EFFICIENT URBAN FREIGHT

POLICY FRAMEWORK

Smart City
MISSION TRANSFORM-NATION

सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India

ROCKY MOUNTAIN INSTITUTE

Ministry of Housing and Urban Affairs
Government of India

ABOUT MINISTRY OF HOUSING AND URBAN AFFAIRS (MoHUA)

The Ministry of Housing and Urban Affairs is the apex authority of Government of India to formulate policies, coordinate the activities of various central ministries, state governments and other nodal authorities and monitor programs related to issues of housing and urban affairs in the country. The Smart Cities Mission was launched by the Ministry in 2015 to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

ABOUT ROCKY MOUNTAIN INSTITUTE (RMI)

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing. RMI has been supporting India's mobility and energy transformation since 2016.

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Document outline

This document provides an introduction to urban freight with the dual purpose of positioning policymakers to reduce the costs of moving goods within a city while also mitigating negative consequences, which freight deliveries create for city livability. This document will introduce basic concepts and terminology, benefits of enhancing urban freight efficiency and an overview of urban freight policy landscape in India.

1.0 Importance

Urban freight is an essential part of an urban economy providing both urban residents and businesses with products they need on a daily basis. Everything from food for shops and restaurants, through e-commerce deliveries for urban residents, to the concrete and steel, which go into urban buildings and fixed assets collectively form the urban freight system. Ensuring that these goods reach businesses and consumers who need them reliably and at minimal cost is a fundamental requirement of a thriving urban economy. However, each one of these freight movements also generate vehicle travel that causes air pollution, congestion, traffic accidents and a host of other negative impacts on urban transportation systems. The fundamental objective of urban freight policy is to balance the competing objectives of delivering goods with minimum costs and maximum reliability and minimizing negative impacts on the urban fabric. If successfully implemented, sound urban logistics policies can support a dynamic urban economy while preserving a clean, healthy and safe urban environment with a smoothly functioning mobility system.

