Department of Commerce
Ministry of Commerce & Industry
Government of India

INDIA LOGISTICS

# Enhancing urban freight systems

A handbook of measures on performance improvement

**July 2, 2021**

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# Foreword

Timely and cost-efficient delivery of goods to residents and businesses underpins all urban economic activity. Growth of our cities and surging demand for logistics, driven by sectors like e-commerce, will propel urban freight demand over the coming decades. In this context, we must address urban freight issues that generally receive little attention.

Urban freight systems in most cities are inefficient. Their associated emissions, congestion, and safety issues undermine public health and city life. An increased focus on improving India's urban freight systems is paramount.

Several cities around the world, and closer to home in India, have undertaken successful interventions to smoothen logistics operations and build efficiency into freight systems. In this handbook, '*Enhancing Urban Freight Systems: A Handbook on Measures for Performance Improvement*,' we present a compendium of solutions to support city practitioners in their freight planning process.

Through this handbook, practitioners will be able to determine measures that best fit their city's unique urban freight challenges and read about locations that have already enacted these measures. Each measure is accompanied by suggested monitoring metrics and an implementation process. A matrix assessing the time and resources required to implement each measure helps decision makers find quick wins while simultaneously planning ahead.

By enacting the measures in this handbook, Indian cities can significantly improve their economic competitiveness. Realised at scale across our country, these solutions have the potential to boost India's ranking in the Logistics Performance Index. They will also deliver cleaner and safer urban environments for us all.

This handbook will be useful to state governments, local administrations, city planners, and city managers to achieve our common goal of an improved urban freight system.

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–

**New Delhi**
July 2, 2021

# Authors and acknowledgments


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# Introduction

## 1.1 Background and context

India is witnessing rapid urbanisation. Indian cities are driving the economic activity of the nation, contributing more than 63 percent of the national GDP.[1] Urban freight transport is a crucial enabler of this economic activity as it ensures that citizens and businesses can maintain the flow of sending and receiving goods for their daily needs.

With India expected to add 124 million people to its cities in this decade,[2] the demand for urban freight will increase by 140 percent.[3] Moreover, India is witnessing rapid growth in e-commerce, which is further increasing the overall urban freight demand. The e-commerce market is expected to grow to ₹11 lakh crore by 2022.[4]

### Existing urban freight systems

A rapidly growing urban freight system is crucial for a city's economy, but it is also plagued with negative externalities such as:

**Environmental impact**
10% of India's freight-related $CO_2$ emissions are due to urban freight. These vehicles impact air quality as they contribute to 23 kilo tonnes of Particulate Matter (PM) emissions and 305 kilo tonnes of Nitrogen Oxides (NOx) emissions annually.[5]

**High costs**
Final-mile freight movement in cities is responsible for 50% of total logistics costs in India's e-commerce supply chains.[6]

**Safety issues**
Freight vehicles contributed to 10% of road fatalities in cities with populations of more than a million people in India in 2019.[7]

**Congestion**
Inefficient driving and parking practices cause traffic congestion and delays.

## 1.2 Need and opportunity

There is an urgent need to improve the urban freight ecosystem's efficiency in Indian cities. The urban freight ecosystem is evolving quickly and getting more diverse and complex due to its stakeholders' differing roles and priorities. An increasing number of customers opting for faster deliveries through e-commerce channels is causing inefficiencies in the system due to smaller shipments and lack of consolidation. While consumers are enjoying faster deliveries, they are also becoming more conscious about the environmental impact of their purchase decisions and are demanding more sustainably sourced and delivered products.[8]

These evolving trends will require concrete efforts from both city managers and logistics operators. Promoting and implementing efficiency measures in Indian cities can enhance their economic competitiveness, reduce logistics-related costs, improve air quality, create jobs, and help achieve climate goals.

## 1.3 About this handbook

In order to make urban freight systems more efficient and realise the associated benefits, cities will have to plan effectively in collaboration with private and public sector stakeholders. Several cities in India and around the world have tested interventions that can address different urban freight-related issues. These case examples provide significant learning and act as best practices for other cities.

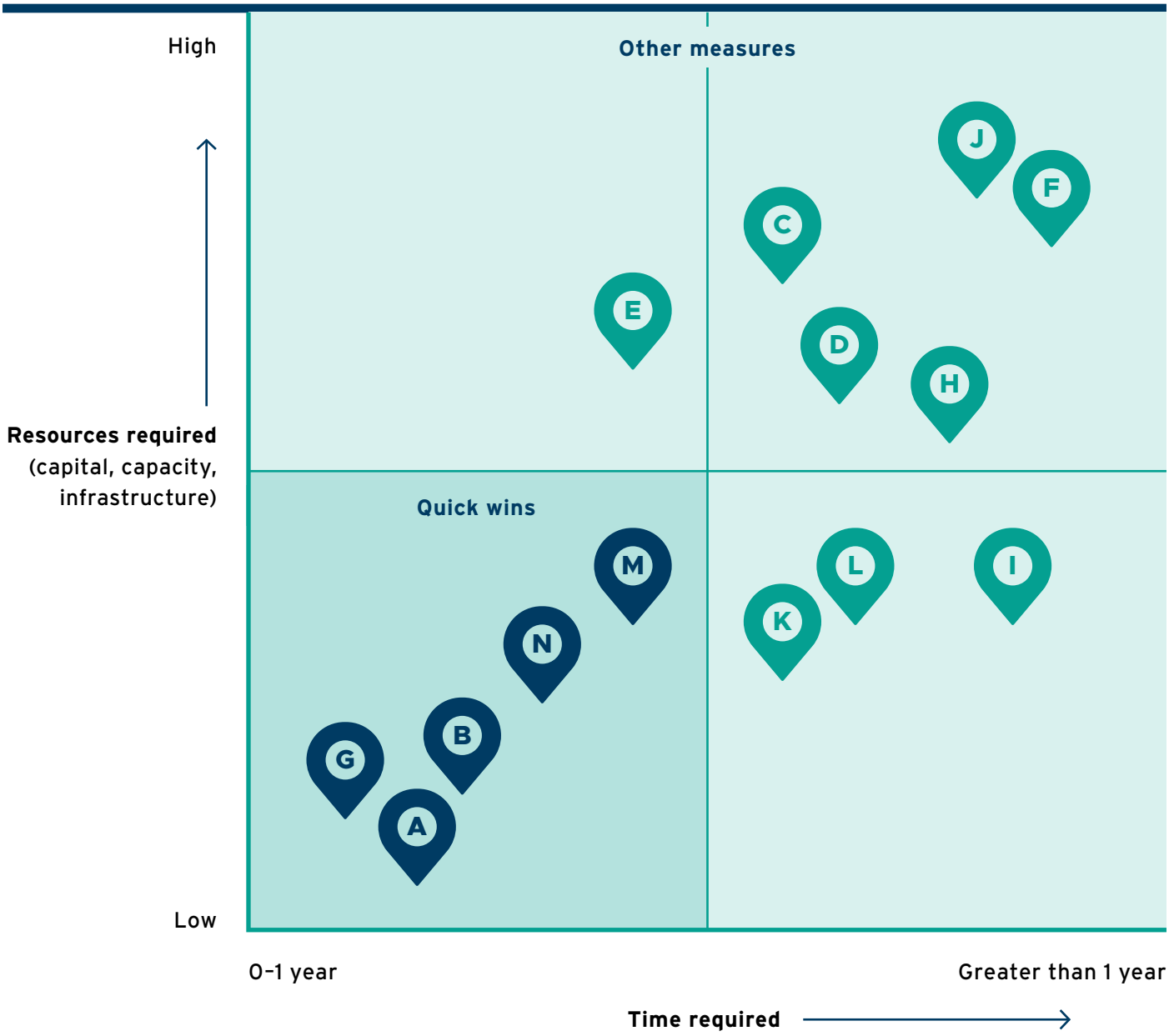
This handbook compiles a few such measures from around the world as a knowledge resource for city practitioners (Table 1). It provides insights into the nature of the interventions, when cities should consider implementing them, and where in the world these measures have been successful. Some of these measures are 'quick win' measures that can be implemented within a short timeline with existing resources available to cities (Exhibit 1).

The following sections provide details of these performance improvement measures. Each city can focus on select measures depending on its needs and priorities.

**Table 1** List of solution categories and associated measures for cities and states to deploy

| Category | Measures |
|---|---|
| **Vehicle use optimisation** | **A.** Night-time deliveries<br>**B.** Developing truck routes<br>**C.** Reverse logistics |
| **Infrastructure development** | **D.** Urban consolidation centres<br>**E.** Urban logistics spaces and hotels<br>**F.** Logistics development and logistics parks<br>**G.** Parcel delivery terminals |
| **Demand and land use planning** | **H.** Industrial planning<br>**I.** Bypasses and ring roads planning<br>**J.** Modal shift planning<br>**K.** Parking and unloading zones<br>**L.** Low-emission zones |
| **Technology adoption** | **M.** Using Intelligent Transportation Systems<br>**N.** Promoting electrification of urban freight |

**Exhibit 1** A 2x2 matrix mapping performance improvement measures according to the time and resources required for their implementation




- **A** Night-time deliveries
- **B** Developing truck routes
- **C** Reverse logistics
- **D** Urban consolidation centres
- **E** Urban logistics spaces and hotels
- **F** Logistics development and logistics parks
- **G** Parcel delivery terminals
- **H** Industrial planning
- **I** Bypasses and ring roads planning
- **J** Modal shift planning
- **K** Parking and unloading zones
- **L** Low-emission zones
- **M** Using Intelligent Transportation Systems
- **N** Promoting electrification of urban freight

# 2.0 Performance improvement measures

Optimising vehicle use can lead to improved loading capacity and reduced congestion.

