestion, pollution, loading offloading</p> | <ul style="list-style-type: none"> • Policy/project be mandatory or voluntary • Locational issues • Desired size, capacity, and connectivity |
| <p>Dedicated parking</p> | | | <p>Congestion, pollution, loading offloading</p> | <ul style="list-style-type: none"> • Locational issues • Desired size, capacity, and connectivity |
| <p>Vehicle initiatives</p> | <p>Pollution, safety</p> | <p>Pollution, safety</p> | <p>Pollution, Safety</p> | <ul style="list-style-type: none"> • Incentive for participation (or penalties for not) • Lead agency |
| <p>Traffic management</p> | <p>Congestion, pollution, safety, incentive, penalty</p> | <p>Congestion, pollution, safety, incentive, penalty</p> | <p>Congestion, pollution, safety, incentive, penalty</p> | <ul style="list-style-type: none"> • Enough right-of-way available • Desired size, capacity, and connectivity |
| <p>Financial incentives</p> | | | <p>Incentive, Penalty, Business margins, Impacts, and Saving.</p> | <ul style="list-style-type: none"> • Lead agency • Private sector engagement • Engage and coordinate with public agencies • Policy/project be mandatory or voluntary • Incentive for participation (or penalties for not) |

4.7.1 Public Sector Initiatives

The comprehensive strategy basket covers array of interventions such as policies, programs, and projects. An example of a policy could be to give delivery trucks preferential access to curb space in commercial areas; an example of a program might be an ongoing effort to incentivize carriers to purchase electric trucks; and an example of a project could be an intersection redesign effort. Selecting the appropriate combination is of great importance.

The matrix (of strategy basket) takes care of the issues such as geographic scope of the challenge and strategy to address the root cause (s) and its more apparent manifestations. This strategy basket can point city authorities in the right direction however, detailed planning and option evaluation exercise alone can help estimate costs and benefits (discussed in next section). An assessment of the trade-offs inherent in the allocation of scarce resources, are only possible through a formal planning and stakeholder participation process.

These measures were classified into 25 groups and summarized with planning and land use related initiatives at one end and infrastructure and traffic related initiatives at the other end. The measures also were tied to the active participation of the main stakeholders involved in the freight issue to be addressed.

The planning for urban freight management does not take place in isolation. The most successful way to initiate the change is to engage all stakeholders for developing consensus-based strategies. Such a process of engagement has to be collaborative and in partnership.

The whole set of interventions require many stakeholders and agencies to play their part for robust coordination to obtain the desired outputs. Such tasks also include extensive stakeholder outreach and respective agency coordination. It also entails tedious data collection/ information gathering exercises along with detailed assessment and analysis. Such as different planning exercises that includes managing NMT like bicycle, or Cycle Rickshaw Trolley (CRT) for freight while also managing the safety and security for inclusive and equitable employments.

Informing and initiating more structural and long-term initiatives such as -

- Land use policies
- Freight demand management strategies

And in more short and medium terms, the 7 groups of urban freight initiatives are -

- ITES
- Last mile delivery
- Infrastructure management
- Parking management
- Vehicle initiatives
- Traffic management
- Finance initiatives

4.7.2 Key Checks and considerations

Ideally, the city development plan or transportation policy therein shall seek for efficient freight movement. If freight consignments are delayed or unreliable, the economy accrues economic losses in the form of reduced economic output due to a lack of input materials, increased inventories to account for the unreliability of deliveries, and higher production costs due to inefficient or unreliable freight transport. All these get transferred to the consumers, in the end.

Public sector agencies need to be vigilant on following mentioned critical aspects for all kind of projects. After selecting the most appropriate initiative to solve a given issue or problem, additional checks need to be ensured for successful implementation. These checks are presented against each type of city and solution strategy to address planning, operations, stakeholder engagement, and risk management and integration in Table 1 described in previous section.

The list below covers issues to address key checks required in planning, operations, risk management and integration across all types of initiatives.

- **Project funding issues:** A fundamental consideration when designing and planning any policy/project is to identify the funding source(s).
- **Geographic scope of the project:** Describing the geographic scope of a project or policy will define the area that will be impacted by that project or policy. For example, some projects may have an impact several hundred miles away, whereas others are more localized.
- **Anticipated duration of the project/policy:** The lifespan or duration of a particular policy or project must be considered during the planning process. For example, if new infrastructure is built, how many years will it be expected to operate without needing major changes? Will a policy be in effect for a short, long, or indefinite time period? If the duration of a project or policy is indefinite, have provisions been planned for its periodic re-evaluation to ensure it is still applicable?
- **Target group and criteria for participation:** The project's target group must be clearly identified to focus project resources in the right direction and ensure that the proper impact is achieved. The target group could include receivers, carriers, drivers, communities, large or small companies, large traffic generators, and a specific industry sector, among other possibilities. Because different industry sectors are likely to exhibit different behavioral responses to public policy, it is important to be certain which group is being targeted. Identification of the target group occurs concurrently with establishment of the criteria for participation.
- **Permits required to initiate/complete the project:** It is necessary to include a list of all permits that are required to be processed before the initiation/completion of the project, along with any pertinent deadlines.
- **Stakeholders:** It is important to identify and engage the proper set of stakeholders for each project and policy. The stakeholders can be any combination of public agencies, private companies, communities, trade groups, individuals, academia, and policy makers.
- **Benefits to the community or pedestrians:** Although the first objective of these projects and policies is to address freight system issues, in some cases it is possible to design the projects or programs to benefit additional stakeholders and local communities. If so, such possibilities should be considered, as they will ease implementation.
- **Safety/security issues:** It is important to identify any safety or security concerns before project implementation. Identifying potential problems in the design phase will reduce costs and improve the safety of the overall system.

However, certain initiative requires specific checks or considerations and those are highlighted against them in the strategy basket. These checks support detailed assessments of each initiative's pros and cons, and decide on the most appropriate course of action. The relevant annexure details out the applicability context in the three type of cities context and how these can be identified, selected, and implemented to address freight-related problems in different cities in India.

4.8 City Action plan

An Action Plan that defines the recommended policies, programs, processes, and improvements to be conducted is one of the key products of the planning process. City action plan is proposed to be created on the lines of a management practices called Balanced Score Card method.

An action plan is a comprehensive list of Tasks and activities defined by their timelines, dependencies, task owner and KPI for follow-up. Preparing an action plan has following steps:

1. **Detailing out the Tasks/projects.** Projects have to be detailed out with sub tasks and activities, that are to be undertaken in order to implement the solution: Each solution identified would require certain task to be completed before the solution can be implemented. Here the planners would have to detail out the list of each task, any sub-tasks and activities that would ultimately have to be completed to implement the solution.
2. **Defining the timelines and dependencies** with other tasks and activities. Each activity is associated with the time. Assessing and defining a range of time in which the tasks and activities have to be defined in the action plan.
3. **Short term, medium term and long-term division:** The set of solutions identified would then be divided into short term, medium term and long-term Tasks and activities. Short-term would generally be tasks that would be completed in a year, while long-term would-be tasks that would take around 5 years to complete. Long term tasks would usually be heavy capital-intensive solutions that would require time for raising capital and then long construction periods. Long term tasks could also include institutional and governance changes that would require changes in the working cultures of organizations.
4. **Detailing out the funding requirement with possible sources:** A base case cost has to be estimated for each task/project. This could be based on thumb rules so as to get an estimate. Detailed costs can be worked out when detailed reports and investigations are conducted. The tasks will have to be identified and funding sources would need to be identified. Funding sources could include government grants, convergence with government programs, bonds, Private funding through PPP etc.
5. **Identifying the owner of the solution and supporting actors:** Owner of the solution here refers to the person or designation in the organization that will take the responsibility of implementing the solution. Identifying an owner is important to ensure that the projects are finally implemented and seen through to its completion. This also ensures that someone is answerable to the results of the implementation process.
6. **Define KPIs for follow-up activities:** It is important to define measurable outcomes, which can at the end reveal the success of the project.

4.8.1 Pilot Testing and Implementation

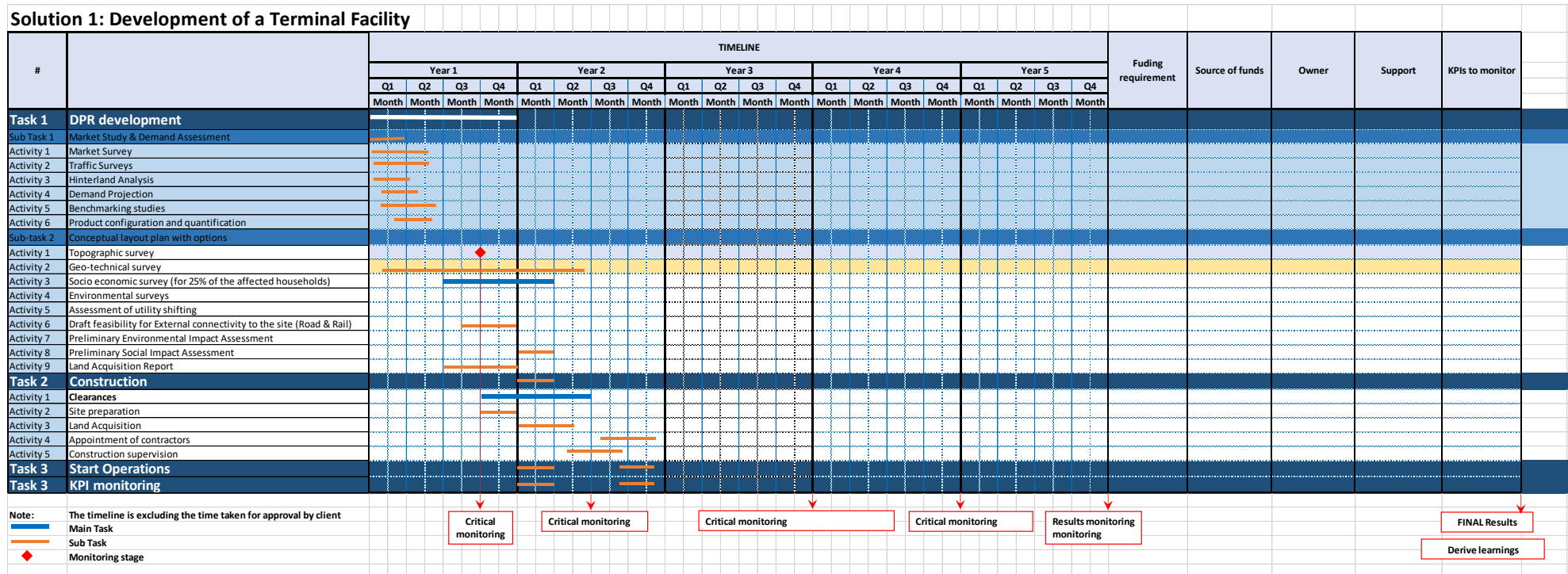
Pilot testing, particularly in urban freight management, could play a key role in demonstrating to the private sector that the public sector is interested in: proceeding carefully with the implementation of new ideas, assessing the real-life impacts of potential initiatives, and implementing only those that successfully pass the pilot tests. Pilot tests provide an opportunity for all stakeholders to find out more about an initiative and mechanism so that they can decide whether to (a) move ahead with a full implementation phase or (b) stop. To fulfill that role, however, pilot tests need to be properly designed; a poorly designed pilot could lead to either a false success (a bad idea that performs well in the pilot), or a false failure (a good idea that does not perform well in the pilot).