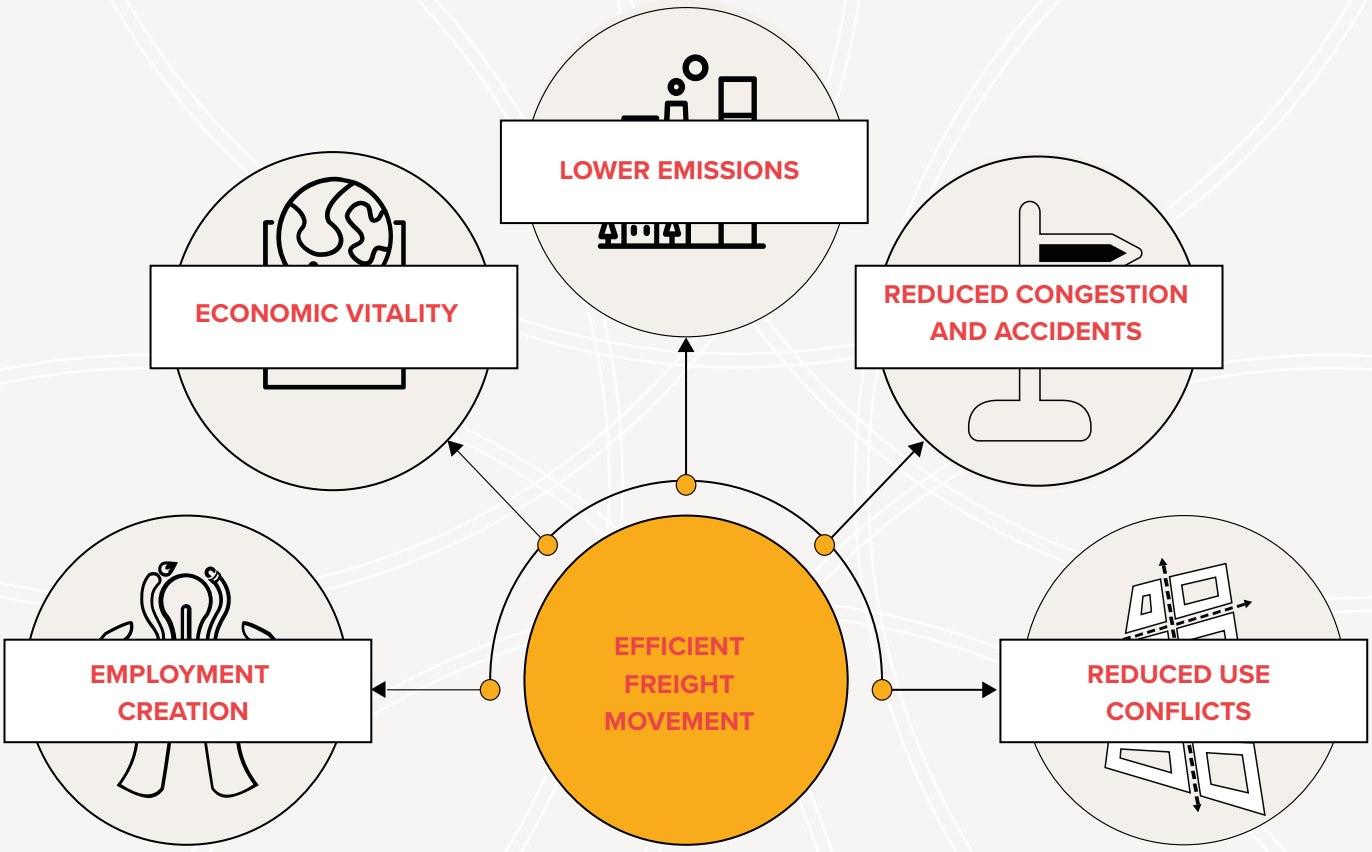


Figure 1: Efficient Freight Movement

1.1 Economic vitality and employment creation

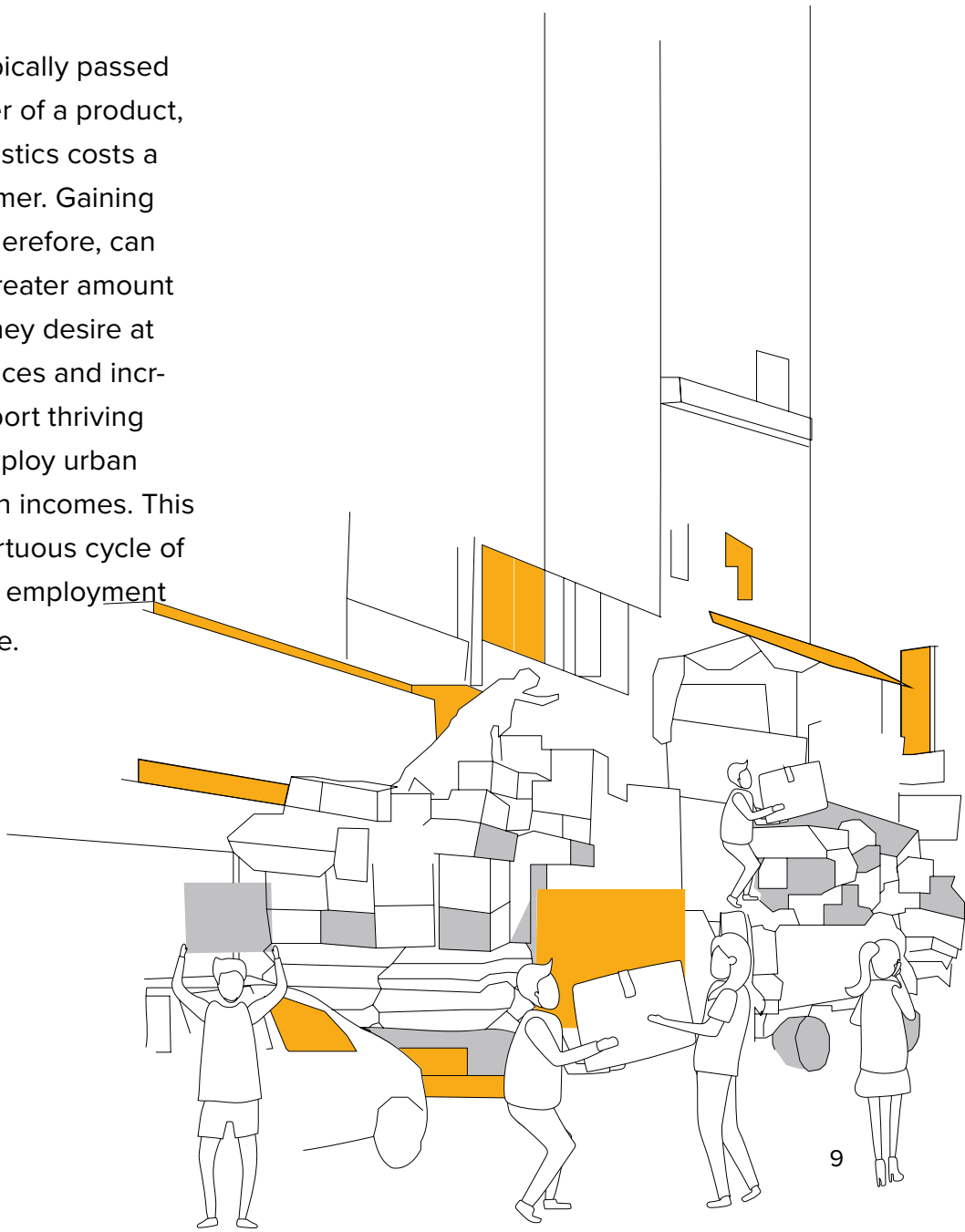
In global supply chains where goods can move thousands of kilometers at different stages of production, urban delivery is among the shortest of all stages of transport, often only consisting of a few kilometers. However, its impact on cost of goods is disproportionately large. For example, in many e-commerce supply chains, the final delivery to the consumer can involve over 50% of the total cost of moving the goods from its point of production to that of its final consumption.