## 2.1 Vehicle use optimisation

Vehicle use optimisation refers to optimising trip distance and the number of trips made by freight vehicles in the city. Optimising vehicle use is critical to maximising vehicle loading capacity, net load factor, delivery productivity, and routing efficiency. This section outlines measures that a city practitioner can incorporate to get the most out of freight vehicular movement.

**Table 2** Vehicle use optimisation measures

| Implementation measures | Definition | Case study |
|---|---|---|
| **A. Night-time deliveries** | Shifting truck traffic to off-peak hours during the night | Night-time deliveries to grocery store chains in Barcelona, Spain using low-noise trucks |
| **B. Developing truck routes** | Developing separate routes for truck operation | Commercial vehicle routes in New York City, United States |
| **C. Reverse logistics** | Picking up returned goods to avoid empty running | Waste material collected at London Construction Consolidation Centre |

## A. Night-time deliveries

### Context

Cities often lack suitable road infrastructure for use in the day, adding to their congestion, noise, emissions, and air pollution. This causes inconvenience for citizens at peak times and inefficiencies in delivery. Night-time deliveries shift truck traffic to off-peak hours when roads are empty.

### Description

To reduce congestion on roads due to truck movement during the day, night-time delivery can be introduced in cities. This can significantly ease freight delivery by providing the following benefits:

- Shorter delivery time and greater delivery efficiency
- Lower risk of delay in deliveries
- Optimised economic viability of freight drivers
- Decreased causality risk; thus, increased road safety
- Reduced air pollution from trucks caught in traffic jams

### When is this measure most effective?

This measure is most effective in congested cities with:

- Narrow roads
- High congestion at peak hours
- Limited parking space for delivery vehicles

### Monitoring metric

Delivery productivity can be used to evaluate the effectiveness of night-time deliveries. Time spent driving between the distribution centre, first delivery point, and subsequent deliveries determines delivery productivity.

### Implementation process

Night-time deliveries can be implemented with the following steps:

- Identify cases where night-time delivery can be implemented.
- Consult with delivery providers and delivery recipients.
- Roll out a legal or regulatory framework to restrict daytime delivery and implement noise standards for trucks moving in the night.
- Ensure agreement between the suppliers and the receivers on delivery timing.
- Monitor and evaluate the impact on congestion in cities during the daytime.

**Case study Barcelona, Spain**

Barcelona worked with grocery store chains to allow night-time deliveries with modified trucks that cause less noise pollution. This was done to substitute daytime deliveries by smaller trucks and vans. By replacing seven daytime trips of medium duty trucks with a single night-time truck, delivery costs were significantly reduced. This also led to lower logistics vehicle congestion during peak hours of the day.[9]

**Exhibit 2** Benefits of night-time deliveries in Barcelona, Spain[10]


## Silent night-time unloading

**407** Stores using silent night-time unloading (6% more than in 2009)

## Gas fuel trucks

**30%** Reduction of $CO_2$ emissions

**50%** Reduction of noise

**70,000** Fewer tonnes of $CO_2$ emissions

## B. Developing truck routes

### Context
Trucks operating on urban roads often lead to congestion and long traffic jams. Developing separate routes for trucks to access the urban core boosts delivery efficiency and keeps roads clear for passenger vehicle movement.

### Description
Developing truck routes is essential to manage freight by providing access for trucks to the urban core. Prior extensive research will ensure that developing truck routes does not add inefficiencies in delivery such as route circuity and barring access to key freight locations. Truck routes should cover all key freight generation and delivery sites while minimising negative externalities for residents.

### When is this measure most effective?
This measure is most effective when the majority of the traffic is through-freight transported on large trucks. Routing such trucks through separate corridors helps decongest core urban roads.

### Monitoring metric
Routing efficiency can be used to evaluate the truck routes. This refers to how efficiently the operator manages various stops on a delivery tour without compromising the liveability of residents.

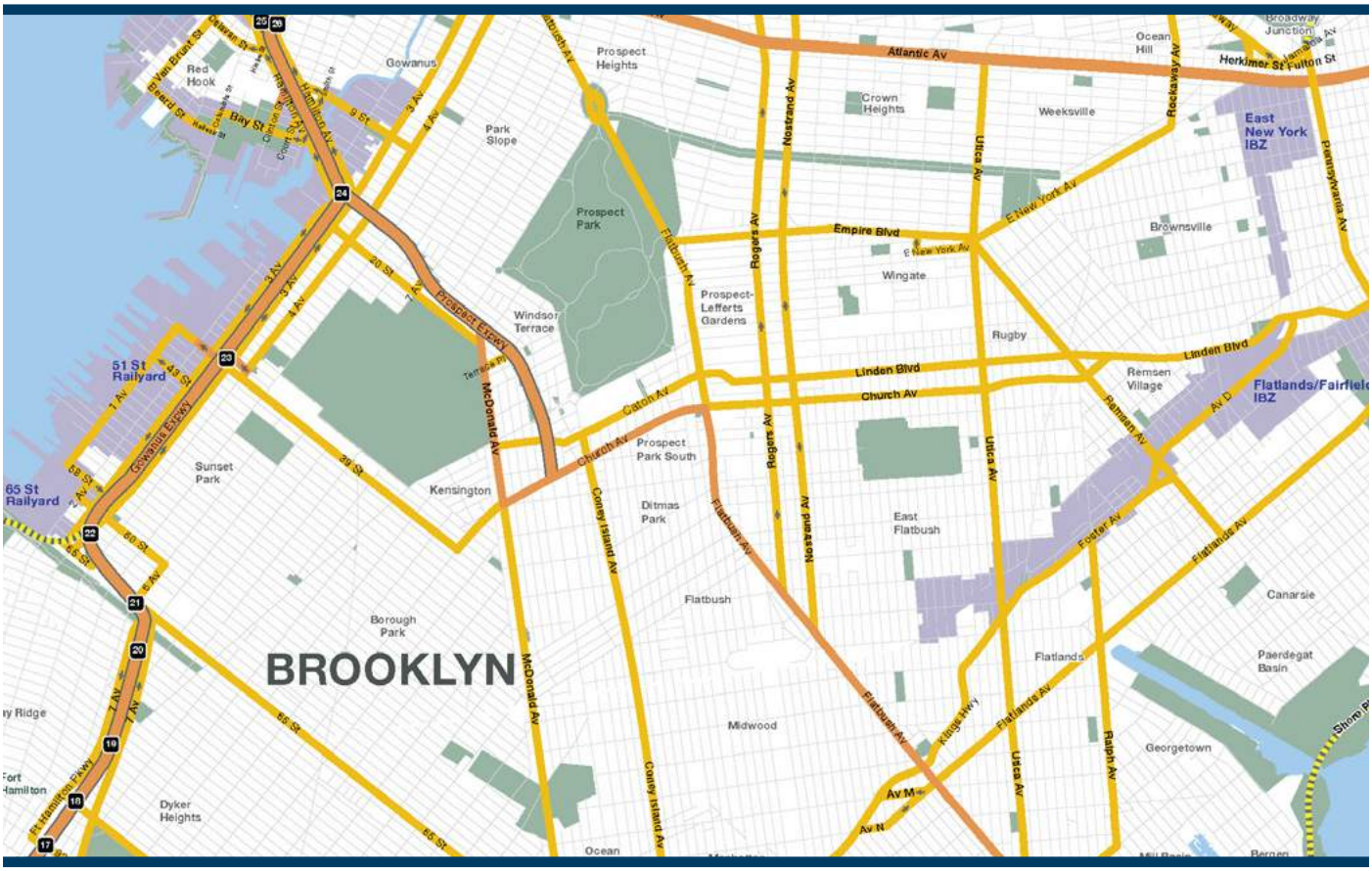
### Implementation process
The following steps need to be taken to implement this measure:

- Map the major routes for movement of trucks in the city.
- Identify routes (existing or new) for movement of trucks that minimise the overall impact on the liveability of residents.
- Assess the potential impact of developing truck routes on efficiency, time, and cost of freight movement.
- Prepare a plan for developing truck routes.
- Introduce a legal framework that restricts freight vehicles to truck routes.
- Periodically review the effectiveness of truck routing schemes in the context of changing land use.

### Case study New York City, United States
New York City has a set of roads that commercial vehicles must use. This truck routing network has Local Truck Routes and Through Truck Routes. In case of Local Truck Routes, drivers can use only non-designated routes at the beginning or end of a trip. The Through Truck Route Network majorly operates on highways and has neither an origin nor destination within the borough.

In 2017, an assessment of the New York routing system reflected that only 5 percent of the city's roads were accessible to freight operators. It showed the need to periodically review the routing schemes with changing land use and zoning policies.[11]


**Exhibit 3** New York City truck routes[12]



## C. Reverse logistics

### Context

During final-mile deliveries, after delivering the product to the recipient, the driver returns to the origination point with an empty load. Delivery providers can use reverse logistics where the driver also picks up returned goods to avoid empty running.

**Exhibit 4** Reverse logistics process[13]


### Description

Reverse logistics is the integration of outbound freight such as customer returns and product packaging into the inbound supply chain. This increases the operational efficiency of transportation and avoids empty running. Additionally, reverse logistics benefits the bottom line of freight operators by providing them an opportunity to monetise the vehicle return trip.

### When is this measure most effective?

Reverse logistics is most effective when:

- Outbound freight is collected from the location where inbound freight is delivered.
- Outbound freight needs to be recycled, refurbished, or safely disposed of.

