City-Level Logistics
Best Practices Handbook

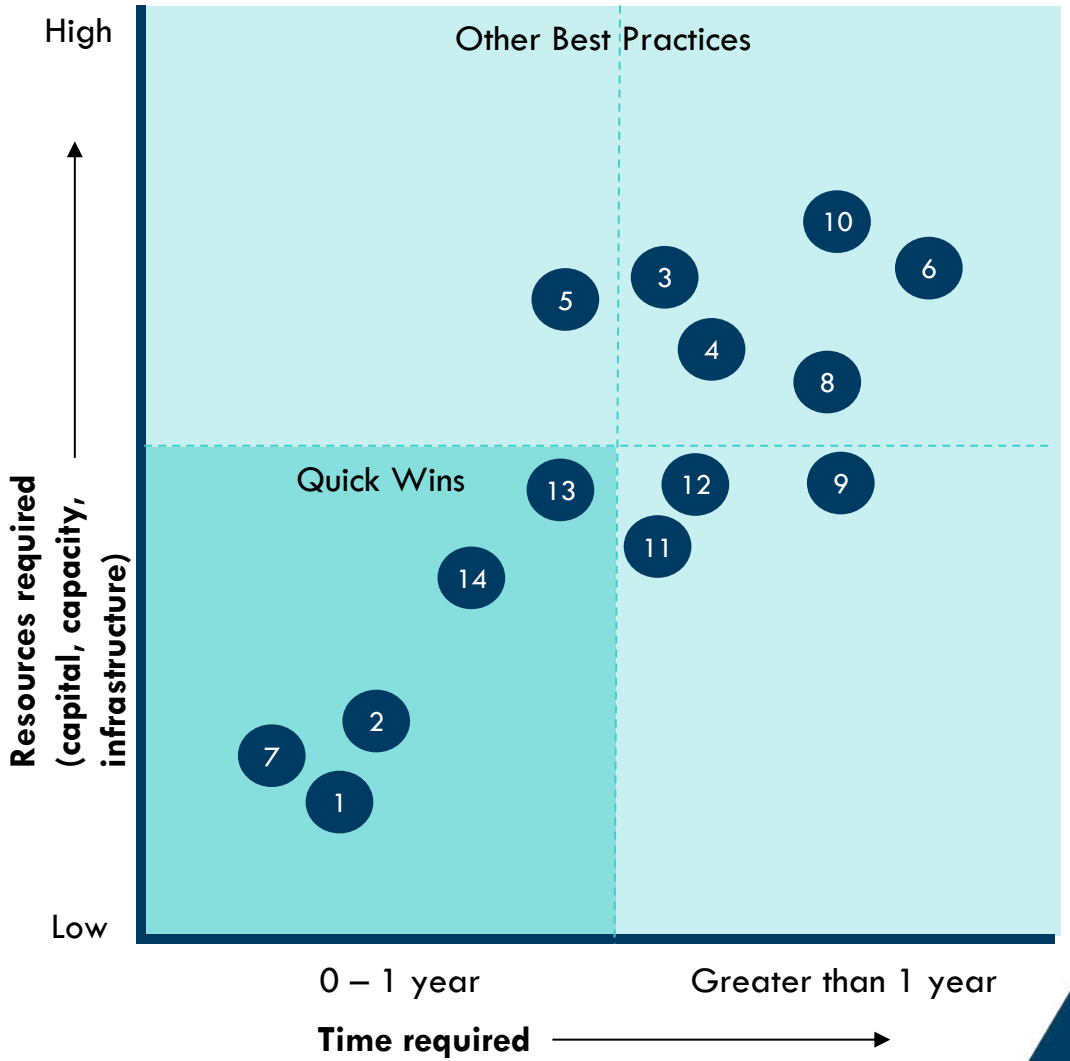
May 2021

About this Handbook

What are logistics best practices and quick win measures?

This handbook consists of best practices that can be used by cities to improve the efficiency of urban freight. Some of these are 'quick wins' – measures that can be enacted within a short timeline and existing resources available to municipal corporations. Below is a menu of the same.

Vehicle use optimization	1. Night-time deliveries 2. Developing truck routes 3. Reverse logistics
Infrastructure development	4. Urban consolidation centers 5. Urban logistics spaces and logistics hotels 6. Logistics developments and logistics parks 7. Parcel delivery terminals
Demand and land use planning	8. Industrial planning 9. Bypasses and ring roads planning 10. Modal shift planning 11. Parking and unloading zones 12. Low-emission zones
Technology adoption	13. Use of Intelligent Transportation Systems 14. Promoting electrification of urban freight



Vehicle use optimization

1. Night-time deliveries
2. Developing truck routes
3. Reverse logistics

Night-time deliveries

Context

Cities often lack suitable road infrastructure in the day, adding to a city's congestion, noise, emissions and air pollution. This creates inconvenience for citizens at peak times, and inefficiencies in delivery. **Night-time deliveries** shifts truck traffic to the night at off-peak hours when roads are empty.