Those logistics costs are typically passed directly to the final purchaser of a product, making any reduction in logistics costs a direct savings for the consumer. Gaining efficiency in the final mile, therefore, can provide consumers with a greater amount of the goods and services they desire at lower price points. Lower prices and increased demand, in turn, support thriving urban businesses, which employ urban residents and increase urban incomes. This lays the groundwork for a virtuous cycle of increasing income, demand, employment and again, increasing income.

1.2 Sustaining urban quality of life

The vehicles that move freight around the city can also negatively impact livability of the city through the externalities they produce.

Ensuring that goods are readily available to city residents while containing the side effects of moving those goods, is a fundamental objective of urban freight management.



ACCIDENTS

Trucks are out-sized contributors to injuries and fatalities in accidents

CONGESTION

Poorly managed delivery activities, especially illegal ones or improperly parked delivery vehicles, can reduce traffic fluidity and create congestion

AIR POLLUTION AND CARBON EMISSIONS

Trucks and other logistics vehicles are disproportionately large emitters of fine particulate matter (PM 2.5), Sulphur Oxides (SOx) and other air pollutants as well as greenhouse gases.

CONFLICTS WITH NON-MOTORIZED TRANSIT

Vehicles that are unloading and loading on sidewalks or bike lanes impede the ability of residents to walk or cycle safely.

Table 1: Negative impacts of freight movement

2.0 Key concepts

Understanding the types of goods moving in a city, the types of vehicles they move in and the organization of supply chains along which they move is critical for good policy formulation and effective infrastructure design.

2.1 Layout of urban supply chains

While each supplier chain is unique, some broad observations about urban supply chains and how they are laid out can still be effective in helping policymakers understand how and why goods move in certain patterns along certain routes. This high-level understanding can be useful in preliminary discussions to frame policy formulation and infrastructure provision. A conceptualization of the movement of a manufactured good is shown overleaf.

Urban logistics is typically focused on the points where a good enters the urban core, either on its way from a distribution center to a store for final sale or in businesses such as e-commerce, to a micro warehouse where it is staged for final delivery directly to the consumer. However, goods can also enter into urban or metro areas in stages of the production process, such as work in process if factories are in the metro area or as finished goods, depending on where distribution centers and warehouses are located. Policymakers must customize solutions to different types of freight traffic.