4.8.2 Follow-up: Reassessment and Modification

Planning is a process that should be continuous, given that issues and challenges in any region continually change. Planners need to continually revisit and reassess freight strategies—both those recommended and those in place—to determine what is working and what may need to be adjusted to successfully improve the performance of the freight transportation system. In urban freight, it is important

Follow-up conveys to the private sector that the public sector is interested in careful consideration of the impacts of their initiatives. Also, it is said that “success breeds success.” Being able to demonstrate the success of freight initiatives that have been recommended and implemented helps build support for future initiatives. If properly conducted, follow-up and reassessment foster an environment in which public and private-sector involvement is ongoing; then proactive freight planning can prosper.

City action plan be built in readily available software such a Microsoft projects or even in Simple spreadsheet software would do. A typical Action plan for each solution will look like as shown in the image below:

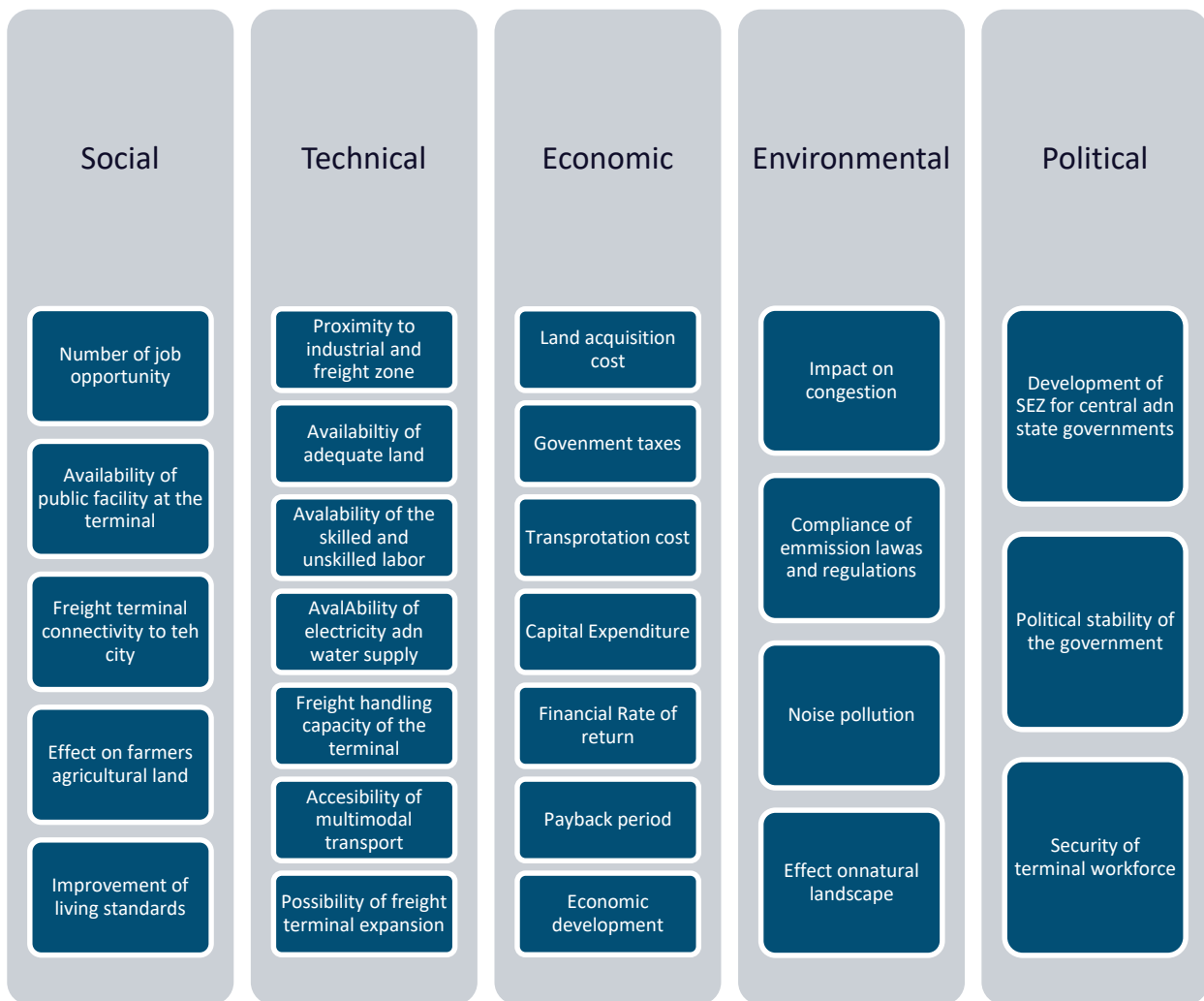


4.9 KPI for impact evaluation and feedback

4.9.1 Suggested STEEP framework²⁸

It is proposed that STEEP framework is used for evaluating the impact of City Action Plan. Following figure depicts a comprehensive list of indicators that should be measured at end implementation of the action plan.

Figure 21: Suggested STEEP Framework



4.9.2 Definition of Performance Measures

Performance measures (PMs) are an important aspect of the planning and decision-making process and are central to gauging the degree to which goals and objectives are achieved. During the planning stage, PMs are used to screen and select a preferred solution from among the possible alternatives. Once a solution has been implemented, PMs provide a method to evaluate the level of success that was attained in achieving intended goals.

²⁸ Kyler, 2003. Assessing Your External Environment: STEEP Analysis.

This implementation guideline refers to measuring performance, by measuring specific outcomes of interventions taken. These could range from a modeling result to more tangible data points such as safety, parking, use of alternative fuels, or reliability of freight movement /delivery.

PMs can be defined in numerous ways, but practice shows that they work best when they are:

1. directly related to a single objective;
2. easily quantifiable;
3. able to gauge the entire range of levels of achievement (a PM that is defined as a continuous variable is better than one that takes only two values, like “achieved” or “not achieved”).

4.9.3 Stakeholder outreach and agency coordination:

Different stakeholders are likely to have different ideas about what PMs should be used, and how to measure them. For example, the delivery costs paid by receivers may be a good metric to measure the objective of “increasing the competitiveness of downtown.” However, freight carriers may argue that delivery costs do not account for the full cost of a delivery given that carriers, typically, absorb parking fines and tolls due to the competitive pressures of the market.

Respecting the confidential nature of commercially sensitive data is crucial. Many useful PMs—such as the full cost of delivery just mentioned—could require the use of data that carriers may refuse to share, such as driver wages, indirect costs, and fringe benefits. Engaging private-sector associations and trade groups could enable the public sector to create solid cost estimates for use as input to the PMs. Gaining stakeholder support in the process of defining the PMs, and securing the corresponding input data, are essential.

4.9.4 Data collection:

PMs are by definition quantitative, and thus require data on the existing or base conditions and/or, in the case of planning efforts, estimates of their future values. Producing such estimates requires the use of planning models and/or simulations. It is suggested that freight planning staff work closely with the modelers at the MPO/state DOT to ensure that the available models can produce the desired PMs. If the models are not capable of providing the necessary PMs, either the PMs must be redefined to suit what the models can provide, or the models must be modified to provide the desired PMs. Careful consideration is needed to determine whether adjusting the PMs or adjusting the models will yield the most applicable and useful data.

Freight PMs may require data from all modes of transportation, and may include analysis of safety, mobility, system conditions, pavement conditions, travel times, congestion, accessibility, parking, or environmental conditions related to freight movements.

Freight data availability often is an issue in defining PMs. Engaging stakeholders in the definition of PMs and, at the same time, securing their support to get the necessary input data, can mitigate the data availability issue considerably.

4.9.5 Assessment and analysis

PMs are used at several steps in the management and planning processes, such as to assess the base case conditions surrounding a freight issue, and to compare the results of the assessment to conditions in other jurisdictions. Such comparisons provide context to PMs that may otherwise be difficult to interpret.

PM analyses must account for such important factors as the variability of the input data used; the time it takes to collect the data and update the PMs; and the sensitivity (or lack thereof) of the PM to changes in the input variables. For example, PMs that use highly variable data (e.g., travel times), need to be analyzed

with caution to ensure the robustness of the results. A PM that relies on data collected every 2 or 3 years will fail to capture rapidly changing conditions, whereas a PM that is too sensitive, or too insensitive, may be difficult to analyze. All of these factors need to be taken into account. Adjustments may be needed to the definitions of the PMs and the necessary input data to ensure that the PMs adequately fulfill their roles.

5 Adopting the Framework in Faridabad

This chapter applies the framework described in chapter 4 to plan for Urban freight in Faridabad. The analysis relies on secondary data taken from CMP Faridabad report. CMP for Faridabad is under draft stage and is being prepared by UMTC.

Study area of CMP Faridabad covers the area proposed in the Final Development Plan 2031 of Faridabad which is 364.47 Sq. Km. The total area considered in CMP includes – Municipal Corporation of Faridabad (208 Sq. Km), Tilpat (Census Town), Piala (Census Town) and 64 surrounding villages.

5.1 Categorization of Faridabad based on the framework

As mentioned in the framework the city is categorized into Production plus or consumptions plus or production consumption balance cities based on its population size, economy and regional settings.

Each of these characteristics of the city are described in this section.

5.1.1 City Size and Population

The population of the city is concentrated within the municipal boundary. As per Census of India 2011 data, population of Municipal Corporation of Faridabad (MCF) was 14.14 lakh spread over 204 sq. km.

Table 7: Population of Faridabad²⁹

| Year | Population | % Growth Rate |
|------|------------|---------------------|
| 1951 | 37,393 | |
| 1961 | 59,039 | 57.89 |
| 1971 | 1,22,817 | 108.03 |
| 1981 | 3,30,864 | 169.40 |
| 1991 | 6,17,717 | 86.70 |
| 2001 | 10,62,307 | 71.97 |
| 2011 | 16,21,293 | 52.60 |
| 2019 | 22,74,659 | 50.40 |
| 2021 | 24,38,000 | ³⁰ 50.40 |

The Faridabad Development Plan projects Faridabad population to be 22.74 Lakhs in 2019. Hence, the city falls under the medium sized cities based on the framework proposed.