### Monitoring metric

The effectiveness of reverse logistics can be measured at an operator level using the net load factor measured in ton-km/GVWR*km (where GVWR is the gross vehicle weight rating). This comprises:

- Share of rated loading capacity (when vehicle is loaded)
- Share of driving (when vehicle is not loaded)

### Implementation process

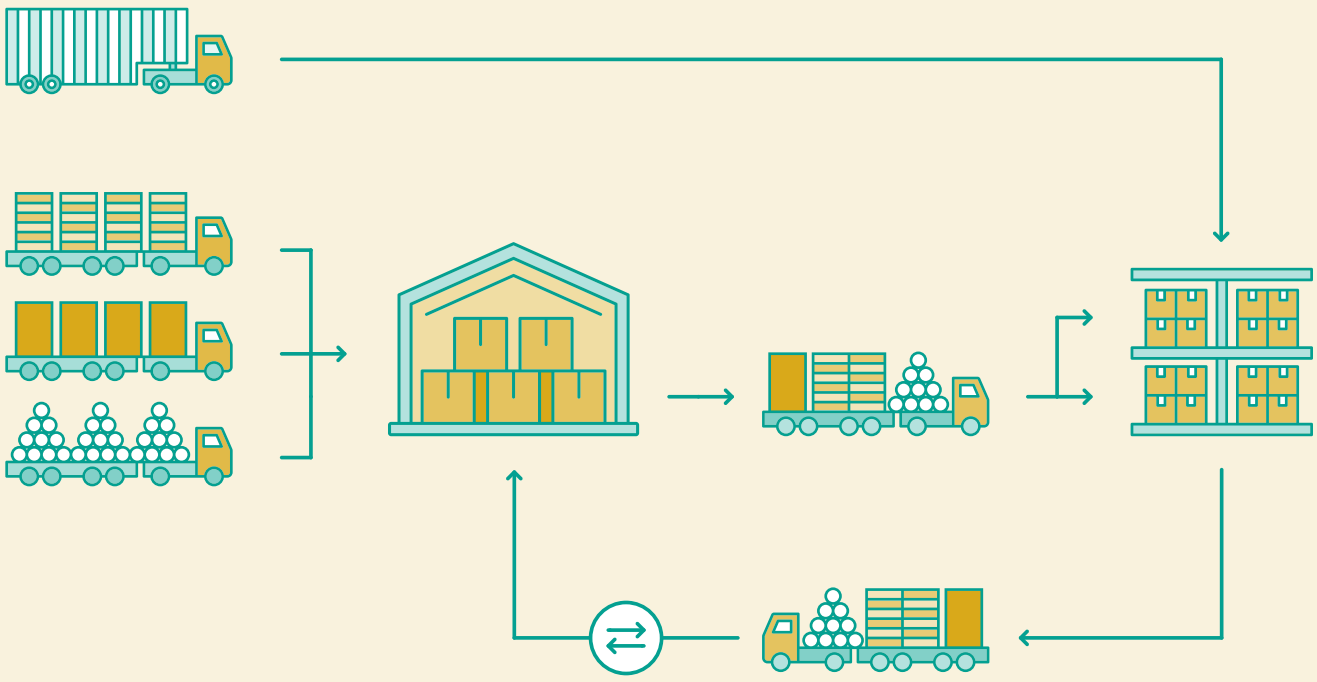
The following can facilitate reverse logistics:

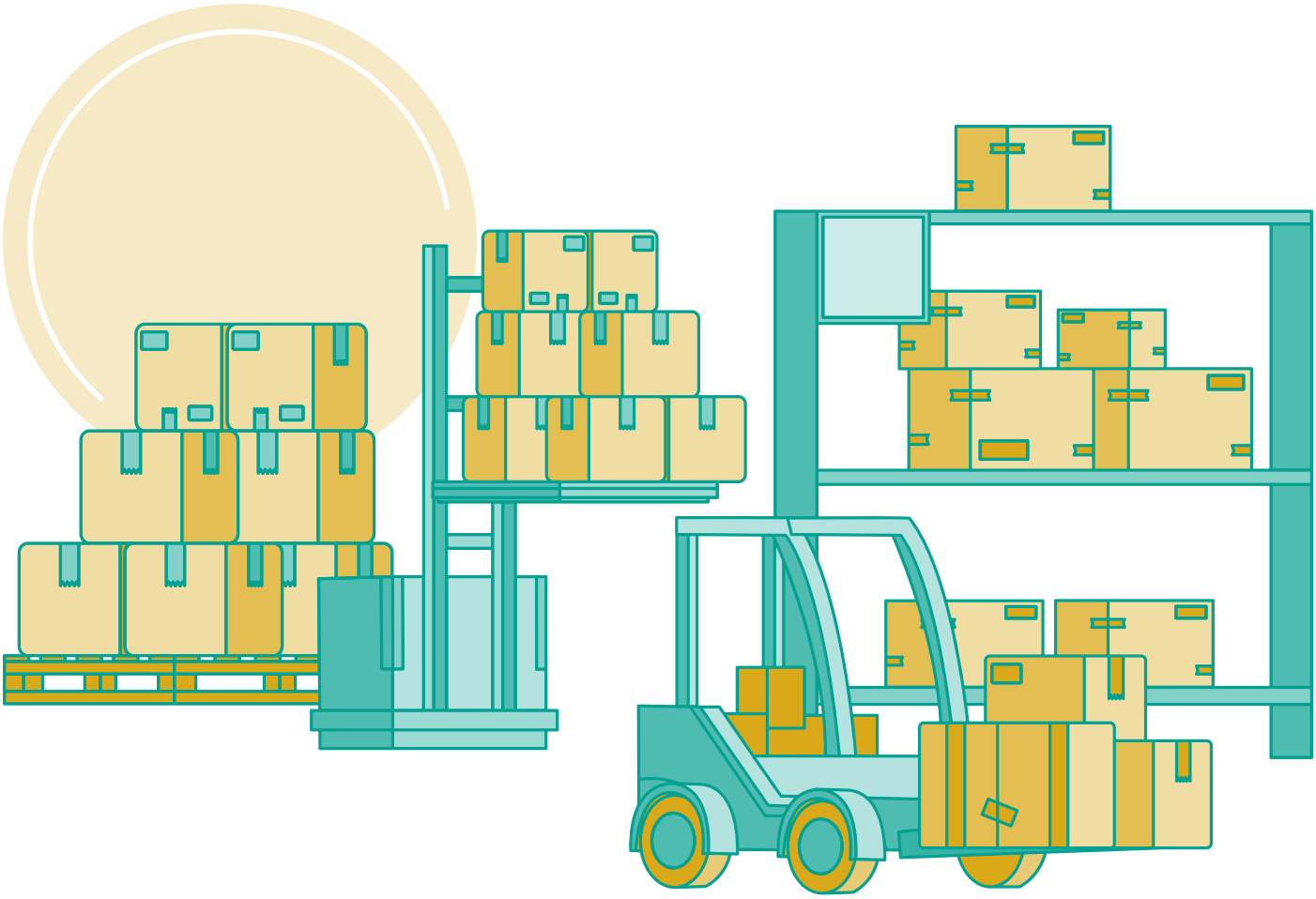
- Identify sectors or use cases to implement reverse logistics.
- Undertake cost-benefit analysis of outbound freight integration.
- Manage and operate reverse logistics.
- Recycle, refurbish, or dispose outbound freight where applicable.

**Case study London, United Kingdom**

The London Construction Consolidation Centre served both as a consolidation point for inbound deliveries of construction materials to building sites in the city centre as well as a reverse logistics channel, collecting waste materials such as used pallets, packaging, and broken supplies. This avoided empty running and created an opportunity to generate revenue during the return trip.[14]

**Exhibit 5** Construction consolidation centres aim to streamline the supply chain through innovative models[15]





**Connected and well-designed infrastructure can provide the required impetus to boost efficient logistics.**

## 2.2 Infrastructure development

Developing infrastructure for inventory management and transportation planning is essential to improve logistics efficiency. It reduces costs and emissions associated with freight movement. While building infrastructure, a city practitioner must ensure optimised siting, high-quality warehouses, and digitised processes within the site. Planning and building adequate infrastructure to meet a city's goods demand can ensure better route planning, efficient inventory management, and improved delivery productivity.

Measures outlined in this section will provide an overview of different types of infrastructure a city can build to handle its goods movement.