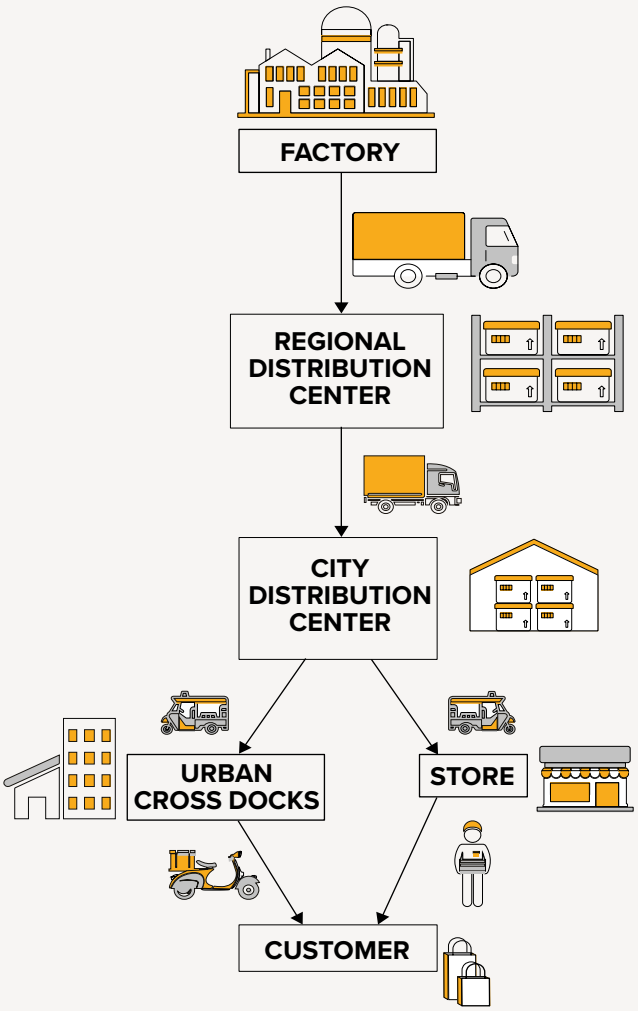


Figure 2: Urban Supply chain

2.2 Types of goods moving in cities

A simple framework to broadly segment types of shipments can be the first step in understanding which market segments exist and what challenges they present.

Heavy, bulk freight:
Goods such as gravel, sand, concrete, other building materials as well as industrial goods such as oil or petrochemicals are a significant component of urban freight, especially in cities that are still in the rapid growth phase. These types of freight are important for a city as they are needed to build infrastructure such as ports, roads or canals, create and maintain a city's building stock and cater to the industrial plants that are often engines of employment and GDP. While this type of freight is important for urban development, it is also problematic for cities. Low-value freight moving in large quantities carried by heavy trucks tend to produce high external costs, especially air pollution and traffic accidents. Furthermore, because handling requirements for the shipment of these types of products tend to be low, there are little barriers to entry for carriers.

Medium value, medium density freight:
Next on the spectrum are medium value goods, such as intermediate products that are inputs or outputs of a city-based light industry, because they still move on large trucks, they do create considerable strain on urban mobility systems. For these types of freight, policymakers must exercise caution on two fronts. The operation of such trucks can harm urban quality of life and the freight they haul is typically not directly consumed by urban residents, arguing for relatively strict regulation. These types of freight are critical for supply chains that eventually cater to the demand of city residents or create employment for them. For that reason, in order to avoid harming a city's economy or the ability of its residents to get the goods they need, the policy must be formulated and implemented with care.

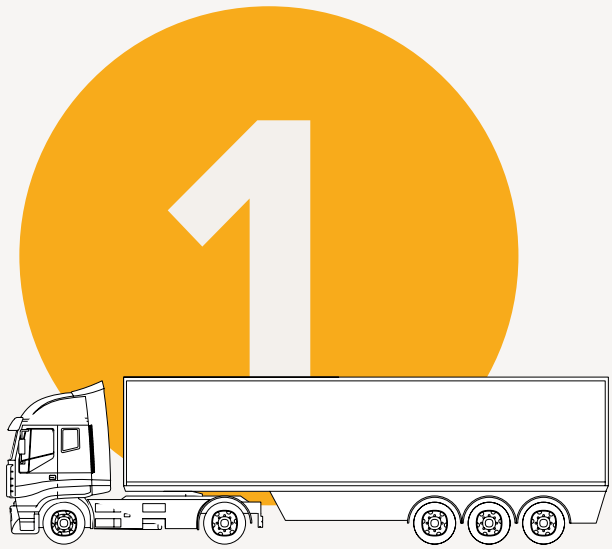
B2B freight for urban consumption:
Further down the spectrum are the shipments of freight to shops, markets and restaurants that directly sell to urban residents. These types of shipments include fresh and packaged food, beverages as well as final products that are stocked on the shelves of urban stores. These types of freight typically move in light or medium trucks and require high levels of access to the urban core. While policymakers can seek to keep heavy trucks moving heavy goods off urban roads, strategies for restricting the movement of goods for consumption in the city itself are less viable. Any restriction typically will not reduce freight volumes but merely force them to move in less efficient ways.

B2C freight for urban residents:
Finally, at the bottom of the spectrum is B2C freight, which typically is of high value, has strict handling and delivery requirements and is transported in small vehicles (or even by bike or foot) directly to the final consumer. This category of freight includes things such as food deliveries, document shipments or small packets and parcels. Formerly a relatively small segment of urban freight, with the rise of e-commerce, these types of goods movements are now a critical issue for efficient urban logistics. While similar to B2B freight in the way that it directly caters to urban residents and that effective policymaking must focus on efficiency rather than demand management, B2C urban freight is different in a critical way.

2.3 Types of vehicles moving in cities

Closely related to the types of freight moving in cities are the types of vehicles carrying it. Understanding the types of freight moving in the city and the role they play in the urban economy, can help formulate an effective policy governing the movement of that freight. Similarly, understanding the types of vehicles being used to move that freight can help decisions on infrastructure and policy to maximize the efficiency of their use. Goods moving within the urban core will use light trucks, three wheelers, scooters or even non-motorized modes such as cycling or walking for the final-mile connectivity.