Description

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

- Reduced delivery time and increased delivery efficiency
- Reduced risk of delay in deliveries
- Optimized economic viability of freight drivers
- Reduced causality risk; thus, increasing road safety
- Reduced air pollution as trucks don't stay struck in jams with running engines

When is this measure most effective?

This measure is most effective in congested cities with:

- narrow roads,
- high congestion at peak hours, and
- lack of parking space for vans and other delivery vehicles.

Source: FedEx

Night-time deliveries

Monitoring Metric

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

Implementation Process

Night-time deliveries can be implemented by undertaking the following steps:

1. Identify use cases where night-time delivery can be implemented.
2. Host consultations with delivery providers and delivery recipients.
3. Roll out a legal/regulatory framework restricting daytime delivery as well as noise standards for trucks moving in the night.
4. Ensure agreements between the suppliers and the receivers on delivery timing.
5. Monitor the deliveries in the city and evaluate the impact on congestion during the day-time

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

Case Study: Barcelona, Spain[1]

Barcelona, Spain worked with grocery store chains to allow night-time deliveries with modified trucks that cause less noise pollution. This was done in order to displace daytime deliveries by smaller trucks and vans. This significantly reduced delivery costs, replacing seven daytime trips of medium duty truck with a single night-time truck. This also resulted in reduction of logistics vehicle congestion during peak hours of the day.

Sources: 1. Dablanc, et al. "City Logistics Best Practices: a Handbook for Authorities" (2015).
2. Mercadona. "Mercadona Environmental Policy" (2010).

Developing truck routes

Context

Trucks operating on urban roads often leads to congestion and long traffic jams. Thus, developing separate routes for truck operation, providing access to urban core, enhances the delivery efficiency of the truck and decongests the routes for passenger vehicle movement.

Description

Developing truck routes play a significant role in managing freight as it provides access for trucks to urban core. Extensive research needs to be done before developing truck routes so that it doesn't add inefficiencies in delivery viz. route circuity, banning access to key freight locations. Truck routes should cover all key freight generation and delivery sites, while minimizing the negative externalities that truck activity impose on residents.

When is this measure most effective?

The measure is most effective when majority of the freight is through-freight being transported on large trucks. Routing such trucks through separate corridors helps decongest core urban roads and decrease other negative externalities.

Source: The Journal of Commerce Online

Developing truck routes

Monitoring Metric

Routing efficiency can evaluate the truck routes. This refers to how efficiently the operator manages various stops on a delivery tour without compromising the livability of residents.

Implementation Process

Following steps need to be taken to implement this measure:

1. Mapping of the major routes for movement of trucks in the city.
2. Identify routes (existing/new) for movement of trucks to minimize the overall impact on the livability of residents/
3. Assess the potential impact of developing truck routes on efficiency, time, and cost of freight movement.
4. Prepare a plan for developing truck routes.
5. Introduce legal framework restricting freight vehicles only to truck routes.
6. Periodically review the effectiveness of truck routing schemes in the context of changing land use.

New York City Truck Routes[1]

Case Study: New York City, USA[1]

New York City in the US 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, driver should only use non-designated routes at the beginning or end of a trip. The Through Truck Route Network has neither an origin nor destination within the borough and majorly operates on highways.
In 2017, assessment of New York routing system reflected that only 5% of city's roads were accessible to the fright operators. It showed the need to periodically review the routing schemes with changing land use and zoning policies.

Sources: 1. New York City Department of Transportation. "New York City Truck Route Management and Community Impact Reduction Study" (2007).

Reverse logistics

Context

During final-mile deliveries, after delivering the product to the recipient, the driver has to return to the origination point with an empty load. Thus, e-commerce can use **reverse logistics** where the driver also picks up retuned goods in order to avoid empty running.