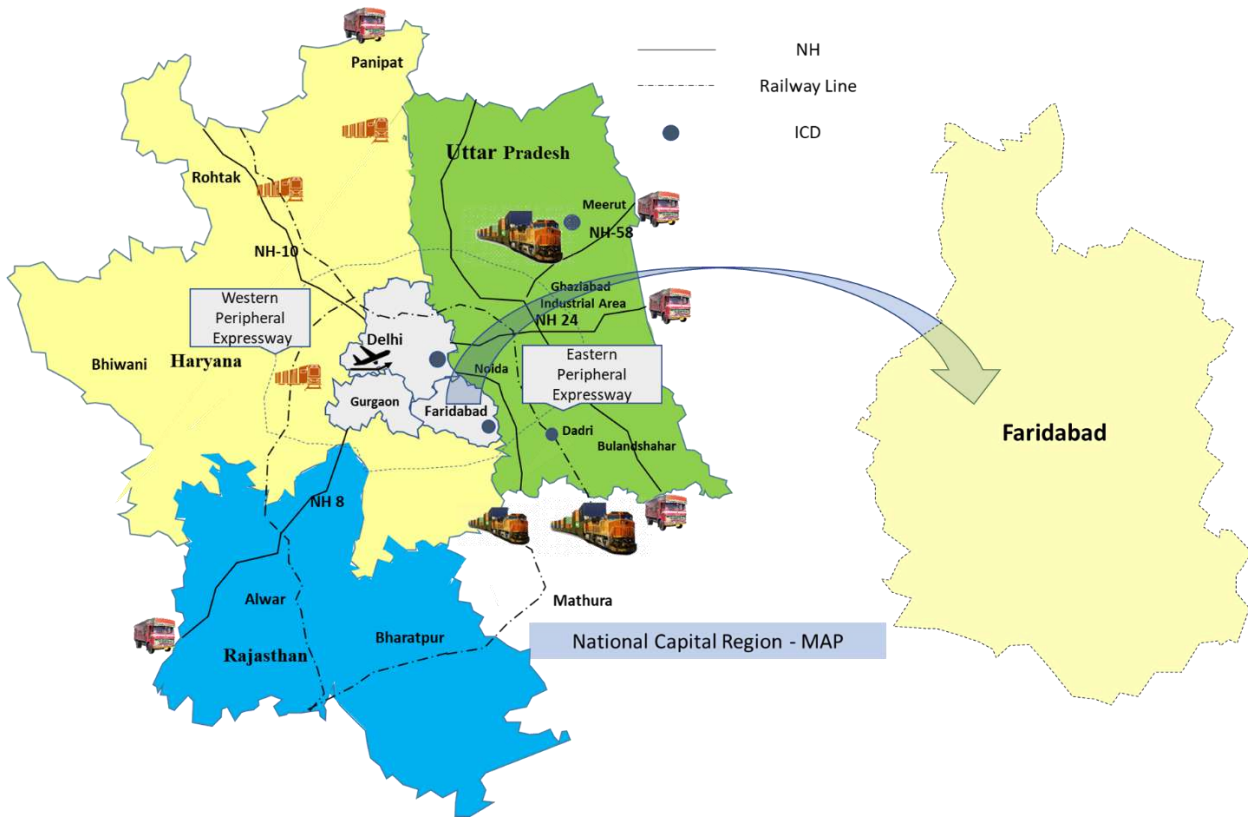
²⁹ Source: Census of India

³⁰ Source: Faridabad Development Plan

5.1.2 Regional Context and Location

Faridabad falls within the **National Capital region (NCR)** which covers a total area of about 55,083 Sq. Kms.

Figure 22: Map of Faridabad in the regional setting



Having New Delhi at its core and few districts of Haryana, Uttar Pradesh and Rajasthan, NCR is a highly passenger and goods flow dominated region with increasing population and activity concentration. Some of the major districts apart from Faridabad falling within the National capital region are – National Capital Territory (Delhi) with a range of administrative offices, commercial centres, and Industrial hubs. Gurugram with widespread of commercial centres, MNC’s, and Industrial townships at the outskirts. Noida again being a major industrial and commercial centre and Ghaziabad.

Faridabad city is situated on the Delhi-Mathura National Highway No-44 (previously known as NH-2) at a distance of 32 km from Delhi. It is the largest city in the Haryana state and Its economy is mainly based on industrial, commercial activities.

Physical growth of Faridabad has been governed by the Mathura Road (now NH-44), since most of the industries are located along this National Highway. Growth of Faridabad has mostly been in a linear fashion (North-South), centered around Mathura Road. Also, with the development of New Industrial Township (NIT) at the western side of Faridabad has led to development of the land that lies in between Mathura Road and the Aravalli range.

5.1.3 Economic Structure

Faridabad is primarily an industrial town with large number of populations employed in the city’s industries. It is also one of largest industrial hubs of Haryana. The largest section of work force in Faridabad is engaged

in manufacturing and processing services while tertiary sector takes the second place but has engaged a substantial portion of work force. A very small portion of Faridabad's work force is engaged in primary activities i.e. cultivation, mining and quarrying.

5.1.3.1 Industrial Profile of Faridabad -

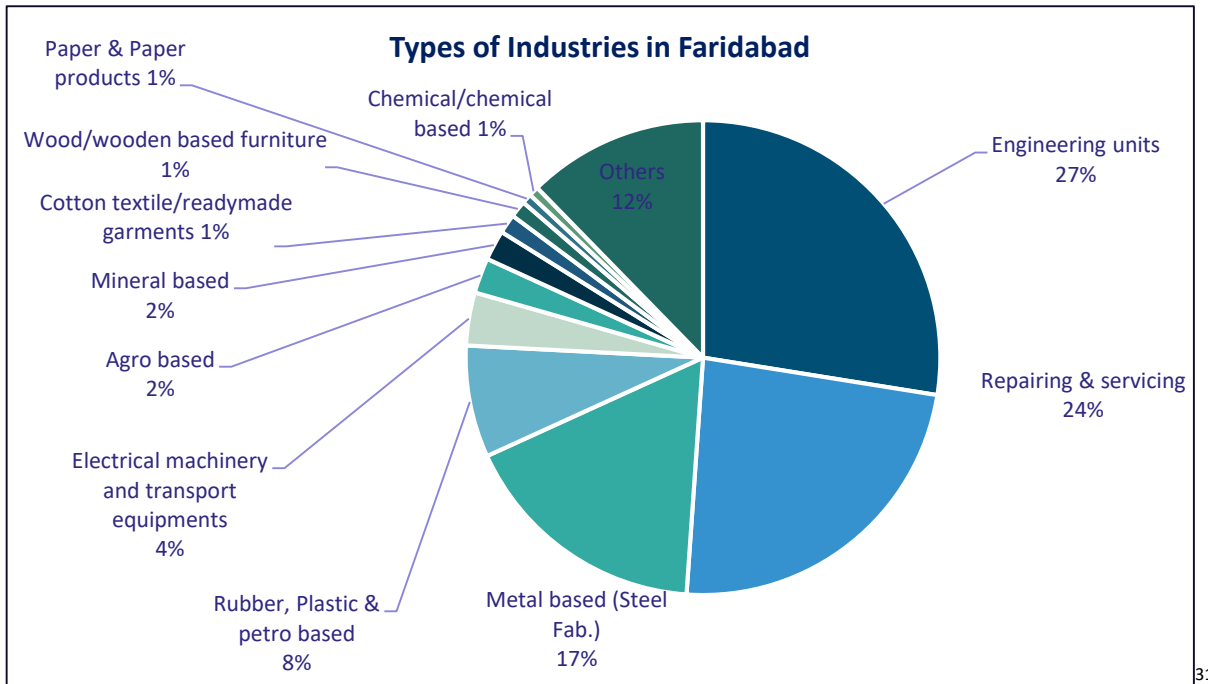
Faridabad is one of the major industrial districts in Haryana. Primarily due to its proximity to Delhi and its location on the Delhi Mathura Road. According to the Industrial profile of Faridabad there are around 18,756 industrial units in the district, about 20.42% of the total in the State. These factories employ an estimated number of 2,10,708 workers therein (about 23.33% of the total in the State). This implies that almost 45% of the total workers in Faridabad are employed in the factories. Major industrial product in the district are:

- Tractors,
- Steel re-rolling,
- Scientific instruments,
- Power looms,
- Agriculture implements,
- JCB cranes,
- Automobile,
- Boilers etc.
- Tractors,
- Switchgears,
- Refrigerators,
- Shoes,
- Tyres,
- Readymade garments,
- Construction machineries,
- Light engineering products.

Apart from this, the city is home to many international/ multinational companies which are operating in the Faridabad-Ballabhgarh belt.

Composition of Medium and small-scale industries in the district by type of industry is as given in the following chart:

Figure 23: Types of Industries in Faridabad



Large scale industries in Faridabad are:

1. Bata India Ltd.
2. Bhartia Cutler Hammer 14
3. Eicher Tractor Ltd.
4. Escorts JCB Ltd.
5. Escorts Ltd.
6. Escorts Yamaha Motors India Ltd.
7. GKN Invel Transmission Ltd.
8. Goodyear India Ltd.
9. Hindustan Wires Ltd.
10. Hyderabad Industries Ltd.
11. Hyderabad Industries Ltd.
12. Jindal Strips Ltd.
13. Lakhani India Ltd.
14. Nuchem Ltd.
15. Tecumseh India P. ltd.
16. Whirlpool India Ltd. etc.
17. National Hydroelectric Power Corporation Ltd., Faridabad, Haryana
18. National Handicapped Finance & Deveopment Corp, Faridabad, Haryana

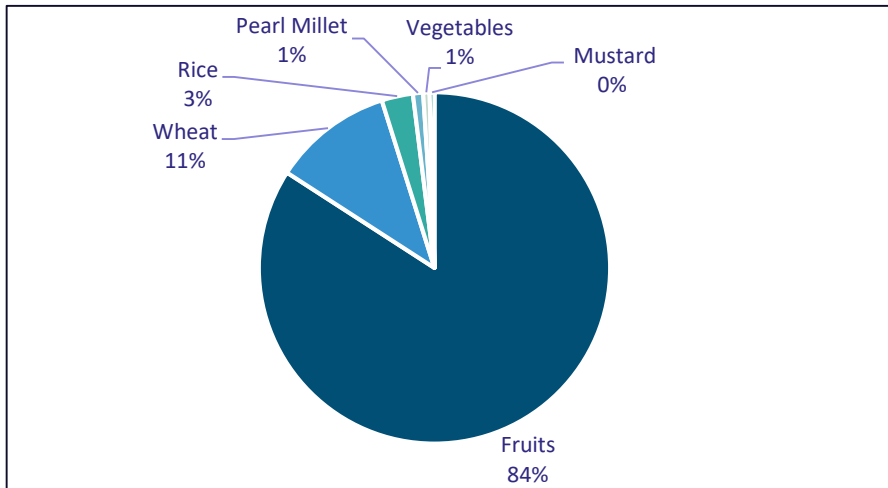
³¹ Source: District Industrial Profile.2017-18. Ministry of Micro, Small and Medium enterprises. <http://dcmsme.gov.in/dips/2016-17/DIP%20Faridabad.pdf>

19. Indian Oil Corporation Limited, R&D Centre, Faridabad, Haryana

5.1.3.2 Agricultural Profile of Faridabad

Faridabad is largely an industrial district. Major crops being grown in the district are wheat, rice, pearl millet, mustard, fruits and vegetables. Following chart shows the

Figure 24: Percentage of net sown area under each crop in in the year 2009³²



Faridabad is the largest exporter of henna (Mehndi) in India. According to the Faridabad Henna Manufacturing Association, the sale of henna from Faridabad is worth an estimated ₹250 crores–₹300 crores annually.

Faridabad is a major hub for food processing industry. It serves as the agricultural hub of value addition, storage and sorting / trading hub for agro-based products that include various grains and vegetables from agricultural belt of Haryana and U.P around. Delhi-Agra railway line.

As can be seen from the information above Faridabad does not have a large population involved in services sector. Plus, it is mid-size city. Therefore, it is a category A city i.e. production plus city.