While the above is a useful rule of thumb, vehicle selection may vary across cities due to economic circumstances, policy differences or geography and topography. Policymakers must evaluate vehicle selection and travel within their own cities in order to craft effective regulation.



Heavy bulk freight will typically move in **dumpers or tankers**, depending on if the goods being moved are liquid or solid.

Manufactured goods or pallets traveling long distances to and from distribution centers or factories in a city will typically move in **heavy enclosed trucks or tractor-trailers.**

Non-perishables moving from distribution centers or wholesale markets to points of sale in the urban core will often be transported in **medium or light trucks**, depending on the density of the goods.

Transportation within the urban core using **light trucks.** Transportation within the urban core using **scooters.**

Perishable goods may be transported in similar vehicles or in **light or medium duty refrigerated or climate-controlled ones.**

Final mile using non-motorized modes like **walking** and **cycling**.

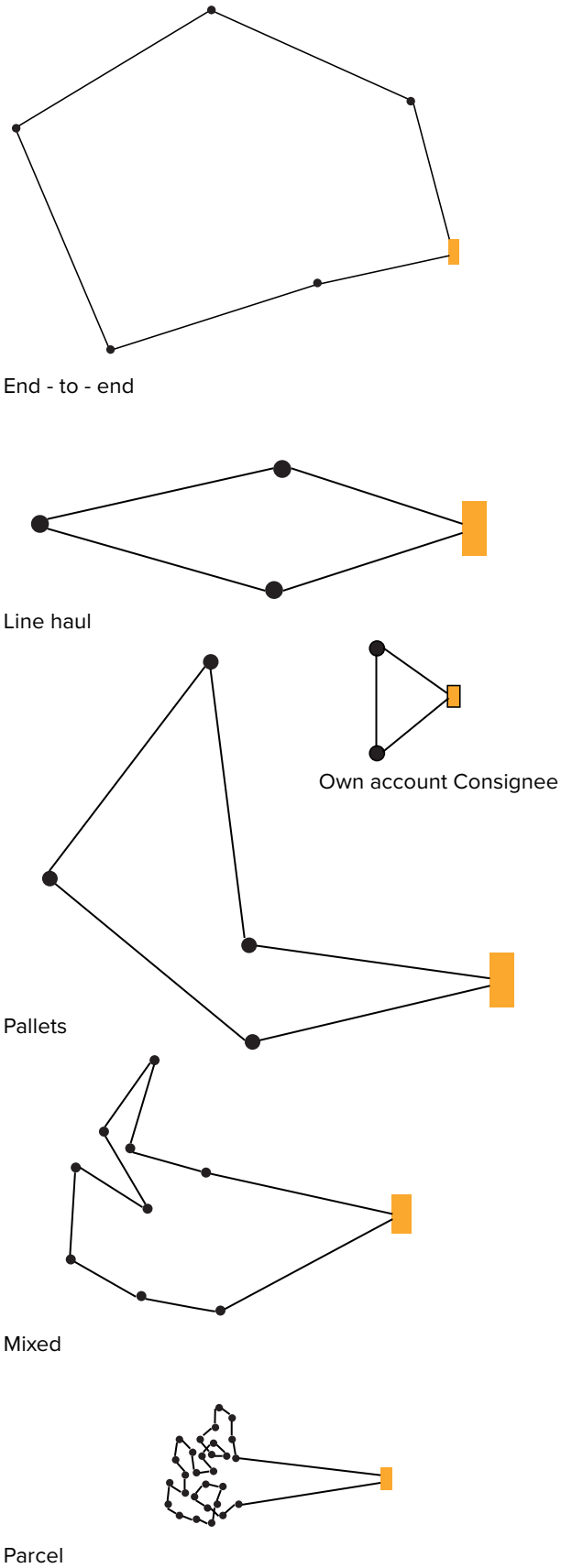


Figure 3: Operational patterns observed in urban logistics in Paris

Size of the vehicle

25 tons

2.5 tons

Duration of the operation

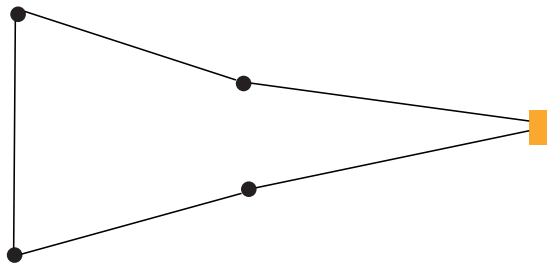
35 minutes

5 minutes

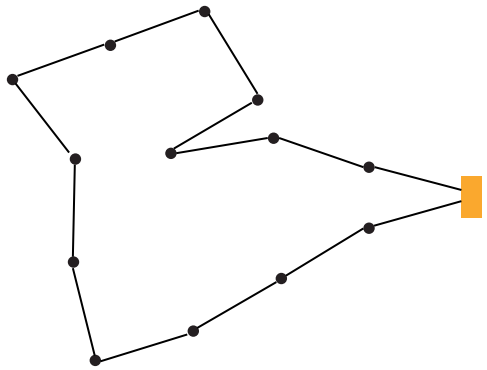
Distance

5 kilometers

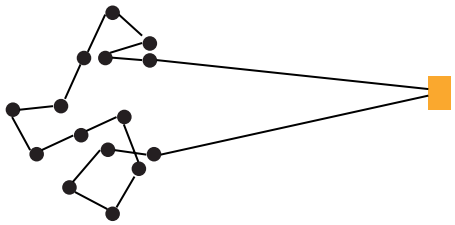
Source: Adrien Beziat, et al. Analysis of Different Types of Freight Routes according to Their Logistics Organization in the Paris Region.



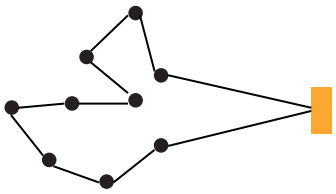
Intermediary products