**Table 3** Infrastructure development measures

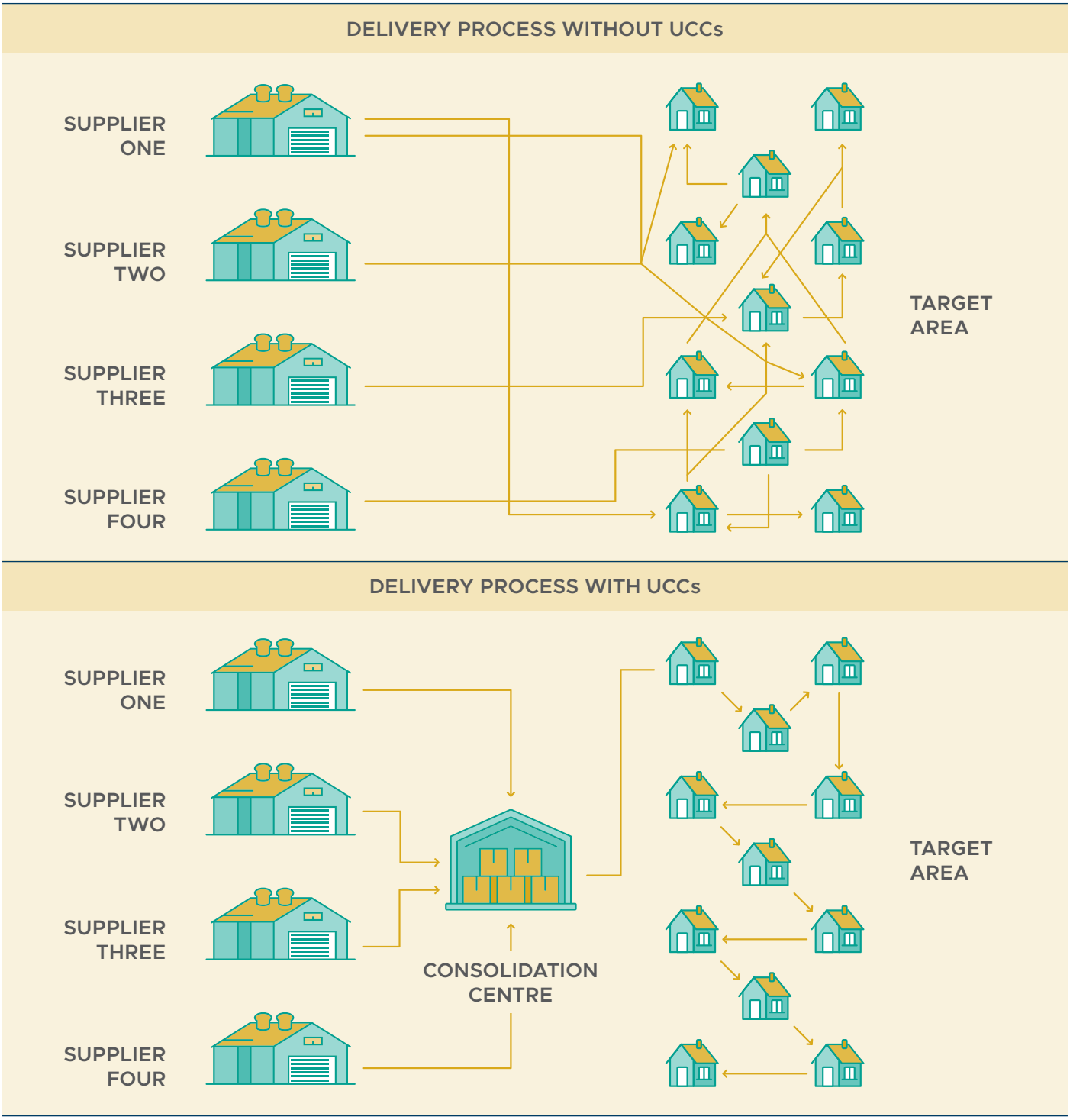
| Implementation measures | Definition | Case study |
|---|---|---|
| **D. Urban consolidation centres (UCCs)** | Government-run or subsidised warehouses located in the urban core that act as consolidation points | UCC developed by four local councils in London |
| **E. Urban logistics spaces and hotels** | Infrastructure within the urban core to temporarily store goods prior to urban deliveries | Parking garages in Paris used as urban logistics spaces |
| **F. Logistics development and logistics parks** | Warehousing and transportation infrastructure and customer services to aggregate industrial and logistics activities at a single facility | Jogighopa Multimodal Logistics Park |
| **G. Parcel delivery terminals** | Pickup terminals for deliveries | Automated parcel delivery terminal by Smartbox |

## D. Urban consolidation centres

### Context

Vehicles running empty or partially loaded increase delivery costs and inefficiencies. Consolidating loads optimises the carrying capacity of goods vehicles.

**Exhibit 6** Load consolidation through UCCs[16]



## Description

Urban consolidation centres (UCCs) are government-run or subsidised warehouses located in the urban core that act as a consolidation point for shipments arriving in the city.

Trucks drop off loads at consolidation centres. From here, smaller loads are combined and picked up for final-mile deliveries. UCCs help maximise the delivery load factors and improve the efficiency of urban logistics.

## When is this measure most effective?

UCCs are most effective when:

- A large number of shipments originate at a distance away from the city
- Underloading of trucks is a key issue with the city's logistics
- The city government has access to capital to invest in and enforce the use of UCCs

## Monitoring metric

The effectiveness of UCCs can be evaluated using the net load factor measured in Ton-km/GVWR*km (where GVWR is the gross vehicle weight rating). This comprises:

- Share of rated loading capacity (when vehicle is loaded)
- Share of driving (when vehicle is not loaded)

## Implementation process

The following steps can be followed to set up UCCs in cities:

- Promote collaboration across private sector players.
- Consult stakeholders to allocate land for UCCs.
- Develop a source of funding (public funding or use of Public Private Partnership).
- Establish a revenue model for UCCs.
- Onboard suppliers and logistics partners.

Developing long-term policies that incentivise consolidation through subsidies and mandates can ensure the sustainability of UCCs.

### Case study **London, United Kingdom**

Four local councils in London collaborated to develop a 2,000 square feet UCC to sort and consolidate deliveries. They first ran the project as a pilot where 400 to 500 items in two product lines (stationery and cleaning products) were processed daily. Final-mile delivery was conducted on pre-planned and optimised routes, often using zero-emission vehicles. The pilot was funded publicly by the Mayor of London and the European Union and obtained a load factor of more than 70 percent, reducing total distance travelled by vehicles by 45 percent.

## E. Urban logistics spaces and hotels

### Context

Logistics spaces for storing goods are often created in distant suburbs. This makes the final-mile delivery of the goods inefficient by increasing the distance between the centre and the recipient. Creating urban logistics spaces and hotels within the urban core of the city minimises this distance.

### Description

Urban logistics spaces (ULSs) are developed within the urban core to temporarily store goods prior to urban deliveries. The goods are then delivered using different vehicle segments for the final-mile delivery. Thus, a ULS increases delivery efficiency and reduces resource consumption.

Urban logistics spaces and hotels require land within the urban core with high potential for critical urban logistics delivery.

### When is this measure most effective?

ULSs are most effective when:[17]

- Existing logistics centres are far away from the urban core and cost of delivery is extremely high
- The city can own or control the use and rent of spaces identified as ULSs

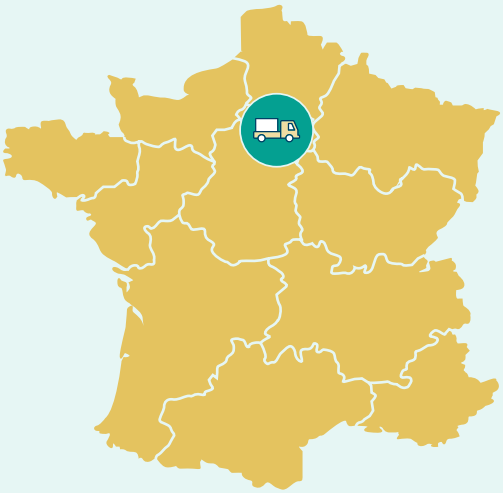
### Monitoring metric

Logistics sprawl is addressed by urban logistics spaces and hotels. Increase in urban land prices and change in land use regulation can be used to measure logistics sprawl. Sprawl is also linked to negative externalities such as long delivery distances or high usage of heavy vehicles.

### Implementation process

The following can be done to set up ULSs in the cities:[18]

- Identify accessible places with low rental costs in core urban areas of the city such as multi-storey car parks.
- Invite applications from tenants stating interest, potential benefits, and a quote.
- Shortlist tenants and design terms of reference based on determined criteria to reduce congestion, pollution, and inefficiency in the system of urban distribution.
- Operate the ULSs using a Public Private Partnership (PPP) model.



## Case study Paris, France

Paris facilitated urban consolidation by making available parking garages (100 to 250 square metres) as ULSs. These spaces are typically used by delivery companies to bundle deliveries within their own supply chain. Chronopost, a French parcel delivery company, which is the main tenant of one such facility, is massing and pooling its flows. In doing so, it is reducing the VKT (vehicle kilometres travelled), traffic congestion, and its carbon footprint.

Paris introduced another similar concept, larger in scale than the ULS, called the Urban Logistics Hotel, for use by multiple tenants.

## F. Logistics development and logistics parks

### Context

Organised hubs are needed where logistics-related activities are consolidated and centralised. Logistics development and logistics parks include warehousing infrastructure, transportation infrastructure, and customer services.