5.2 Map freight infrastructure

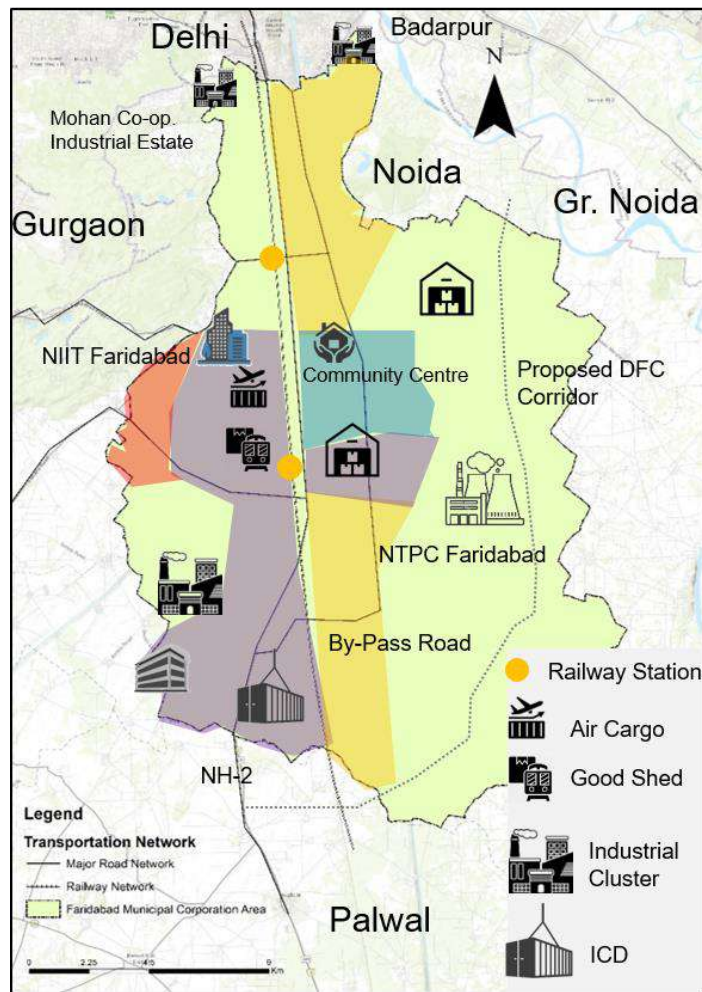
5.2.1 Urban Freight Generators

As per the CMP Faridabad, the major land-use within the municipal boundary of Faridabad includes - Residential area (43%), Industrial area (14%) and Commercial area (8%).

Major Industrial and Commercial area falls on the western side of National Highway -2. Major freight generating/attracting land-uses in Faridabad includes - Industrial Areas near (Sectors – 24, 25, 57, 58, 59), NIT Faridabad, Power Grid, Ballabgarh, DLF City, NTPC Faridabad Power Plant, Residential areas (Sectors - 15, 16 21), and Construction sites near Badarpur. Others include weekly hats, Mandi, retailer markets and shopping hubs, local shops, district court, community centers, hospitals and more.

³² Source: <http://agricoop.nic.in/sites/default/files/HAR7-Faridabad-%2030-06-2011.pdf>

Figure 25: Urban Freight Generators, Faridabad

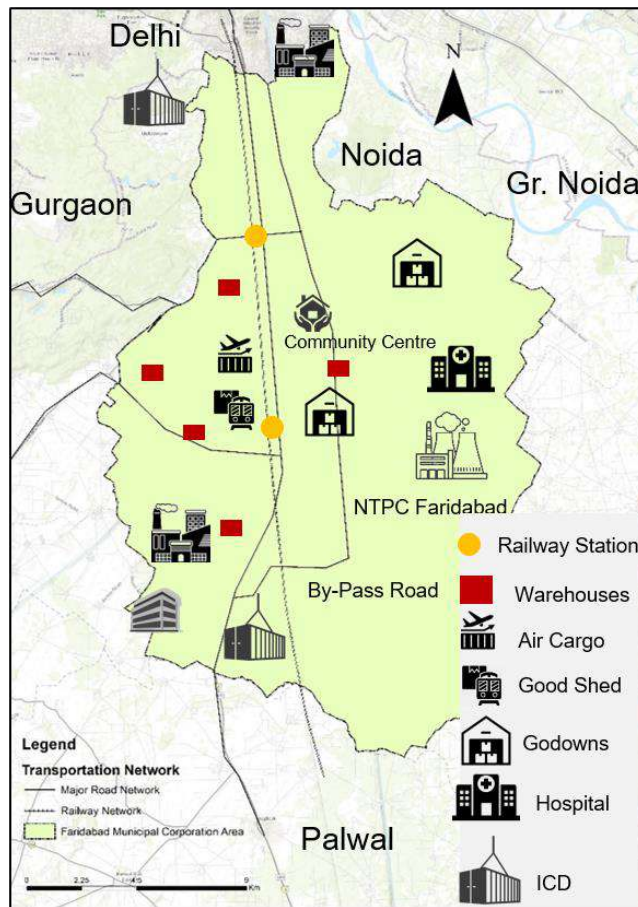


5.2.2 Storage and Distribution Facilities

Major Storage and Distribution facilities in Faridabad includes -

- Freight Terminal (Transport Nagar, Sector 59)
- Inland Container Depot (Sec. 59 Faridabad)
- Inland Container Depot (Tughlakabad) -Situated on southeast of Delhi, it is India's biggest dry port existing near Faridabad.
- Railways Station Godown
- Warehouses, Godowns near NIT Faridabad, Sector 59 and other industrial areas
- Cold Storages (Near NIT Faridabad)
- Air Cargo agents

Figure 26: Storage and Distribution facilities in Faridabad



Apart from the above mentioned operational infrastructural facilities, Faridabad Development Plan (2031), has proposed five areas as Freight Terminals/ Logistics areas.

5.2.3 Transport Infrastructure

Major Routes influencing freight movement in Faridabad includes –

- National Highway-44
- Faridabad main By-pass Road
- Railway line running parallel to NH-44
- Western and Eastern peripheral expressway
- Gurgaon-Faridabad Road

Access Routes in Faridabad carrying major road based freight includes -

- Sohna Road
- Badkal Road
- Rajiv Gandhi Marg
- Sahupura Road

Modes mainly used to move road based freight inside and through Faridabad includes -

- Light Commercial Vehicles

- 2-Axle Trucks
- Multi-Axle Vehicles
- Tractors/ Trailers
- NMT Modes – Rickshaws, Hand Carts

Moreover, the DFC Corridor aligned through Faridabad district would attract a lot of goods movement from within the city.

5.3 Identify stakeholders

| # | Stakeholder category | Representative list of stakeholders |
|----|---------------------------------------|---|
| 1. | Potential users of logistics facility | <p>Industries</p> <ul style="list-style-type: none"> • Bata India Limited • Bhartia Cutler Hammer • Eicher Tractor Limited • Escorts Ltd. • Indian Oil Corporation Limited, R&D Centre, Faridabad, Haryana • National Hydroelectric Power Corporation Ltd., Faridabad, Haryana • Whirlpool India Ltd. • Tecumseh India P. Ltd. • Jindal Strips Ltd. • Hindustan Wires Ltd. • National Handicapped Finance & Development Corp, Faridabad, Haryana • Castrol India Ltd. • JCB India Limited • NTPC Power Station <p>Freight Forwarders</p> <ul style="list-style-type: none"> • TCI FREIGHT • Sampark Global Logistics Private Limited • Gateway Rail Freight Limited • Satkar Logistics Pvt. Ltd • Aramex India Pvt. Ltd. • DHL Express (India) Pvt. Ltd • TNT India Private Limited • S.J. Cargo Movers • Fed Ex Express Services India Pvt. Ltd <p>3PL Logistics Players</p> <ul style="list-style-type: none"> • V-Express Faridabad • DHL Express India Pvt. Ltd. • Falcon Freight Link Pvt. Ltd. • Radiant 3PL Solutions India Private Limited • Safexpress <p>Trucking Companies</p> <ul style="list-style-type: none"> • Shri Balaji Logistics |

| | | |
|-----------|---|---|
| | | <ul style="list-style-type: none"> • Vijay Bharat Logistics • Professional Transport Company Services Faridabad • Interstate Transport Industries • North East Carrying Corporation Limited • Best ways Transport India Private Limited • Naveen Roadways • JNA Cargo Movers • Falcon Freight Link P Ltd • zyxel Logistics • Pal Freight Carriers • UP Haryana Freight Carrier Pvt. Ltd • Chc Logistics Pvt. Ltd • Shiv Shakti Freight Carriers • Jainco Freight Carriers • Om Logistics Limited • HP Freight Carolyn <p>Air Cargo Agents</p> <ul style="list-style-type: none"> • NCER Air Freight Pvt. Ltd. • Satkar Air Cargo Services Pvt..Ltd • JNA Cargo Movers • Falcon Freight Link P Ltd • Blue Bells Logistics • Uni Air Cargo Pvt. Ltd |
| <p>2.</p> | <p>Potential Investors in logistics facility</p> | <p>Terminal Logistics operators</p> <p>ICD</p> <ul style="list-style-type: none"> • Associated Container Terminals Limited <p>Railway Terminals</p> <ul style="list-style-type: none"> • Railways Good Shed <p>Warehouse</p> <ul style="list-style-type: none"> • KACS PALWAL (Kailash Agro Cold Storage) • Ambuja Cement Ltd • Uniclear Logistics Pvt. Ltd. • Apeejay Global Logistics Park • Biba Apparels • Nitesh Group of Companies <p>Real Estate Developers</p> <ul style="list-style-type: none"> • Omaxe Group • Vision one Faridabad • Gaur Real Estate Group • SRS Group • Ansal Group • Eros Group • Mahindra Life Spaces |

| | | |
|----|---|--|
| | | <ul style="list-style-type: none"> • CGHS Group • RPS Group |
| 3. | Governments, regulatory, modal authorities and other agencies | <ul style="list-style-type: none"> • Central Government – • State government <p>Modal Authorities/Operators</p> <p>Industry Associations</p> <p>There are around 10 local Industry Associations in Faridabad, out of which 7 are geography specific and 3 are industry specific.</p> |

5.4 Stakeholder Interactions

There are many key challenges that have been highlighted by the stakeholders. These are depicted in the chart below:



5.5 Traffic and Commodity Survey

5.5.1 Freight survey coverage

For the present study no primary survey was conducted and this analysis and results predicted in the section depends on the primary survey data collected for the preparation of CMP Faridabad.

Primary survey data referred from CMP Faridabad mainly includes -

- Classified Volume Counts (13- Screen Line locations) - Total 900 Road Side (O-D) Interview were done at 13 different locations during the CMP Faridabad Survey, which were extrapolated for 24-hours movement using the corresponding expansion factors.

Following Information was collected during the RSI at the screen-line locations –

- Direction of Travel
- Origin TAZ & Destination TAZ
- Commodity Type – 14 Types
- Commodity Quantity
- Empty Trips
- Type of mode – LCV, Truck 2-Axle, MAV and Tractors
- Model Year
- Mileage of vehicles
- Parking Locations

Survey results

Using the RSI interview data, a sample for 58 zones was generated which included the mode-wise freight trips attracted/generated and the type and amount of freight attracted/generated.