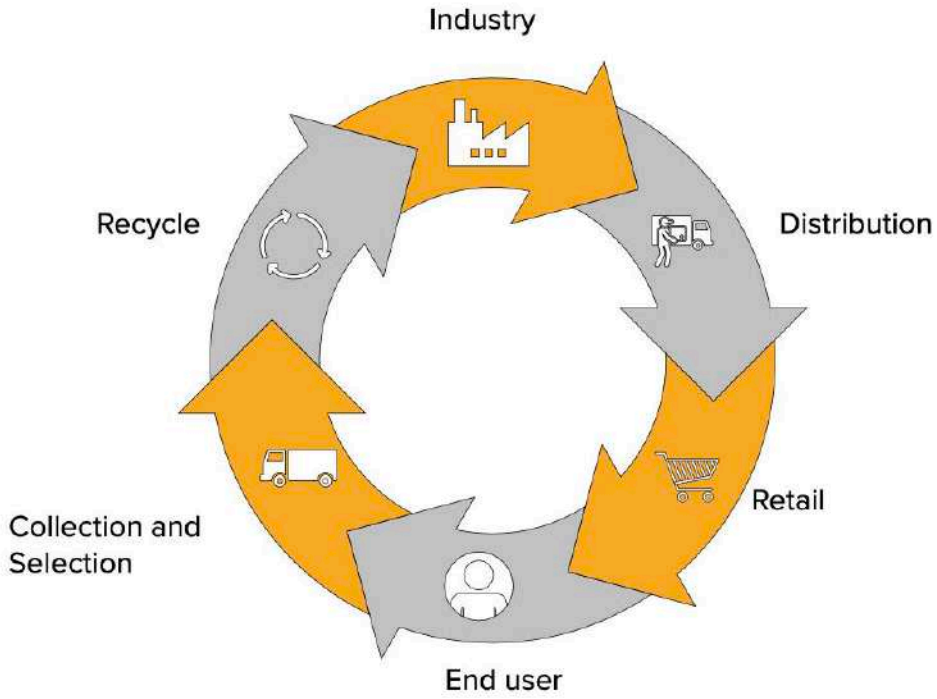
Description

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 monetize 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.
- When the outbound freight needs to recycled, refurbished or safely disposed.



Source: Ministry of Housing and Urban Affairs and RMI. "Efficient Urban Freight" (2019).

Reverse logistics

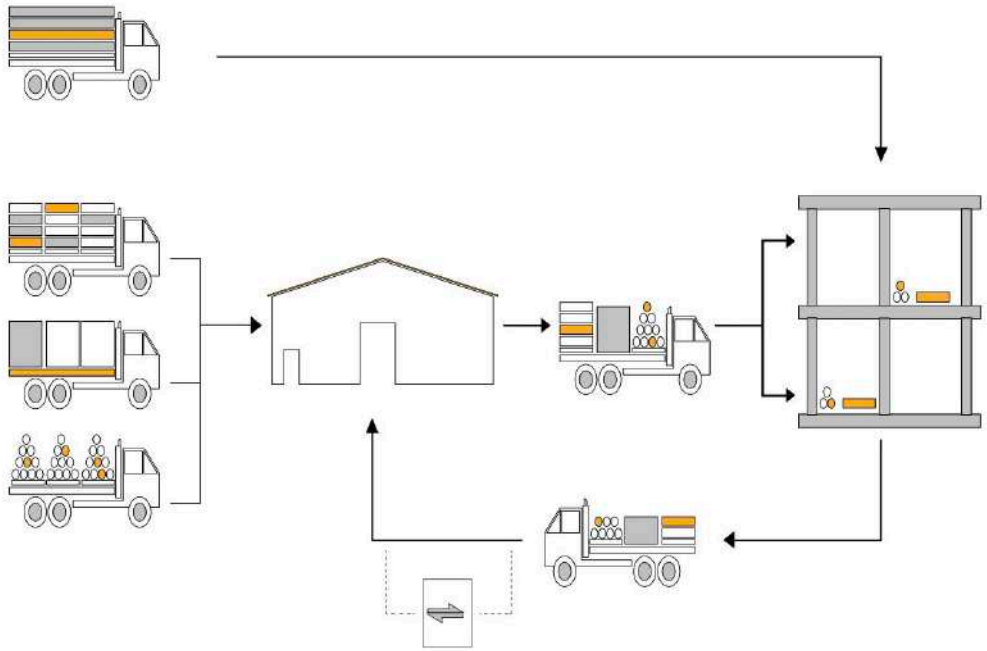
Monitoring Metric

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 it is not loaded)

Implementation Process

The following can be done to facilitate reverse logistics:
1. Identify opportunity sectors/ use cases to implement reverse logistics.
2. Undertake cost benefit analysis of integrating outbound freight integration.
3. Management and operation of reverse logistics.
4. Whenever applicable, recycling/ refurbishing/ disposal of outbound freight.

Construction Consolidation Center[2]



Case Study: London, UK[1]

The London Construction Consolidation Center served both as a consolidation point for inbound deliveries of construction materials to building sites in the city center 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.