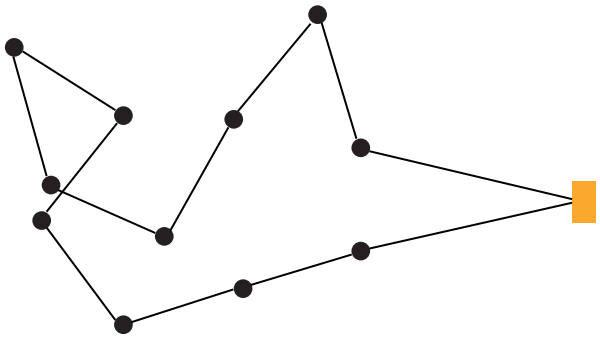
Finished products



Dry food



Beverages



Fresh food

2.4 Putting it together—travel patterns in urban logistics

Bringing together supply chain layouts, types of freight shipments and vehicles used to ship them, give a view on the key questions of urban logistics. How do goods move in a city and how can policymakers best support both healthy development of the sector and the city?

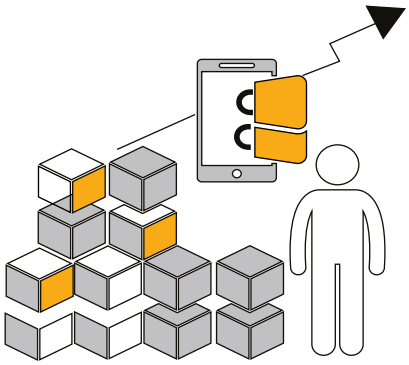
Understanding goods movement is critically important for effective policymaking because it informs what tools a policymaker should bring into play. For example, a city which sees large amounts of bulk, intermediate products, pallets or line-haul shipments occurring on urban roads may prioritize demand management as the most important pathway to increase efficiency. On the other hand, a city that sees primarily finished products, food, beverages or parcel shipments occurring on its roads may prefer to focus on path-ways to enhance the efficiency of those deliveries.

The image on the left is a visualization of how goods move in the city of Paris—what types of vehicles a given type of goods uses, how deliveries are spaced, how long deliveries take, how far delivery points are from distribution centers, etc.

3.0 Root causes of inefficiency in urban freight

Segmenting the problem of inefficiency in urban freight into broad constituent categories can help policymakers understand the problem in a methodical way, which positions them to effectively address the problem.

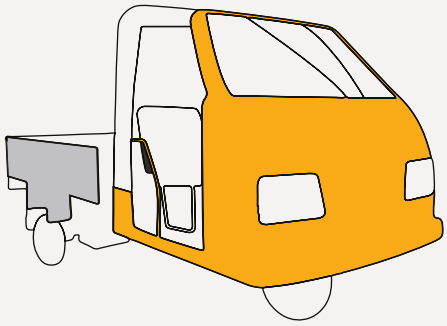
EXCESS DEMAND



Any freight movement that doesn't directly benefit urban residents.