Apart from the survey data, other information used from the CMP Faridabad for carrying out analysis includes

- Digitized TAZ Map - Including 176 zones
- Land-use Data for all 176 zones
- Population and Employment for all 176 zones

5.5.2 Traffic projections

Using the sample data of 58 zones, freight Demand model was formulated. Multiple correlations were tried keeping trips (generated/attracted) as the dependent variable and the socio-economic variables as independent variables. It was observed that the correlation between the trips generated with all possible combination of independent variables was significantly poor, hence, in the present analysis only the trip attraction model was formulated.

It should also, be noted the trip attracted model was formulated for only I-I Trips of 58 sample zones. The predicted values for 169 zones were later summed with the sample E-I Trips for all zones.

5.5.2.1 Attraction Model

The sample attracted trips data for 58 zones were correlated with the zone-wise Socio-Economic variables (Residential area, Commercial area, Industrial area, Public/Semi-Public area, Agricultural area, Population and Employment). Multiple Correlations were tried using different combinations, and the attracted trips were found to be significantly correlated with Industrial area and Population.

- Zero Intercept Regression Model

$$Y=F(X)$$

$$F(X) = \beta_1 X + \beta_2 X^2$$

Table 8: Regression Statistics

| Regression Statistics | |
|--------------------------|------------|
| Multiple R | 0.70598211 |
| R Square | 0.49841073 |
| Adjusted R Square | 0.47159664 |

This type of model had also been used by CRR (MegaLog, 2018) in their analysis for predicting freight trips in Delhi. Significance of this model is that if the independent variables have a value equal to zero, the freight trips attracted to that zone would also be negligible.

The model developed -

$$\text{Attracted Trips (Per day)} = 1.40215 * \text{Industrial Area} + 0.016312 * \text{Population}$$

As discussed, the model formulated took only I-I Sample trips of 58 zones, hence, trip attracted per day predicted for all 169 zones were later summed with the sample E-I Trips for all zones.

Table 9: Regression Results

| Intercept | Coefficient | Standard Error | t-statistics | p-value |
|-------------------------|-------------|----------------|--------------|-----------|
| Industrial | 1.40215 | 0.676612532 | 2.072309 | 0.042852 |
| Population(2019) | 0.0163118 | 0.002649705 | 6.156083 | 8.46E(-8) |

5.5.2.2 Classified Predicted Attraction Counts (2019 & 2031)

Table 10: Sample Results for Classified Attraction Counts

| TAZ No. | Population | Industrial | Attractions | LCV | Truck (2-Axle) | MAV | Tractor |
|----------|------------|------------|-------------|---------|----------------|--------|---------|
| 1 | 23114.0 | 24264.0 | 1583.2 | 1123.35 | 0.00 | 285.17 | 174.70 |
| 2 | 24669.0 | 29877.0 | 795.1 | 413.40 | 254.28 | 0.00 | 127.43 |
| 3 | 26334.0 | 121.0 | 429.6 | 225.48 | 23.10 | 68.90 | 112.08 |
| 4 | 28854.0 | 3154.0 | 788.0 | 413.62 | 42.38 | 126.39 | 205.60 |
| 5 | 22977.0 | 152.0 | 860.6 | 451.76 | 46.29 | 138.04 | 224.56 |
| 6 | 32035.0 | 110.0 | 522.6 | 274.29 | 28.11 | 83.81 | 136.34 |
| 7 | 11480.0 | 42.0 | 252.3 | 252.29 | 0.00 | 0.00 | 0.00 |

Total Predicted Attractions (2019) for 169 internal zones (E-I and I-I) = **53,363 per day**.

Using the predicted attracted trips classified counts for different freight vehicles (LCV, 2-Axle Trucks, Multi-Axle Axle Trucks and Tractors) were estimated.

To estimate the zone wise classified goods vehicle volume, the modal share for each surveyed 58 zone (CMP, Faridabad) was applied to its adjoining zones, which was used to calculate the mode-wise attracted trips for all 169 zones.

Predicted Attraction Counts (2031)

Using the forecasted population of 2031 and forecasted Industrial area for each TAZ, the attracted trips were predicted for 2031, **84,591/day**.

5.5.3 Commodity composition and value chain

Commodity movement in terms of quantum carried and flow directions in a city can be ideally captured through establishment based surveys, which is an intensive process in nature. Given the limited time frame for the study, commodity wise movement analysis was carried out using the data obtained through road side interview (RSI) for goods vehicles conducted during the Faridabad CMP study (2019). The RSI surveys conducted captured all types of trip flow: external-external, external-internal, internal-external as well as internal-internal. The data captured included attraction & generations in quantity for different types of commodities for 60 zones and 50 zones respectively.

Table 11: List of primary commodities captured in the survey

| Code | Category | Commodity Type |
|------|-------------------------|--|
| 1 | Food Items | Vegetable/Fruit/Milk/Fish |
| 2 | Food Items | Food Grains(Rice/Wheat/Jowar etc.) |
| 3 | Construction Materials | Sand/Brick/Cement/Steel/Aggregate |
| 4 | Petroleum products | Petrol/Diesel/Gas/LPG |
| 5 | Consumer Goods | Forest Products(Wood/Rubber etc.) |
| 6 | Textiles | Textiles |
| 7 | Others | Container |
| 8 | Industrial Goods | Iron Coils /Sheets |
| 9 | Consumer Goods | Consumer Goods |
| 10 | Industrial Goods | Industrial Goods(Alloy/Machine etc.) |
| 11 | Chemicals & Fertilizers | Chemicals & Fertilizers |
| 12 | Food Items | Turmeric Products |
| 13 | Others | Others(Paper/Plastic/Cable Wire, etc.) |

For Mapping the average percentage of quantity of different type of commodities, these TAZ'S were grouped based on their locations into 7 broad groups –

1. North Zone

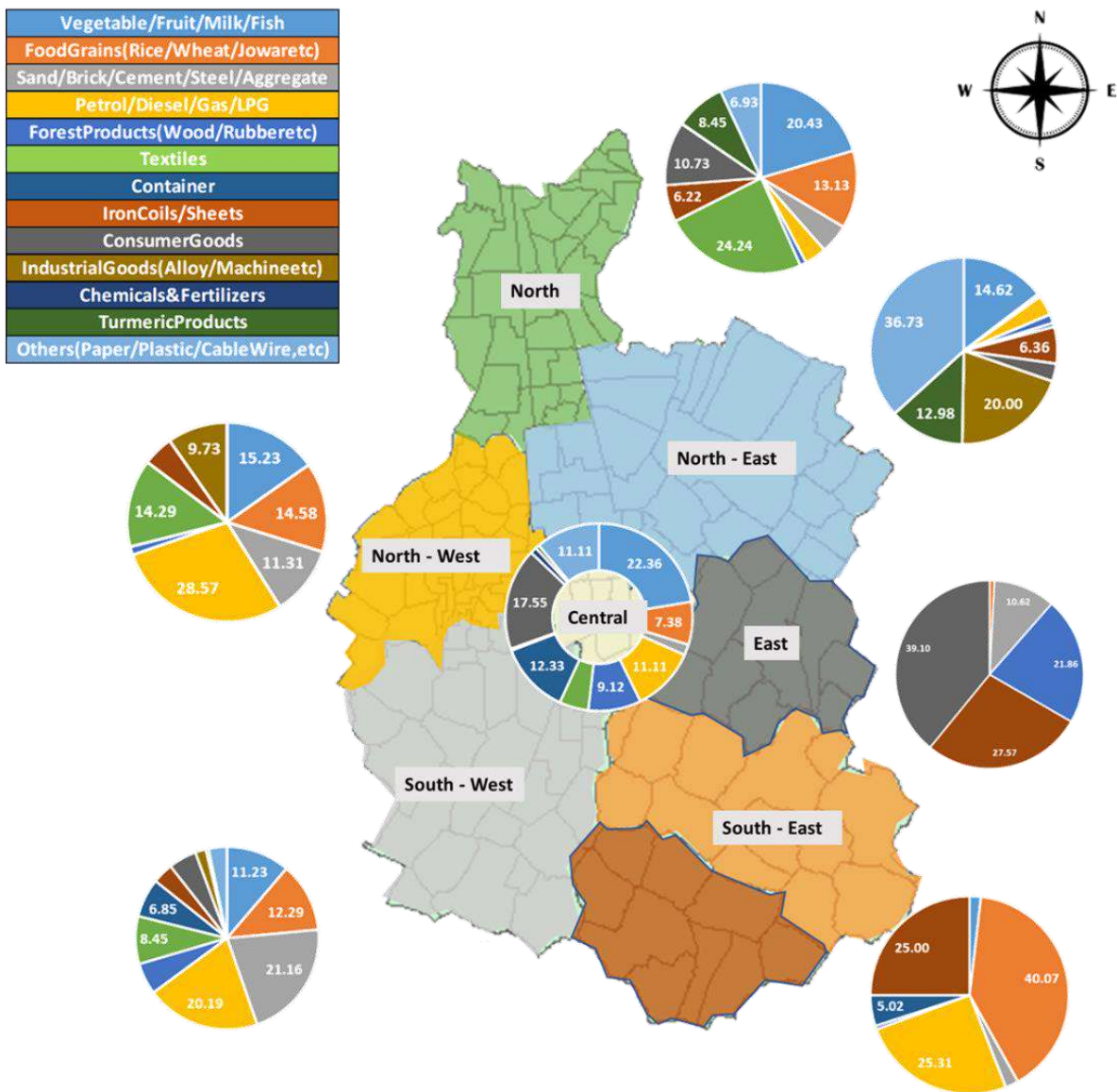
2. North West Zone
3. North East Zone
4. East Zone
5. South West Zone
6. Central Zone
7. South East Zone.

5.5.3.1 Attracted Commodities

Major type of commodities attracted in different parts of Faridabad were found to be as follows -

- **North Zone** – Textiles, Vegetable/Fruit/Milk and Food Grains
- **North West Zone** – Petroleum Goods, Vegetable/Fruit/Milk
- **North East Zone** – Paper/Plastic/Cable Wire, Vegetable/Fruit/Milk
- **East Zone** – Consumer Goods, Industrial Goods, Forest Products
- **South West Zone** – Construction Items, Petroleum goods
- **Central Zone** – Mix of all Goods
- **South East Zone** – Industrial goods, Petroleum goods, Iron Coils/Sheets