### Description

Logistics parks allow the aggregation of industrial and logistics activities at a single facility. This enhances load factors, enabling multimodal transport and making transportation of bulk freight cost-effective and more competitive. Logistics parks at strategic locations can provide:[19]

- Infrastructure enabling multimodal freight transfer (railside or portside)
- Mechanised material handling and specialised storage solutions such as cold storages
- Value-added service (like customer clearances) and post-manufacturing activities (like sorting and grading)

### When is this measure most effective?

Logistics parks are most effective when:

- Land is owned by the city and is designated for industrial use
- There is a potential for intermodal logistics delivery, i.e., when the park is close to a railway line, road network, or waterway

### Monitoring metric

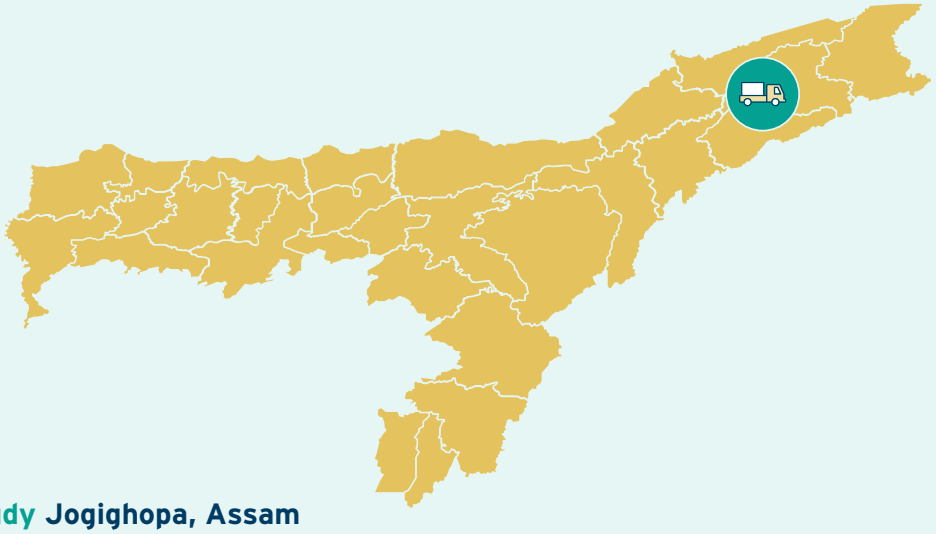
Logistics park evaluation includes assessment of:

- State of the logistics park in terms of accessibility and finance
- Operation of the facility in terms of scale and activities
- Social and environmental contribution to employment and carbon footprint

### Implementation process

Cities will need to undertake the following steps in consultation with the state government:[20]

- Conduct a feasibility study for developing logistics parks, especially at locations that provide direct connection to rail freight and other multimodal transport.
- Consult stakeholders to identify barriers and prepare a strategy for efficient multimodal freight transfer.
- Develop a PPP framework stipulating responsibilities of the city and private players.
- Shortlist eligible projects and set up operational mechanisms.



**Case study Jogighopa, Assam**

In 2017, the Government of India approved 34 multimodal logistics parks across the country. The largest logistics parks are to be developed in Bengaluru, Chennai, Nagpur, Vijayawada, Surat, Hyderabad, and Guwahati.

Jogighopa Multimodal Logistics Park, Assam is located 150 km from Guwahati, near National Waterway 2 on the River Brahmaputra. The park offers connectivity through road, rail, and inland waterway. It is expected to be a distribution or consolidation centre for the North-Eastern states as well as a centre for cross-border trade with Bangladesh, Bhutan, Nepal, and Myanmar.[21]

## G. Parcel delivery terminals

### Context

Final-mile transport cost is high, comprising up to 50 percent of the total transportation cost at times. This is because multiple delivery points and delivery to the final recipient is time and resource inefficient. Thus, to increase the delivery productivity, cities can introduce parcel delivery terminals.

### Description

Parcel delivery terminals help in reducing delivery points, decreasing the number of delivery trips, and increasing productivity. The terminals can be of two types:

- Trucks drop boxes at the terminal during off-peak hours and bikes or scooters make final deliveries during the day
- Recipients collect their boxes from the terminals

### When is this measure most effective?

This measure is most effective when the cost of delivery is high and cities are greatly congested, making deliveries difficult. This can also be combined effectively with other delivery productivity measures such as night-time deliveries.

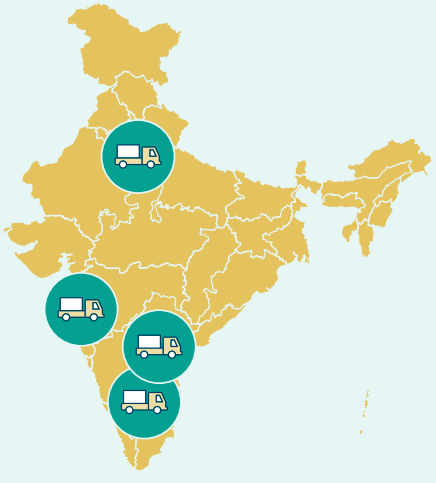
### Monitoring metric

Delivery productivity can be used to evaluate the effectiveness of parcel delivery terminals. It is measured by the number of deliveries completed per day or per hour.

### Implementation process

The following steps will ensure smooth operations of parcel delivery terminals:

- Identify use cases for delivery terminals.
- Consult potential private players or local communities interested in setting up such terminals.
- Identifying land or area for installation of terminals, taking into consideration factors such as cost, convenience, time, and efficiency.
- Install automated smart parcel lockers suitable for the delivery products.
- Operate and monitor the parcel delivery terminals.



### Case study Smartbox, India

Smartbox is an automated parcel delivery terminal available 24x7. It provides customised parcel locker solutions that solve last-mile delivery issues. Customers can register for a Smartbox for parcel deliveries. As soon as their parcel is delivered, customers get a one-time password to unlock their delivery box and collect their packages. Smartbox offers a card swipe on delivery or cash on delivery options. The service is operational in Delhi, Mumbai, Bengaluru, and Hyderabad.[22]

**Planned and adequate land use within a city is key to streamlining urban freight movement.**

## 2.3 Demand and land use planning

Rising urban freight demand in cities is inevitable. Planning for it and associated land use is key to ensuring smooth operations. Interventions should reduce peak hour traffic, promote sustainable practices, shorten trip distances, and manage freight and passenger vehicular movement in the city. Demand planning can also ensure that through-freight does not produce a negative impact on citizens. The best practices in this section will cover a range of topics such as long-term industrial planning and introduction of low-emission zones to promote technologies such as electric vehicles (EVs).