- Through freight that moves through the streets of a city but whose shipment neither originates nor terminates within the city
- Freight which originates in a city but is typically not consumed in the city

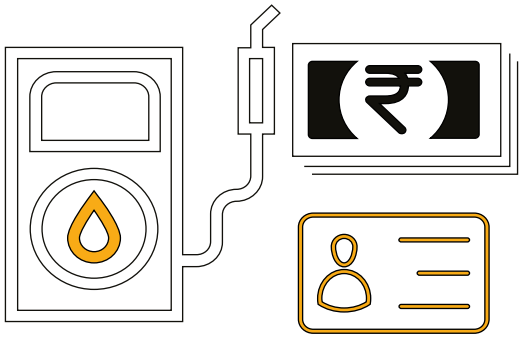
EXCESS VEHICLE TRAVEL



Potential causes of excess travel can be grouped into:

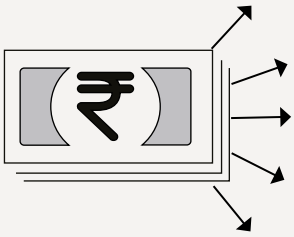
- Excess trip creation
- Excess trip distance

EXCESS INTERNAL COSTS



- Fixed costs: Driver wages, insurance, permits and licenses, financing charges and vehicle depreciation
- Variable costs: Fuel, maintenance, tires, etc..

EXCESS EXTERNAL COSTS



- Safety: injuries and accidents caused by urban freight vehicles
- Emissions: freight vehicle emissions
- Congestion: traffic congestion caused by freight vehicles
- Space-use conflicts: Occupying space dedicated to other urban functions such as sidewalks and bike lanes

Table 2: Causes of inefficiency in urban freight

4.0 Landscape of urban freight

In order to effectively regulate urban freight, municipal policymakers need a basic understanding of relevant policies and players.

4.1 Main stakeholders

Urban logistics is a complex ecosystem with many players—both in private and public sectors.

PRIVATE SECTOR

SHIPPER

The owner of the goods being transported, for example an e-commerce firm or consumer goods company whose products are destined for sale within the city

RECEIVER

The purchaser of the goods being shipped, also referred to as the consignee

CARRIER

The transport company operating the delivery vehicle carrying the shipped goods

LOGISTICS PROVIDER

The firm to which the shipper outsources logistics functions

OEMs

Although not under the jurisdiction of urban policymakers, the manufacturers of delivery vehicles are key stakeholders in the overall systemic efficiency

TECH PROVIDERS

Providers of technologies like urban delivery route optimization software or intelligent transport systems, can greatly enhance systemic efficiency even if they are not directly under the jurisdiction

In order to make an effective urban logistic policy, city practitioners must coordinate with a broad spectrum of stakeholders in both public and private sectors. In public sector, urban logistics involves many different overlapping government bodies at national, state and city levels. Coordination between these policymakers can avoid contradictory and redundant regulations. Logistics policymaking and infrastructure development affects a wide spectrum of private sector players. Effective engagement and consultation with these players can help city practitioners get a whole systems perspective and enhance the efficiency of the entire urban logistics system.

PUBLIC SECTOR

TRANSPORT POLICYMAKERS

Government officials, whether elected or appointed, who are responsible for creating rules governing urban transport systems

LAW ENFORCEMENT

Police or other bodies responsible for enforcing the laws governing the mobility system

LAND-USE PLANNERS

Government officials, whether elected or appointed, who are responsible for planning and zoning decisions that affect urban form

TECHNICAL STAFF

Engineers, software designers and other technical staffs

VEHICLE REGULATORS

Authorities with the responsibility to decide what types of vehicles are suitable for urban travel

4.2 Existing policies

The Government of India has several relevant policies and plans in place or drafted that pertain to urban freight.

National Urban Transport Policy (NUTP): This policy focuses on staggering freight and passenger transport so that the infrastructure is best utilized. Some of the suggested guidelines for efficient management of urban freight in NUTP 2014 include: using off-peak hours for urban freight transport; restricting entry of heavy vehicles in the city during the day; building bypasses through public–private partnerships in order to create alternate route for freight traffic; building truck terminals and parking infrastructure outside city limits; using digitization and intelligent transport services for freight traffic management and adopting cleaner fuels.

Unified Metropolitan Transport Authorities (UMTA): NUTP proposed integrated planning of large cities by setting up a committee of relevant stakeholders called Unified Metropolitan Transport Authority (UMTA). UMTAs are expected to streamline and holistically integrate the functioning of various agencies associated with passenger and freight mobility in the cities, as well as develop integrated land-use plans, schedule intramodal and intermodal services and create an integrated common platform for planning, financing, monitoring and operational agencies to coordinate with each other. Currently, there are four UMTAs in India in Ahmedabad, Bangalore, Hyderabad and Kochi.