Figure 27: Major type of commodities attracted in different parts of Faridabad

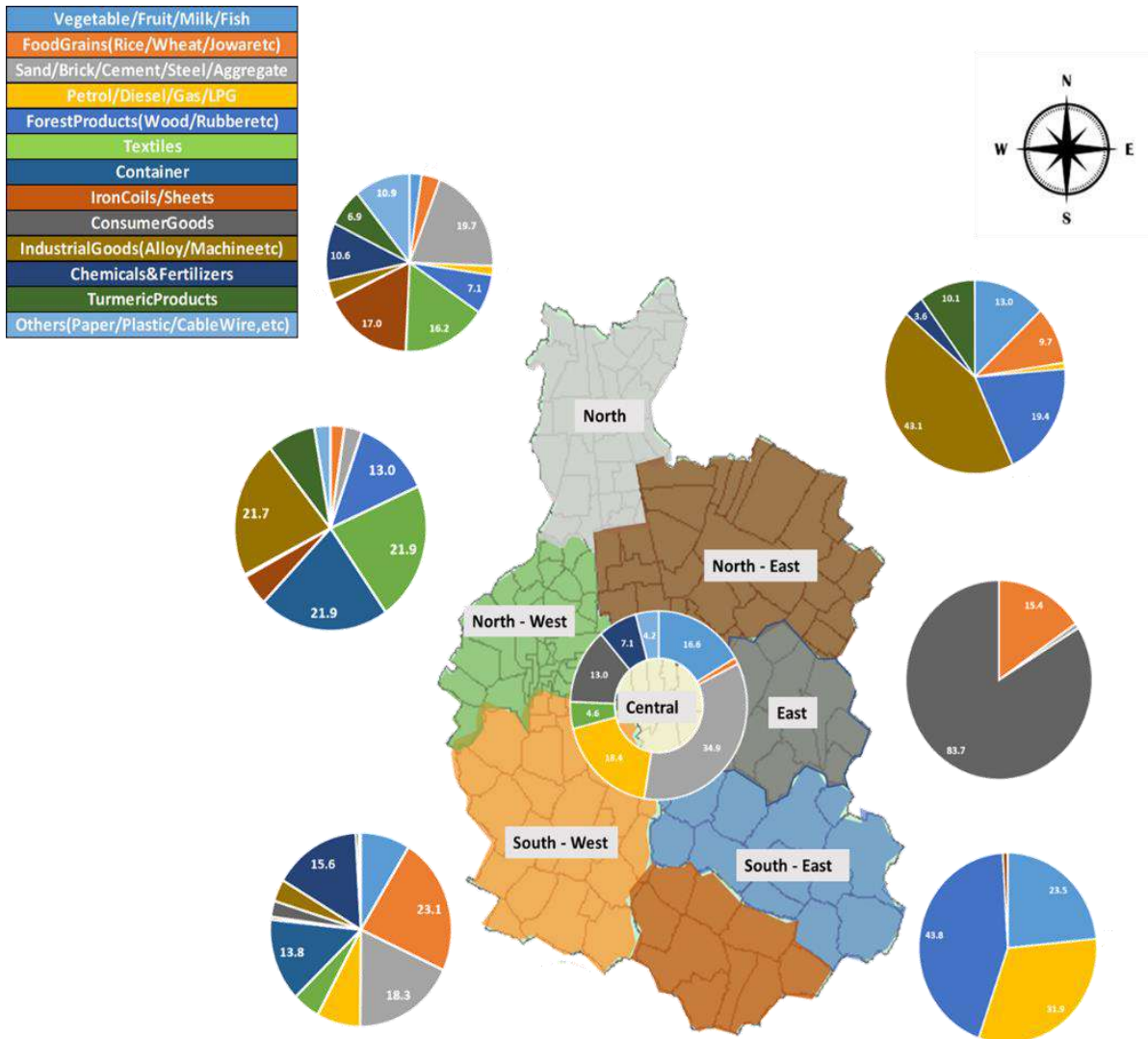


5.5.3.2 Generated Commodities

Major type of commodities generated in different parts of Faridabad were found to be as follows -

- **North Zone** – Construction materials, Iron Coils & Sheets and Textile goods etc.
- **North West Zone** – Textile goods, Industrial goods, Containers etc.
- **North East Zone** – Industrial goods, Vegetables, Food Grains
- **East Zone** – Consumer Goods, Food Grains
- **South West Zone** – Construction materials, containers & forest grains
- **Central Zone** – Mix of all Goods
- **South East Zone** – Forest Goods, Petroleum goods

Figure 28: Major type of commodities generated in different parts of Faridabad



5.5.4 Challenges and Solutions Map

Faridabad is one of the most industrialized cities of Haryana. As mentioned earlier there are many manufacturing as well as retail market bases scattered across city leading to considerable freight movement along certain roads within the city.

Faridabad with its growing economy also has growing freight movement for both within and regional freight traffic. Some of the key challenges that have been highlighted by stakeholders and that have been found in after the traffic and commodity analysis are:

5.5.4.1 Congestion on major entry points of the city

NH-44 has become a major arterial road of Faridabad as the city has grown on both sides of the highway. The railways line too passes through the city right along the National highway. There are many storage and distribution facilities such as - godowns, warehouses, railway goods shed etc. are scattered along the national highway and the railway line.

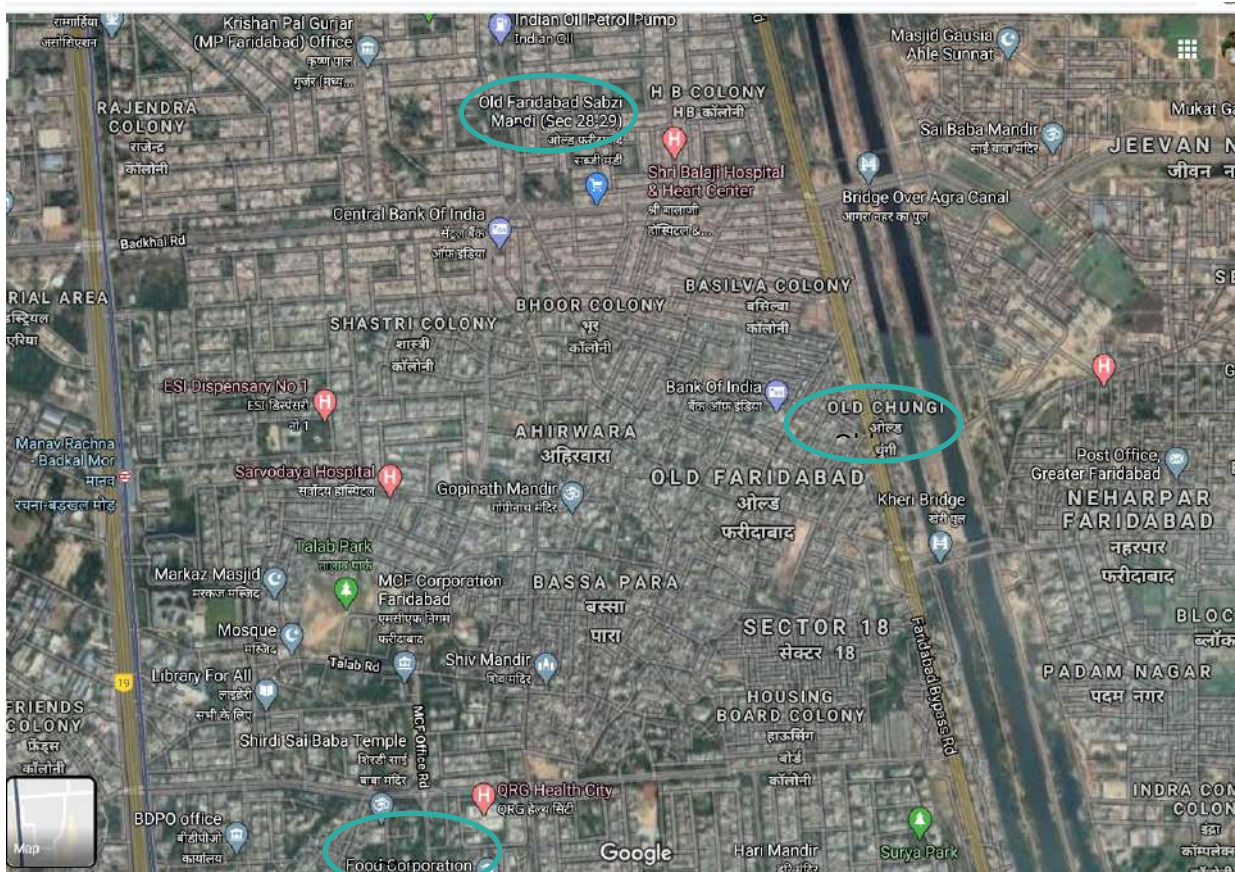
Heavy traffic on the highway causes congestion at both the ends where the highway inters the city limits. trucks are parked on the highways curbs near the various road side dhabas, eateries all along the highway.

Solution – Integrated Multi modal logistics park facility

Both Agro based and manufacturing based business to be shifted to concentrated hubs Multi modal logistics parks with integrated facilities for all kind of freight operations and all stakeholders such as truck parking, lodging and boarding facilities for truck operators, office space for freight forwarders etc. The analysis of freight flows and spatial preferences from stakeholders shall be able to guide the appropriate locations and available land parcel.

5.5.4.2 Congested old / core city areas

Old Faridabad starts from the old Sabji Mandi, Ahirwada, and extends through Bassa Para. There is an FCI storage near MCG corporation road in Sector 16. Old city area is home to cottage industries related to utensil malting, pottery, carpentry, mehndi grinding and manufacturing glass bangles. Anaz mandi and vegetable mandis are also located within the old city leading to heavy traffic of trucks. This part of the city generated significant freight traffic due to the presence of FCI godowns and other cottage industries.



Solution: Shifting of certain facilities to create loading unloading space for wholesale markets

Some of the facilities such as the FCI warehouses and ‘Anaj Mandis’ can be shifted to an outer location while the space vacated can be used to create facilities such as parking for the wholesale market.

As mentioned in the report many time urban freight strategies involve proposing shifting of the wholesale markets, cottage industries to a new location outside the city. However, most of the time there is significant opposition from the local traders and industries. often such strategies remain proposals on paper and are

never implemented. Therefore, it is proposed in this framework, that only those facilities that are not directly linked to larger economic activity of an area to be shifted out.

5.5.4.3 *Lack of Loading unloading spaces in the Industrial areas*

Due to its proximity to Delhi and the basic industrial infrastructure provided by the government, there has been rapid industrial developed in the planned industrial zone as well as the old Faridabad and Ballabgarh. Industrial development in Faridabad, paradoxically, is in the peripheral sectors i.e. Hodal and Palwal. This partially sorts the problem of freight traffic for the industrial hub in Faridabad and through traffic that is bound to Delhi or Agra/Gwalior (on the NH 44). However, truck parking space, loading off-loading space is grossly inadequate for the freight traffic produced by the factories in the industrial estate and around it on the NH-44.

Solution – Integrated Multi modal logistics park facility

It is important the MMLP is planned near the industrial area and the highway such that it caters to the needs of both the industries and the truckers.

5.5.4.4 *Poor quality of trucks and services*

Trucking industry in India is highly disaggregated. It is characterized by cut throat competition given the large number of single or small fleet truck owners. As market rates tend to fluctuate there is an incentive to drive and earn more. This leads to practices such as overloading, over speeding, not taking required breaks, violating the regulatory provisions etc. Further, the driving hours often violate the Motor Transport Workers Act.

Given the structure of the freight transport industry, most of the trucking companies/owners (being small – approximately 80%) do not focus much on service quality. The competition is cost based rather than service based; this considerably affects the consumer experience but tends to remain low key or even ignored in the transport operator's purview.

Solution: Incentives and disincentive structures to promote annual maintenance of trucks

This is a larger and complex problem requiring action at the central and state level. Incentives and disincentive structures should be designed to promote better maintenance of freight vehicles.

5.5.4.5 *Growing services sector and hence the ecommerce freight*

For a long time, Faridabad was the industrial hub of Haryana, defined by factories, warehouses and industrial estates. In last few years it has grown to include residential estates, modern schools and high-end hospitals, malls, corporate offices and other such benchmarks of 21st century urban growth.

Owing to expanding economy and its proximity to National Capital, many businesses and corporate houses too made it their head-quarters. This further gave impetus to its secondary and tertiary sector related economy and population. With it grew the consumptions needs in the city and it gradually became the consumption plus city hosting a population of 1.6 million today and a density of 2,421/km² (6,270/sq mi).