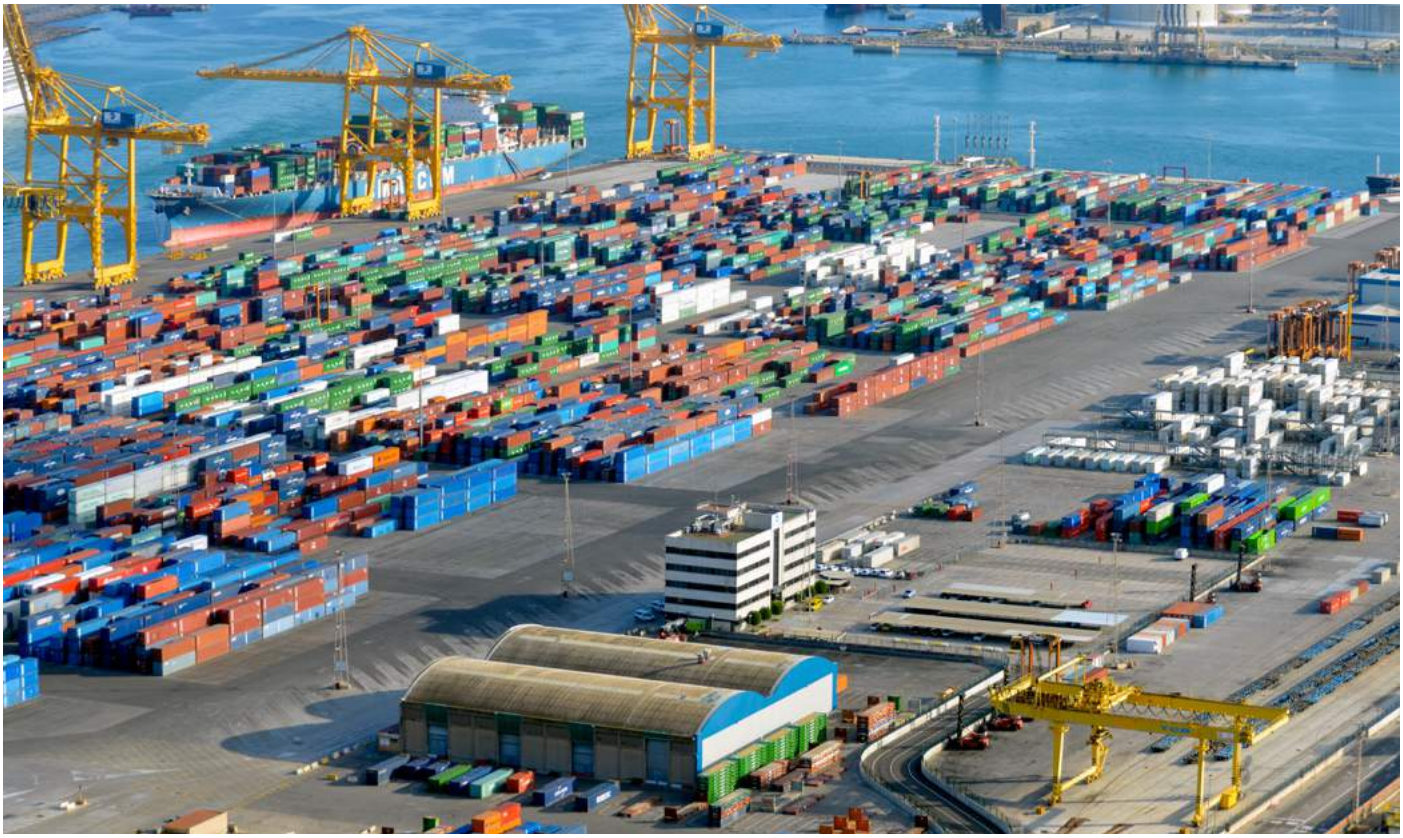


**Table 4** Demand and land use planning measures

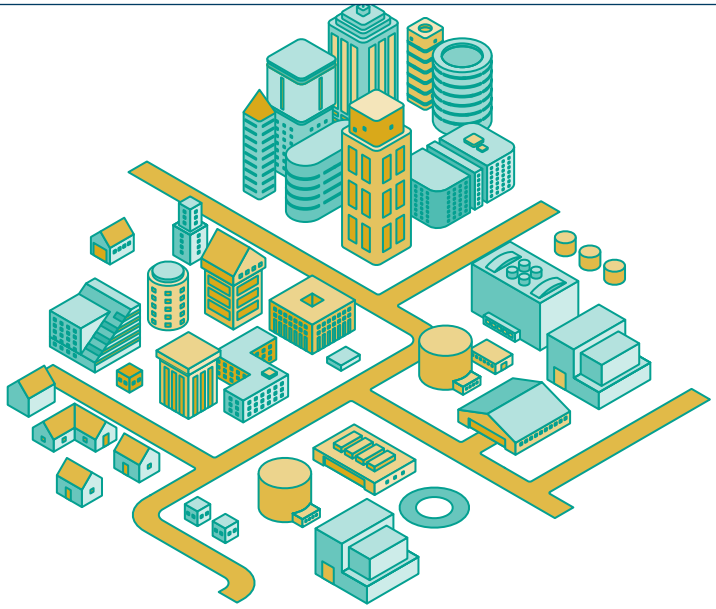
| Implementation measures | Definition | Case study |
|---|---|---|
| **H. Industrial planning** | Long-term industrial land use planning to designate manufacturing or industrial units | Delhi Master Plan created by the Delhi Development Authority |
| **I. Bypasses and ring roads planning** | Building routes for heavy transport around a city instead of through it | Bypass in California to overcome truck bottlenecks |
| **J. Modal shift planning** | Shifting transportation modes from road to rail or waterways | Alameda Corridor—a high capacity below-grade rail line with a daily capacity of 150 trains |
| **K. Parking and unloading zones** | Allocating spaces for freight use in the city | Freight-specific infrastructure development in Barcelona, Spain |
| **L. Low-emission zones (LEZs)** | Creating areas where internal combustion engine vehicles are restricted | LEZs in London |

# H. Industrial planning

## Context

Setting up large industrial facilities in cities generates employment. However, they also cause heavy truck traffic and noise and air pollution near residential or recreational areas. Long term industrial land use planning mitigates the negative impact of such industrial facilities without compromising job opportunities.

**A holistic industrial planning process is key to ensuring efficient goods movement.**



## Description

Long term industrial planning sets a vision for land use in the city. Planning authorities designate areas for manufacturing or industrial units with assured access to major highways, railways, and ports (for freight traffic) and commuter lines (for manpower). Core residential areas are thus kept free of industries and high volumes of heavy freight.

## When is this measure most effective?

Industrial planning is effective for all urban areas.

## Monitoring metric

Freight intensity of the GDP is used to measure the effectiveness of industrial planning. It is defined as the ratio of tonne-km of freight over GDP dollars. An efficient industrial planning process leads to dense industrial zones and brings the origin and destination of freight movement closer. This translates to shorter distances for the same amount of tonnes moved and their associated value.

## Implementation process

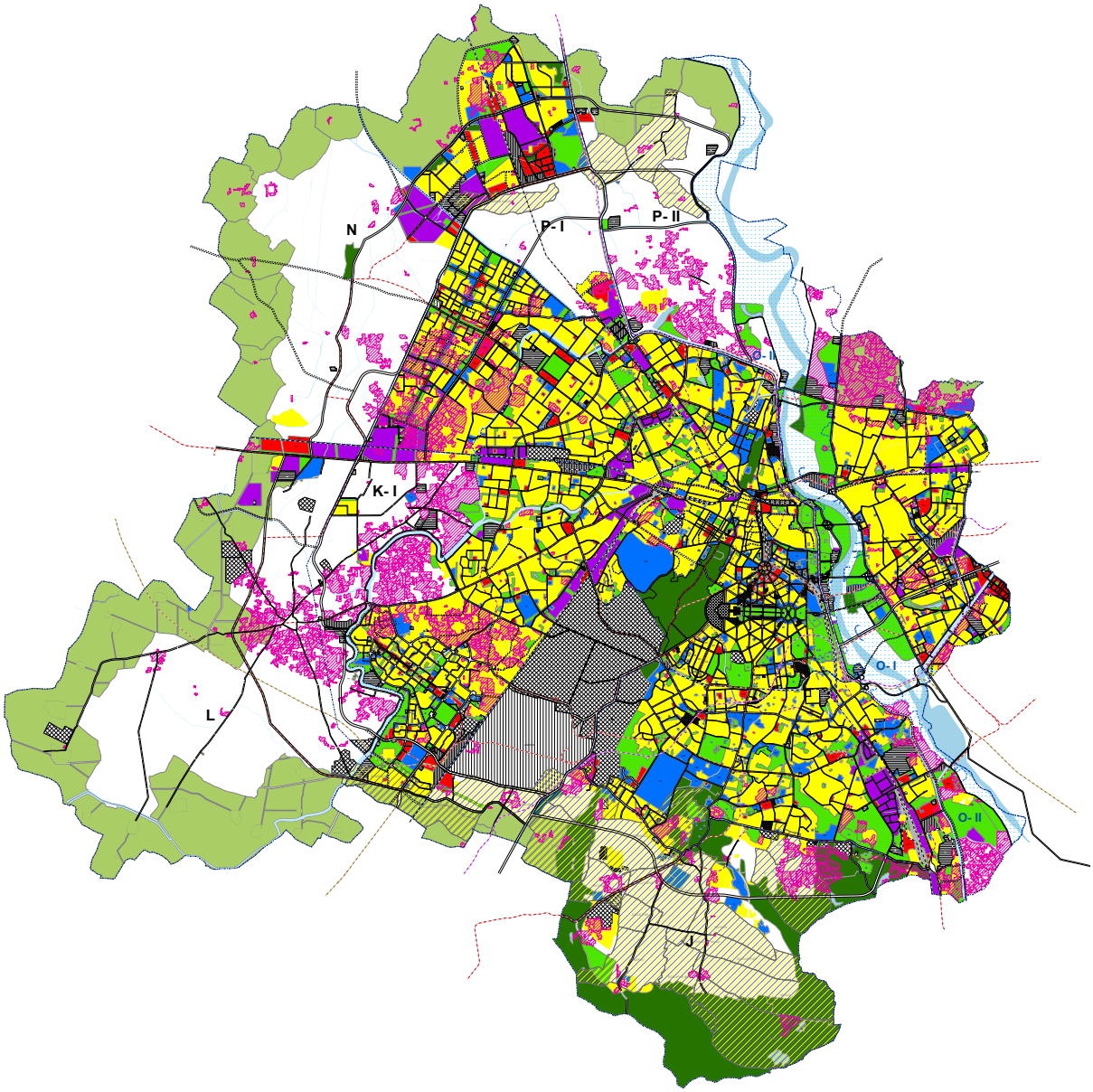
Industrial planning must be recognised as a long-term policy measure led by planning or development authorities. It also needs to consider the perspectives of various stakeholders for success. The following steps to develop an industrial plan are:

- Conduct community surveys and analyse existing land use policies.
- Consult with government departments, industries, chief security officers, and residents to understand the current challenges and future needs of the city.
- Engage with urban planners to propose future industrial plans.
- Revise the proposed plans based on feedback from stakeholders.
- Create a roadmap for implementing the industrial plan.
- Set up monitoring, reporting, and verification processes to ensure compliance.

**Case study Delhi, India**

The Delhi Development Authority created the Delhi Master Plan, 2021 in 2005, and approved the Delhi Master Plan, 2041 in 2021. The Plans provide a framework for future growth in the capital, enabling stakeholders to know the policies that apply to land parcels. The 2041 Plan aims to reduce pollution in the city by dividing the urban region into residential, commercial, and industrial zones. It reinforces zoning restrictions to reduce the negative impact on the health of residents from industries.[23]

**Exhibit 7** Draft land use plan for Delhi 2041[24]



## I. Bypasses and ring roads planning

### Context

Goods moving through a city are seldom produced or consumed in that area. This through-freight movement creates truck congestion without contributing significantly to the urban economy. Bypasses and ring roads planning reroutes this traffic away from the city.

### Description

Bypasses and ring roads planning creates routes for heavy transport around a city rather than through it. It is a common tool to minimise traffic on inner streets which may be designed for lower capacities. It directly reduces the negative impact of freight on a city's residents.

When planned well, bypasses and ring roads can also improve the efficiency of logistics by reducing travel time (thus cost) for freight.

### When is this measure most effective?

This measure is most effective when the city is a key node for national freight transportation but when most of the trips do not originate or terminate within it.

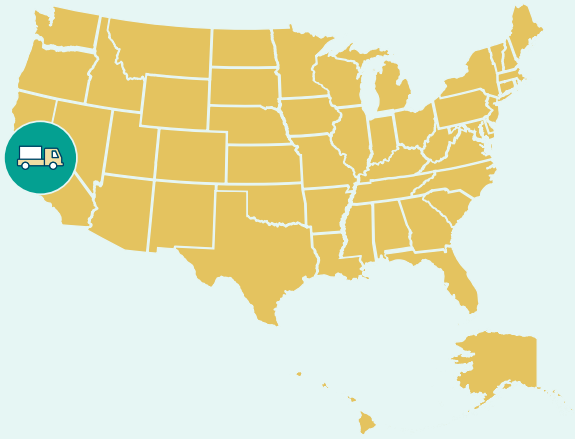
### Monitoring metric

The effectiveness of bypasses and ring roads can be measured by ton-through/total tons. This metric considers the share of through-freight in total freight tons.

### Implementation process

Developing bypasses and ring roads requires significant investment and approvals from state and central agencies. The following activities are required:

- Research extensively on the need, benefits, investments, and trade-offs for bypasses and ring roads.
- Prepare a plan comprising land and cost estimate, time frame, and key stakeholders.
- Consult with stakeholders for inputs on the plan.
- Submit the plan to the state and central agencies for approval.
- Roll out and monitor the plan.