City-level practices: Many cities in India have introduced efficient urban freight management practices based on land-use policy measures, vehicle restrictions, taxation and infrastructure development. Metro cities such as Mumbai have time and route restrictions on freight vehicles (based on size, weight and emissions) to reduce congestion during peak traffic hours. Incentives for off-hour deliveries and switch to non-motorized transport or two-wheelers is also a popular mechanism to alleviate congestion. Cities also have no parking zones for heavy vehicles. Many cities such as Chennai are planning to have truck terminals and parking zones on the periphery of the city. Central, state and city governments are also planning to expand bypass roads and ring road networks to reduce urban freight movement. Depending on the type of vehicle, cities have tolls and taxes to manage freight traffic interaction within the city.

5.0 Charting a path forward

DATA ACQUISITION AND ANALYSIS

Without data, policymakers are unable to understand the types of freight moving in their cities and the efficiency with which they are moving

PRIVATE SECTOR ENGAGEMENT

A close working relationship with logistics system users is critical to ensure that the policy is both effective and in line with the needs of industry

PERFORMANCE EVALUATION AND CONTINUOUS IMPROVEMENT

Through standing collaboration with private sector and monitoring of high-level KPIs, policymakers can maintain awareness of the system performance and ongoing system needs

SOLUTION IDENTIFICATION AND PRIORITIZATION

Based on the data collected and in consultation with private sector partners, policymakers must identify and prioritize measures to enhance the system performance

6.0 Resources

Urban logistics

Purpose: Understand principles of sustainable urban logistics

TU Delft
» Name : Sustainable Urban Freight Transport: A Global Perspective
»Type: Online course
» Link: https://www.edx.org/course/sustainable-urban-freight-transport-a-global-perspective

Mobility Academy
» Name : City Logistics
»Type: Online course
» Link:https://www.mobility-academy.eu/course/view.php?id=67

European Union -CIVITAS Initiative
» Name : Making urban freight logistics more sustainable from theory to practice
»Type: Webinar
» Purpose: Understand principles of sustainable urban logistics
» Link:https://www.mobility-academy.eu/course/view.php?id=67

» Name : Sustainable Urban Freight Transport
»Type: Online course
» Link: https://civitas-learningcentre.talentlms.com/catalog/info/id:145

IFFSTAR
» Name : City Logistics
»Type: Webinar
» Link:https://www.youtube.com/watch?v=wiNS12Kho6o

Electric vehicles in urban logistics

Purpose: Understand pathways and challenges to electrifying final-mile delivery

Mobility Academy
» Name : How to encourage increased electric mobility in the logistics sector
»Type: Online course
» Link: https://www.mobility-academy.eu/course/view.php?id=11

European Commission - FREVUE project
» Name : Technical Assessment of Electric Urban Freight Vehicles (EU Perspective)
»Type: Webinar
» Link: http://frevue.eu/wp-content/uploads/2017/03/FREVUE-Webinar-Technical-assessment-.-.-.-vrijdag-17-maart-2017-11.00.13.mp4?_=1

» Name : The environmental benefits of electric freight in urban areas (EU Perspective)
»Type: Webinar
» Link: https://frevue.eu/newsroom/video-recordings-frevue-webinars-available-now/

» Name : The economics of electric urban logistics
»Type: Webinar
» Link: https://frevue.eu/newsroom/video-recordings-frevue-webinars-available-now/

Supply chain management

Purpose: Understand fundamentals of supply chain management from private sector perspective

MIT
» Name : Supply Chain Fundamentals
»Type: Online course
» Link: https://www.edx.org/course/supply-chain-fundamentals-0

Rutgers University
» Name : Supply Chain Logistics
»Type: Online course
» Link: https://www.coursera.org/learn/supply-chain-logistics

Green vehicles in urban logistics

Purpose: Understand options for green vehicles in final mile delivery (EU perspective)

European Union -CIVITAS Initiative
» Name : Green vehicles for urban freight delivery
»Type: Webinar
» Link: https://www.youtube.com/watch?v=kLoIR7tKrRE

International experience in sustainable urban logistics

Purpose: Understand experiences and outcomes of urban logistics projects in the EU

European Commission - SUGAR Initiative
» Name : City Logistics Best Practices: A Handbook for Authorities
»Type: Case studeis - multiple types
» Link: http://www.sugarlogistics.eu/pliki/handbook.pdf

» Name : BESTFACT – Best Practice Factor for Freight Transport (Urban Freight Cluster)
»Type: Case studeis - multiple types
» Link: http://www.bestfact.net/category/urban-freight/

Congestion management in urban logistics

Purpose: Understand fundamentals of supply chain management from private sector perspective

MIT
» Name : Supply Chain Fundamentals
»Type: Online course
» Link: https://www.edx.org/course/supply-chain-fundamentals-0

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