However, urban expansion has many issues in the linear city of Faridabad such as growing e-commerce for deliveries to the door step. This has become a major concern in the city with many trips catering to last mile small deliveries.

Solution: Use of EV vehicles for last mile small deliveries and place small freight consolidation centers all across the city

It is important to place small freight consolidation centers, all across the city, especially where dense populations are residing, for freight loading /unloading, sorting and reconsolidation of freight for both offices and residential land use.

Strategies need to be put in place for promoting use of e-vehicles for delivery of small packages across the city.

5.5.4.6 Poor public transport connectivity for worker population to both industrial or freight infrastructure

One of the unintended developments of the rapid industrial developments without plans for worker accommodation or transportation of worker population, is growth of slums. Faridabad also faces the same problem. There has been a growth of slums across Faridabad worker population travels to the industrial areas for work. There is lack of proper public transport to facilitate their movement to and from the industrial or freight infrastructure.

Solution: Development of rental housing for workers

5.5.4.7 Freight traffic is a significant contributor to air and noise pollution in the city

The major cause of air pollution in Faridabad is the discharge from automobiles. large number of industry related vehicles ply on Faridabad roads and pass through the city on the National highway.

There is a lack of organized and cheap public transport in Faridabad available to worker population. Often the worker population use the shared auto and other IPTs operated by private individuals. There is a new city bus service however its use has not become widespread.

Solution: development of NMT and EV IPTs for worker transportation

5.6 Faridabad City Action Plan and KPIs

Faridabad’s Solution map based on the framework is as presented below:

Table 12: Faridabad solution map

| Solutions | FARIDABAD Category A city (production Plus cities) | Checks or Key Considerations |
|--|---|--|
| MMLP | Addressing comprehensive analysis of problems and solutions | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project • Engage and coordinate with public agencies |
| Old city and core area reforms | Old city and core has road safety issues, congestion in wholesale markets | <ul style="list-style-type: none"> • Enough right-of-way available • Other projects required to fully complete the project |
| CDP, CMP and CTTS | Integrated planning of passenger and freight | <ul style="list-style-type: none"> • Lead agency • Resources needed to operate the project • Engage and coordinate with public agencies |
| Alternate choice for last mile delivery | Congestion and delay in freight delivery | <ul style="list-style-type: none"> • Desired size, capacity, and connectivity • Resources needed to operate the project |
| Dedicated freight parking and loading zones | Congestion, pollution, loading offloading | <ul style="list-style-type: none"> • Enough right-of-way available • Locational issues <p>Desired size, capacity, and connectivity</p> |
| Vehicle initiatives - EV/NMT | Pollution , safety | <ul style="list-style-type: none"> • Incentive for participation (or penalties for not) • Lead agency |

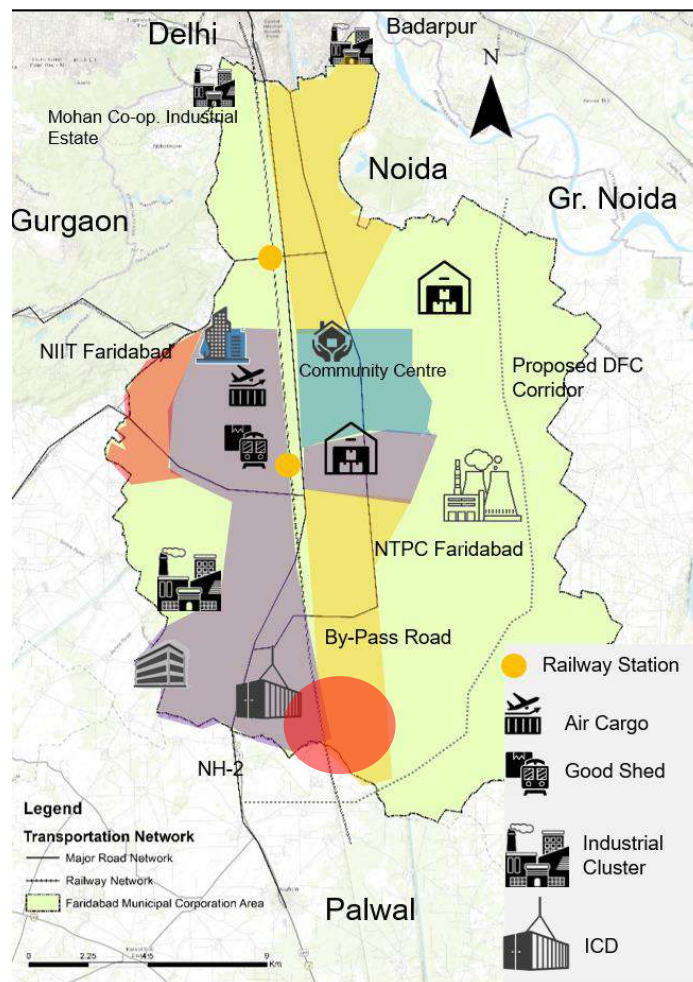
5.6.1 MMLP to cater to industries in Faridabad

Faridabad has some form of multi modal facilities such a railway goods shed or ICD but these do not offer integrated facilities. The concept of MMLP as proposed by NHA in its MMLP policy is to provide integrated facilities for all stakeholders - terminal operator, truckers, shippers, freight forwarders and workers.

Our starting point for this action plan is the four sites identified by the Faridabad development plan for such facility. This facility can be developed on a PPP basis. This would require detailed technical and financial analysis and a independent bid advisor.

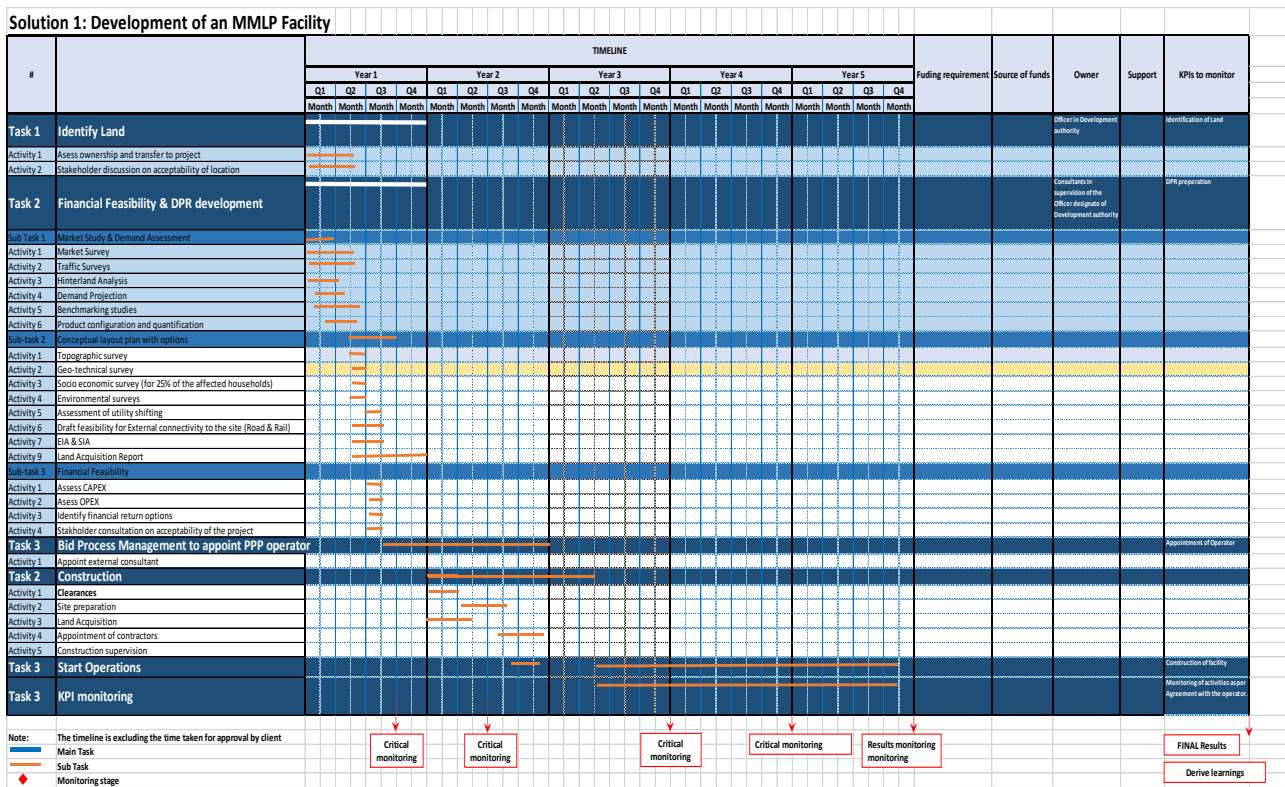
As per Faridabad Development Plan, 2031, five areas have been demarcated under transport land-use. Out of these 1 & 2 locations (refer below figure) are proposed sites for Transport Nagar. With the DFC corridor passing through the study area, and a proposed station in Faridabad, there is need of designated areas for temporarily housing the incoming and outgoing freight. Also, the land-use surrounding these transport land-use is primarily industrial in nature. This will attract lot of freight for transporting the finished products and raw materials from/to these sectors leading to the need of temporary parking zones & logistic hubs. The freight terminal is proposed near DFC corridor so that heavy vehicles coming to the city for loading and unloading could be parked during day time and if necessary smaller commercial vehicles could help for transition of the goods. It is proposed that these areas may be designated for use as freight terminals/logistics hubs after detailed demand analysis.

Figure 29: Proposed Location for MMLP in Faridabad



The action plan detailed out in the table below provides a step by step process for developing such an integrated facility.

5.6.1.1 Action Plan Development of MMLP



5.6.2 NMT and EV vehicles for last mile delivery

The last mile delivery is referred to the process of transporting products to the shelves of stores or the doorsteps of consumers themselves. It involves different driving patterns, different vehicles, and a different geography from long distance trucking. Hence its important to **study them in detail and collect data and insights through regular City Traffic and Transport Studies and adequately addressed through CMPs**. Key reason for separately discussing urban logistics and its vehicles is that despite it being a very short link in supply chains, it is a critically important component for three reasons.

- First, it is very high cost, for example, in e-commerce supply chains, the final mile accounts for approximately 53% of total logistics costs.
- Second, it is growing very rapidly due to accelerating urbanization, which increased from approximately 20% in early 2000's to 32% in 2019 and is projected to reach approximately 50% in next 20 years. The increased urbanization in Faridabad and shift to tertiary sector has led to an explosion of consumer demand, particularly in e-commerce /retail.
- Thirdly, it creates significant externalities such as congestion and air pollution in populous dense urban areas especially old city areas.

To maximize the amount of freight which can be delivered on an average tour, following inefficiency needs to be guarded –

Technical capacity of urban logistics operators - to optimize truck loads and delivery points in a tour, minimize total driving but also improve customer service. Since these operators are highly fragmented and relatively immature – Indian Postal Services or similar operational and technical consolidator – can be roped in to use adequate tools and bring operational expertise and network using efficient green modes. Banning

the last mile deliveries in the city by private operators individually (allowing freight consolidators only) shall bring in the economies of density required to dispatch delivery trucks for efficient urban tours.