### Case study California, United States

CalTrans analysed the need for a bypass to overcome severe truck bottlenecks in California. A bypass can provide more than 8 percent return on investment through time and cost saving for logistics vehicles. The bypass can also resolve choke points and congestion, and ease and improve the reliability of goods movement in the San Francisco Bay Area and California Central Valleys.[25]

# J. Modal shift planning

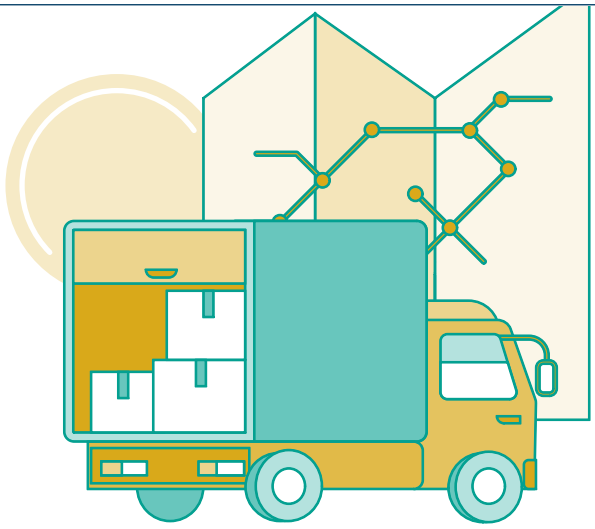
## Context

Most freight delivery happens via road even in cities with potential for freight movement by train or on water. Modal shift planning is required to efficiently integrate alternative modes of transport.

## When is this measure most effective?

This measure is most effective when the majority of the freight is transported-through freight and the existing rail or waterway infrastructure is underutilised.

**Rail networks can play an active role in optimising deliveries.**



## Description

Modal shift planning builds the capacity of existing railways or waterways to shift freight movement from roads. Rail is a more efficient mode for transportation over long distances (greater than 250 km) and is relatively isolated from the urban core. For cargo movement between port cities, waterways are also a viable option.

Alternative infrastructure, if planned and developed efficiently, mitigates congestion and carbon emissions without an adverse influence on the time and cost for logistics.

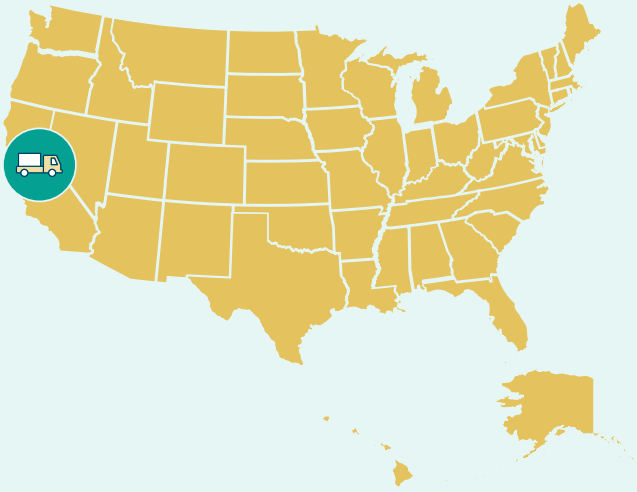
## Monitoring metric

The effectiveness of modal shift planning can be measured by ton-through/total tons. This metric considers the share of through-freight in total freight tons. It can also be assessed through the proportion of freight moved by road vis-a-vis other modes of transport.

## Implementation process

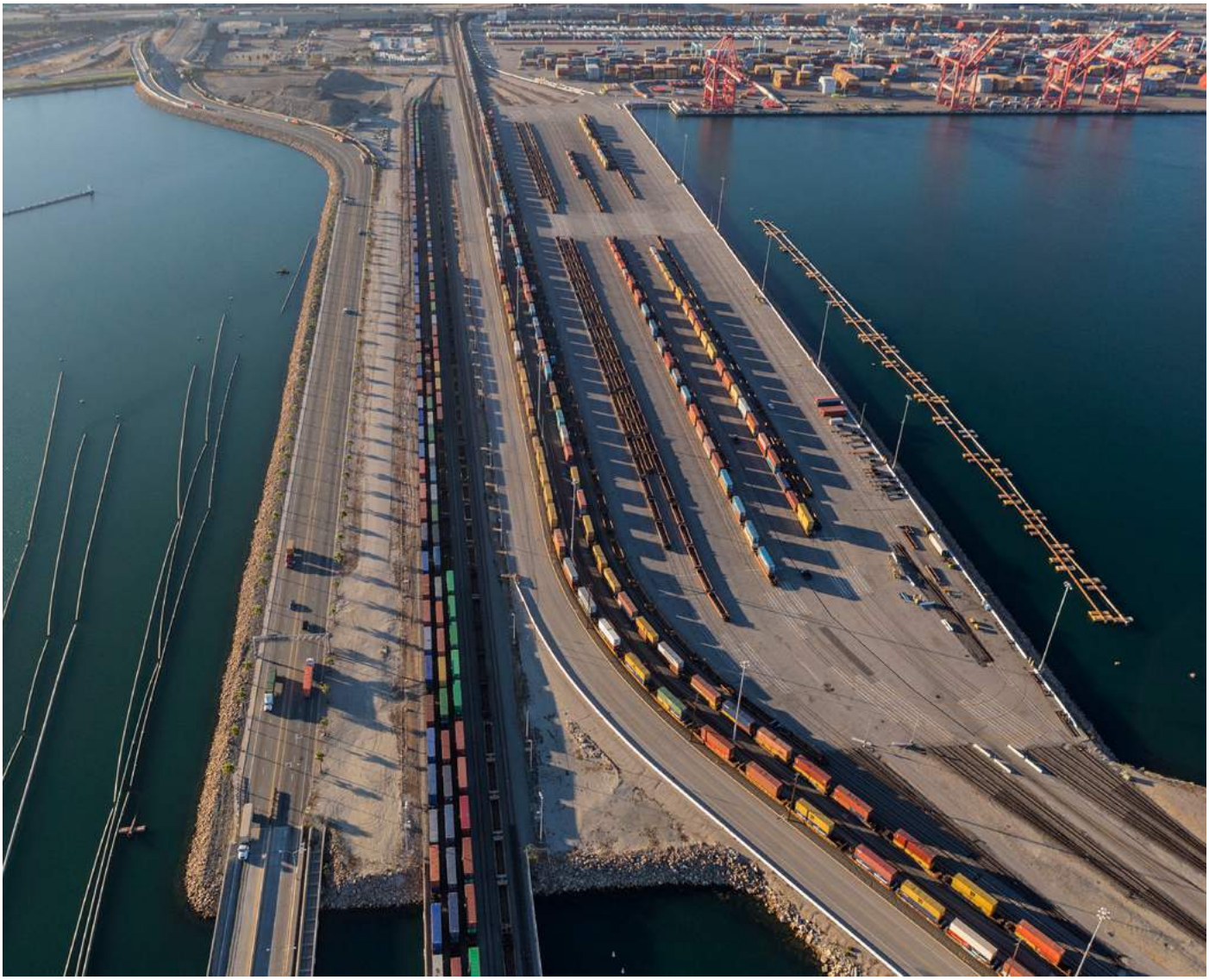
Cities need to work with states and central agencies to implement this measure. The following are required:

- Identify the use cases with potential for modal shift, especially to rail.
- Investigate the feasibility and assess the benefits from a modal shift.
- Prepare a modal shift plan comprising infrastructural, operational, legal, and financial requirements.
- Consult with the stakeholders for the modal shift plan.
- Seek approval from the state and central agencies.
- Build the infrastructure required to implement the plan.
- Roll out and monitor the plan.



### Case study California, United States

The ports of Los Angeles (LA) and Long Beach in California manage 20 percent of the shipments entering the United States. As a result, there is enormous through-freight in LA. Before 2002, the port had only four low speed railway lines with multiple crossings, limiting the rail capacity, adding to road traffic waiting for trains to pass, and causing air pollution. Alameda Corridor, a high capacity below-grade rail line with a daily capacity of 150 trains, was constructed to overcome these problems. The Corridor eliminated approximately 12 million truck trips of through-freight per year.[26]



## K. Parking and unloading zones

### Context

Often, delivery vehicles travel more for operations than driving between stops. This reduces delivery productivity as trucks spend time looking for parking and block lanes meant for pedestrians or passenger traffic. Providing parking infrastructure removes these inefficiencies.

### Description

Creating dedicated parking and unloading zones in cities involves allocating specific spaces for freight use. These spaces are designed to support the use of tools such as hand carts or wheeled crates that make delivery easier. This can be done in multiple ways:

- Amending building codes to mandate freight unloading provisions
- Creating time-of-day restrictions that benefit freight parking
- Allocating kerb space for parking and unloading
- Revising parking pricing policies to prioritise freight

### When is this measure most effective?

Parking and unloading zones are most effective when there is congestion and delivery delay in cities due to insufficient and/or haphazard parking.

### Monitoring metric

Delivery productivity can be used to evaluate the effectiveness of parking and unloading zones. It is measured by the number of deliveries per day or per hour.

### Implementation process

The focus should be to understand policies that can work in a particular city as this measure involves making regulatory amendments. Stakeholders need to be consulted first to understand the existing status and plan infrastructure. This consultation should include:

- Freight industry groups to gauge freight movement patterns.
- City planning bodies to learn of land use constraints.
- Civil society organisations and citizen interest groups (especially from areas directly affected by policy amendments).