Unorganized sector (nano-stores aka kirana shops) dominates the retail and provide employment to many small business owners, accounting for 60% of all goods deliveries in urban areas. The shippers are mostly multitude of brands and their wholesale hubs (shifted to outskirts owing to logistics sprawl). **UCC at the city level can consolidate deliveries** in this enormously complex and inefficient system that lowers the efficiency of goods delivery. Mega warehouse like facilities can be developed in the industrial zone or freight village as planned near the highway.

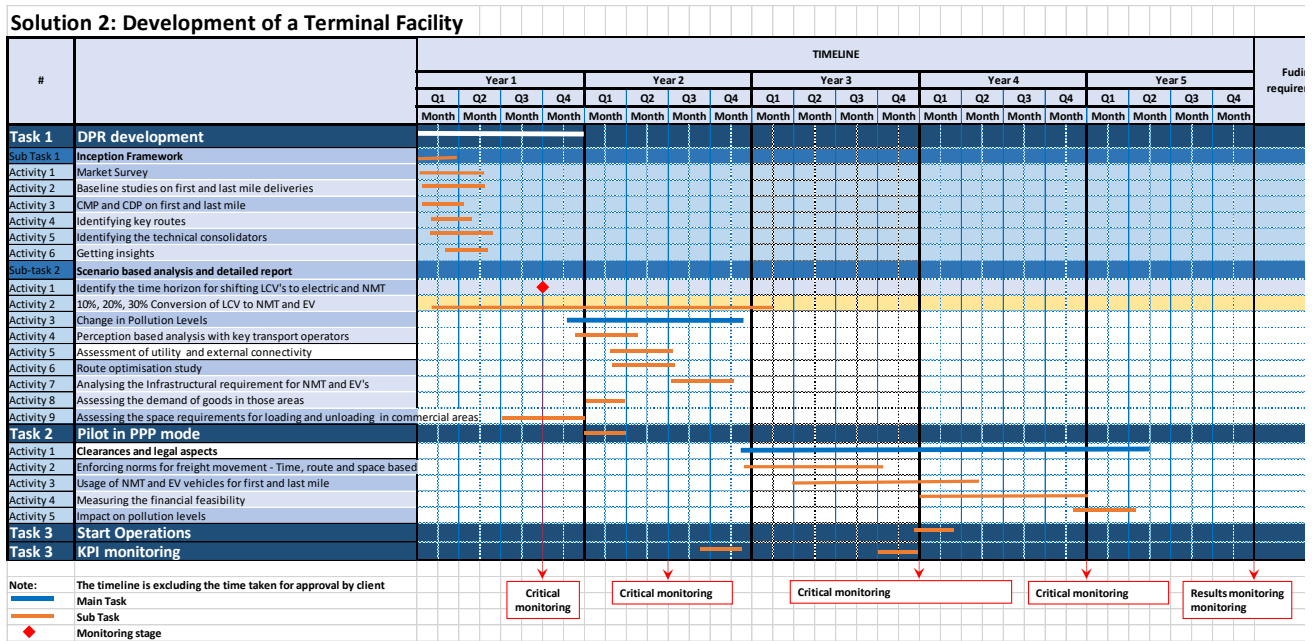
Identify and enforce norms around freight movement, e.g. dedicated freight routes (connecting logistics hotels /mini freight hubs) using the timing and zoning constraints shall help counter the traffic induced by logistics sprawl. It shall decrease the amount of congestion going into and out of cities and also decreases the amount of time needed to complete the tour, potentially increasing the amount of deliveries that can be accomplished in a single tour.

CDP/CMP of the city or appropriate state authorities shall issue a guideline to assist local bodies to develop **dedicated loading & unloading zones at key commercial areas**. These shall include a rough quantification of the needs for such spaces and a set of recommendations on time zones, for improving their utilization.

Effective **feeder network can be developed at zonal /ward level connecting warehouse hub with logistics hotels / mini freight hubs** using only NMT and EV connectivity for all urban deliveries: Such green vehicles have lower emissions, and can enter into narrow city lanes, and are noise less thus attracting no time restrictions. City authorities can use and employ Cycle Rickshaw Trolleys in old city areas especially where NMT lanes can be planned.

The regularly spaced logistics hotels /mini freight hubs along with optimally planned warehouses increases the uptake of **efficient non-motorized and or electrified two and three wheeled delivery vehicles**, as last mile delivery. However these currently lack an effective regulatory framework for commercial use –hence city can initially invest in developing pilots under PPP to regularize and formalize this sector.

5.6.2.1 Action Plan



5.6.3 Old city area reformation

Faridabad old city areas offers exciting opportunities of manmade heritage, while the outer city areas offer many natural landscapes and lakes. These two important elements can be interwoven with arts, crafts and other similar **tourism attracting cottage industries and establishments**. The city and areas around it, already boasts of several terracotta related households units and various ceramic making small establishments. Besides many garments and apparels and embroidery related production. Apparently the area is famous for its henna production from the agricultural sector. It is extremely popular as a temporary tattoo art amongst the tourists, especially foreigners.

Additionally the terracotta (Badhkal), colourful basketry and *mudha (low stools)* making from *sarkanda (natural long strong grass)* (Palwal) and bone carving along with metal jewellery (Hodal) are popular local traditional arts in the area. In the interest of **reviving the city with cleaner, tourism friendly (non-polluting) establishments**, these arts and artisan hubs are recommended to be promoted. Heritage walks and Ho- On Hop-Off (HOHO) like services connecting natural and manmade heritage utilizing environmental friendly modes is desired.

The polluting establishments along with wholesale and distribution hubs such as **old Sabji Mandi, IFC store cum godown can be easily shifted** to the industrial hub or other viable land parcels near the highway. Additionally, the **relocation of the wholesale business** dealing with grains, clothes and automobile parts and machinery etc. shall be towards the industrial hub near to highways. The location of warehouses need to be optimized to further minimize the interaction between commercial and passenger traffic, additional modes such as rail and waterways should be actively utilized. These warehouses should accordingly provide infrastructure for smooth transshipment of freight. Developing these large **shared warehouses can eventually serve as consolidation centers** amongst many / all businesses sorting and redistributing goods (spatially and temporally) for delivery in the city populous areas (thus reducing the trips and efforts).

Some of the space thus freed up in old city shall be developed as **logistics hotels /hubs** (protecting against the increasing land prices for logistics establishments and exchanges) to serve the storage, loading/off-loading space, parking of freight vehicles and as smaller consolidation and distribution area for the old city population and last mile deliveries. Well-planned, adequate multi-modal logistics and interchange facilities from limited larger vehicles to smaller EV or NMT shall be planned.

Other freed up spaces/land parcels can be used for the **cottage industries, flatted factories, and market or haats** to sell the finished products. Thus, attracting tourism related amenities and services (hotels, restaurants, and other hospitality centers) in the core city under reforms.

5.6.3.1 Action Plan

| Solution 3: Development of old city area | | TIMELINE | | | | | | | | | | | | | | | | | | | | Funding requirement | Source of funds | Owner | Support | KPIs to monitor | | |
|--|--|----------|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|---------------------|--|---|--|--|--|--|
| # | | Year 1 | | | | Year 2 | | | | Year 3 | | | | Year 4 | | | | Year 5 | | | | | | | | | | |
| | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | | | | | | | |
| | | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | Month | | | | | | | |
| Task 1 | Revitalizing the old city areas taken up by CDP for next phases of urban reforms. | | | | | | | | | | | | | | | | | | | | | | Urban planning department in Municipal Corporation | Urban Dev Authority, business and commercial net planning, utilities, schools, transport dept and fire dept | Officer in Development authority | | | |
| Sub Task 1 | Shifting out factories and warehouses; attracting pro-tourism units and traditional art units and cottage industries | | | | | | | | | | | | | | | | | | | | | | | Development authority and MIT | | | | |
| Activity 1 | Old city survey, traffic and landuse data collection | | | | | | | | | | | | | | | | | | | | | | | | planning and traffic dept | | | |
| Activity 2 | business establishments data on type, freight, building area used, streets used, open area, parking used etc | | | | | | | | | | | | | | | | | | | | | | | | business groups, public and private agencies | | | |
| Activity 3 | Stakeholder listings and FGD | | | | | | | | | | | | | | | | | | | | | | | | site survey | | | |
| Task 2 | Old Sabji Mandi, IFC store cum godown can be easily shifted | | | | | | | | | | | | | | | | | | | | | | | none wing of MIT | Business Development and DA | Consultants on supervision of the Officer in charge of Development authority | | |
| Activity 1 | development of relocation alternatives | | | | | | | | | | | | | | | | | | | | | | | | SEZ and Industrial estate: CEO | | | |
| Activity 2 | site identification and comparative analysis | | | | | | | | | | | | | | | | | | | | | | | | FGD, Qualitative interviews | | | |
| Activity 3 | warehousing, freight needs, value chain analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 4 | business margins and other aspects | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 5 | Stakeholder discussions and consensus building | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 6 | incentives and subsidies planning | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 7 | legal provisions and rules/regulations | | | | | | | | | | | | | | | | | | | | | | | Industrial estate CEO | stakeholder groups of business relocation | | | |
| Activity 8 | communications and monitoring protocols | | | | | | | | | | | | | | | | | | | | | | | transport planners | freight forwarders, SPL, etc. | | | |
| Task 3 | Large shared warehouses can eventually serve as consolidation centers | | | | | | | | | | | | | | | | | | | | | | | Industrial estate CEO | | Consultants on supervision of the Officer in charge of Development authority | | |
| Activity 1 | Infrastructure planning and funding provisions | | | | | | | | | | | | | | | | | | | | | | | planning dept and Industrial estate CEO | | | | |
| Activity 2 | identifying and designing the freight corridors | | | | | | | | | | | | | | | | | | | | | | | planning wing MC and DA | architects and urban designers in team or experts and consultants and academic institutions of relevance | | | |
| Activity 3 | phase wise shifting/relocation | | | | | | | | | | | | | | | | | | | | | | | planning wing MC and DA | architects and urban designers in team or experts and consultants and academic institutions of relevance | | | |
| Activity 4 | procuring land and changing land uses | | | | | | | | | | | | | | | | | | | | | | | consultant expert | survey and financial models | | | |
| Task 4 | old city area replanning | | | | | | | | | | | | | | | | | | | | | | | consultant expert | survey and financial models | | | |
| Activity 1 | planning, designing and building new uses such as haats, markets, flatted factories, in the space available and vacated by relocated land uses | | | | | | | | | | | | | | | | | | | | | | | planning wing MC and DA | business and public agencies | | | |
| Task 5 | logistics hotels /mini-hubs | | | | | | | | | | | | | | | | | | | | | | | logistics expert consultant | | | | |
| Activity 1 | identifying evenly located available or underutilized land parcels | | | | | | | | | | | | | | | | | | | | | | | swiss challenge mode | | | | |
| Activity 2 | site value analysis | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 3 | Feasibility and viability of logistics hotel | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 4 | Stakeholder discussion and consensus building | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 5 | planning and designing the logistics hotels | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activity 6 | PPP mode private party initiatives | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Task 6 | Start Operations | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Task 7 | KPI monitoring | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Note: The timeline is excluding the time taken for approval by client
 Main Task
 Sub Task
 Monitoring stage

Critical monitoring
 Critical monitoring
 Critical monitoring
 Results monitoring monitoring
 FINAL Results
 Derive learnings



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