Following this, the government can proceed to amend and enforce policies that enable freight parking in cities.

**Case study Barcelona, Spain**

Barcelona adopted several methods to create parking and unloading infrastructure along major freight hotspots in the city. Firstly, the city amended its building codes to mandate provision for loading and unloading space for deliveries in commercial establishments. Secondly, the city modified its street design to incorporate multi-use lanes with different functions depending on the time of the day. For example, during peak commuting hours, the major streets in tourist and shopping districts are reserved for passengers and buses. During off-peak hours, they are used for freight loading and unloading. This approach resulted in a 12 to 15 percent reduction in travel time for trucks.[27]

## L. Low-emission zones

### Context

Logistics vehicles, especially trucks, are a major source of pollution in cities, hampering liveability and public health. A diesel truck in India emits 1,300 tons of $CO_2$ over its lifetime. Demand for logistics is expected to rise significantly to meet the increase in demand for goods. Low-emission zones (LEZs) impose strict emission criteria for freight vehicles operating in the urban core.

### Description

LEZs are areas in the city where internal combustion vehicles are restricted. They allow only delivery vehicles meeting strict pollution emission standards. They can provide multiple benefits for the target area, such as environmental sustainability, improved air quality, and reduced noise pollution and congestion. They require effective control and enforcement through:

- Camera detection (investment heavy, e.g., London)
- Manual visual inspection (personnel heavy, e.g., German cities)
- Other technologies (e.g., radio-frequency identification (RFID) transponders)[28]

### When is this measure most effective?

This measure is most effective when air pollution is a city-wide concern and vehicular emissions in certain areas are disproportionately high.

### Monitoring metric

This intervention can be measured by emissions reduction in the region.

### Implementation process

The area and scope of an LEZ should be identified based on extensive investigation of major pollutants, exposed population, scale of congestion, local demographics, and vehicle ownership. Once an LEZ is identified, the city government will need to undertake the following steps:

- Engage stakeholders, both inside and outside the proposed LEZ, to analyse the LEZ's impact.
- Define the geographical extent, scale, allowed vehicle types, emission standards, and enforcement patterns and system for the LEZ.
- Introduce legal framework to implement LEZs and penalties for non-compliance.
- Collaborate with business groups, delivery providers, government authorities, and civil society groups to gain support and increase awareness.

**Case study London, United Kingdom**

London introduced LEZs in 2008 and has since increased the stringency of emissions standards from time to time. Compliance with LEZ mandates require low- or zero-emitting vehicles, which have higher upfront costs than conventional vehicles. For example, moving from the Euro III standard to the Euro IV standard costs approximately $4,100. Transitioning to Euro VI would require nearly $7,000. This cost of compliance accelerates the switch to zero-emissions vehicles (ZEVs).[29]

Urban freight deliveries can be optimised through use of technology.

## 2.4 Technology adoption

In supply chain operations, digitisation and technology are crucial to improving logistics efficiency and curbing the negative effect of freight movement. Digitising transportation and inventory management can optimise trip distances, duration, and improve operational safety. Similarly, promoting the use of fuel-efficient technologies and ZEVs can reduce costs and emissions.

**Table 5** Technology adoption measures

| Implementation measures | Definition | Case study |
|---|---|---|
| **M. Using Intelligent Transportation Systems (ITS)** | Using advanced technology and digital intelligent decision-making tools to make existing infrastructure efficient | Truck Parking Information System and Integrated Corridor Management Systems in Michigan, United States |
| **N. Promoting electrification of urban freight** | Deploying electric vehicles for deliveries to reduce costs and emissions | Electric logistics vehicles (ELVs) in Shenzhen, China |

## M. Using Intelligent Transportation Systems

### Context

Delivery vehicles caught in traffic create inefficiencies. Intelligent Transportation Systems (ITS) use advanced technology and intelligent decision-making to make existing infrastructure for freight transportation more efficient.[30]

### Description

ITS have different applications that process and share information to enhance traffic management, reduce congestion, increase cost-benefit, and minimise the carbon footprint.[31] The key benefits of using ITS are:

- Speed control
- Travel time management
- Congestion abatement
- Reduction in stops and delays at intersections
- Decline in accident rates

### When is this measure most effective?

This measure is most effective in highly congested cities with a high rate of accidents.

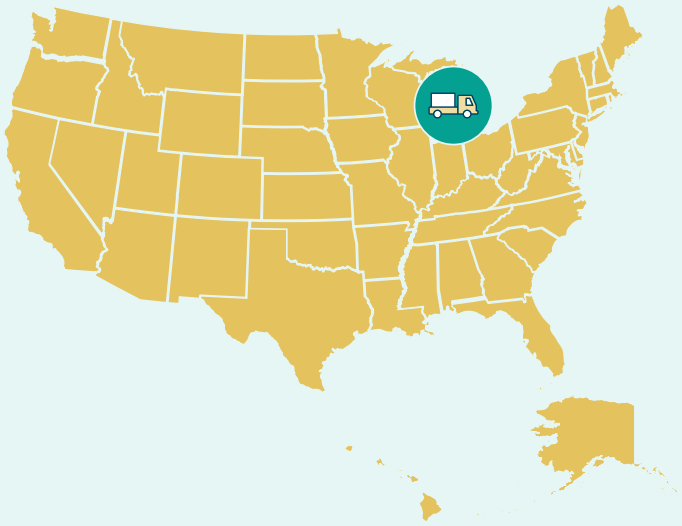
### Monitoring metric

Routing efficiency is used to monitor ITS. This enhances productivity without compromising the liveability of residents.

### Implementation process

The steps to implement ITS for logistics delivery in Indian cities are:

- Identify ITS needs of the city in terms of congestion management, predictability of journey time, and effective operation of logistics.
- Consult with the city government and logistics operators to define functional requirements and operating procedures for the ITS.
- Roll out guidelines for logistic vehicles.
- Set up mechanisms to collect, process, and share information.



**Case study Michigan, United States**

Michigan Department of Transportation (MDOT) Intelligent Transportation Systems (ITS) Program has been deploying ITS since the 1960s. In 2014, MDOT deployed the First Truck Parking Information System and the Integrated Corridor Management Systems in Michigan for efficient management of freight.[32] The MDOT's three transportation operation centres and the Blue Water Bridge Operation Center (BWBOC) operate these systems to monitor roadways and manage traffic. MDOT has partnered with the truck driving community, private truck stop operators, and other private players to successfully operate the ITS.

## N. Promoting electrification of urban freight

### Context

Currently, 10 percent of freight emissions in India are from urban freight. This share is expected to grow by 114 percent by 2030.[33] EVs have lower operational costs and zero tailpipe emissions, which can help improve the air quality.

### Description

India's freight vehicles rely primarily on diesel. With increasing import prices, high dependence on diesel is both environmentally and economically concerning. EVs emit 15 to 40 percent less $CO_2$ than internal combustion engine vehicles. Their operational cost is lower. Promoting electrification of freight in Indian cities is thus advantageous.

### When is this measure most effective?

This measure is most effective in areas with high air pollution and poor health due to air quality.

### Monitoring metric

This intervention can be measured by the percentage of electric freight vehicles sold in the city and reduction in delivery emissions.

### Implementation process

Several interventions have been proposed at the national and state level to promote the electrification of urban freight. Despite this, adoption has been low. The following measures can accelerate the transition:

- **Policy:** Consult with the state government to include freight in EV policies, particularly fiscal incentives such as upfront subsidies and road tax and registration cost exemptions.
- **Regulatory:** Introduce measures such as idle parking and plying allowances, remove entry restrictions for freight EVs, demarcate LEZs, and offer preferential registration for EVs.
- **Charging infrastructure:** Work with electric distribution companies and charging providers to build commercial charging infrastructure in the city.
- **Awareness:** Run consumer-facing and industry-facing awareness programs on electrification of commercial vehicles.

### Case study Shenzhen, China

Shenzhen is a global leader in the deployment of electric logistics vehicles (ELVs). Approximately 300 operative ELVs were registered in Shenzhen at the beginning of 2015, and that number grew to 61,857 by the end of 2018. ELVs in Shenzhen have inbuilt telematics boxes that report GPS coordinates, battery data, and engine data to an aggregated new energy vehicle data monitoring platform. Subsidies, mandates, preferential road access, and economical electricity rates were major drivers for the adoption of ELVs.[34]

# 3.0
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# About us

Department of Commerce
Ministry of Commerce & Industry
Government of India

## Department of Commerce, Ministry of Commerce and Industry

The Department of Commerce under Ministry of Commerce and Industries aims to make India a major player in the world trade by 2020 and assume a role of leadership in the international trade organizations commensurate with India's growing importance. The medium-term vision is to double India's exports of goods and services by 2017-18 over the level of 2008-09 with a long-term objective of doubling India's share in Global trade.

INDIA LOGISTICS

## Logistics Division, Department of Commerce, Ministry of Commerce and Industry

The Logistics Division was set up on 7 July, 2017 as a consequence of the Government of India (GoI) Rules, 1961 in the Department of Commerce, Ministry of Commerce and Industry. The division is headed by a Special Secretary to GoI and aims to develop an Action Plan for the integrated development of the logistics section in the nation, by introducing various policy changes, advances in existing procedures, finding of bottlenecks and gaps and introduction of technology in this sector.

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## RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policy makers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing.

RMI INDIA
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## RMI India

RMI India is an independent organisation. RMI India takes inspiration from and collaborates with RMI, a 40-year-old non-governmental organisation. RMI India's mission is to accelerate India's transition to a clean, prosperous and inclusive energy future.

Enhancing urban freight systems: A handbook of measures on performance improvement, July 2021

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