Sources: 1. Transport for London. "London Construction Consolidation Centre: Final Report" (2008).
2. Greger Lundesjo, The Logistics Business - Working together for a world without waste

Infrastructure development

4. Urban consolidation centers
5. Urban logistics spaces and logistics hotels
6. Logistics developments and logistics parks
7. Parcel delivery terminals

Urban consolidation centers

Context

Vehicles running empty or partially loaded increase delivery costs and reduce efficiencies. Consolidating loads optimizes the carrying capacity of goods vehicles.

Description

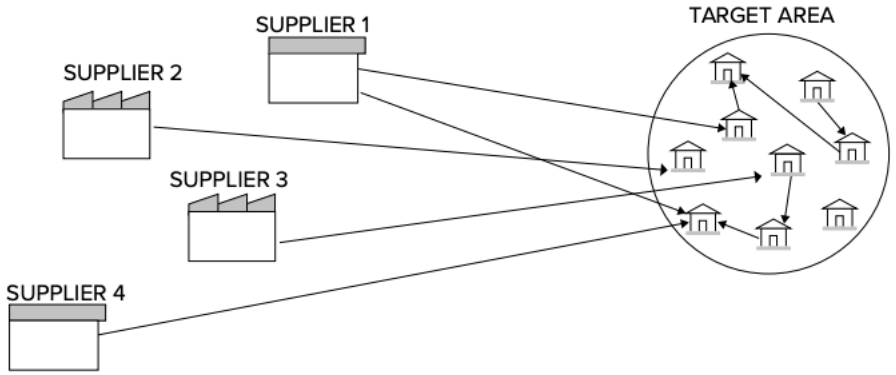
Urban consolidation centers (UCCs) are government-run or subsidized warehouses located in the urban core that act as a consolidation point for shipments arriving in the city.
Trucks drop off loads at consolidation centers, following which smaller loads are combined and picked up for final-mile deliveries. UCCs help maximize the delivery load factors, improving efficiency of urban logistics.

When is this measure most effective?

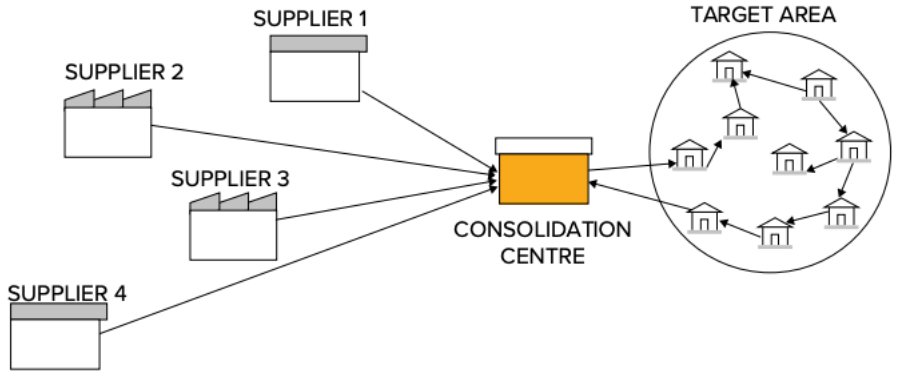
UCCs are most effective when:

- 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.

Deliveries before establishment of UCC



Deliveries after establishment of UCC



Source: Columbia University, "Going the Last Mile" (2017).

Urban consolidation centers

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:

1. Share of rated loading capacity (when vehicle is loaded)
2. Share of driving (when it is not loaded)

Implementation Process

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

1. Promoting collaboration across private sector players.
2. Stakeholder consultation to allocate land for UCC.
3. Developing a source of funding (publicly funded or using PPPs).
4. Developing a revenue model for UCC.
5. Onboarding suppliers and logistics partners.

Developing longer term policy that incentivizes consolidation through subsidies and mandates can ensure the long-term sustainability of UCCs.

UCC in Motomachi shopping district, Yokohama, Japan[2]

Case Study: London, UK

Four local councils in London collaborated to develop a 2,000 sq.ft. UCC to sort and consolidate deliveries. They first ran the project as a pilot where between 400 and 500 items in two product lines (stationery and cleaning products) were processed daily. Final mile delivery was conducted on pre-planned and optimized 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 over 70%, reducing total distance travelled by vehicles by 45%.

Sources: 1. Browne, et al. "Evaluating the use of an urban consolidation centre and electric vehicles in central London" (2011).
2. MetroFreight Consortium. "City Logistics: Concept, Policy, Practice"

Urban logistics spaces and logistics 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 center and the recipient. Creating **Urban Logistics Spaces and Hotels** within urban core of the city can help minimize this distance.

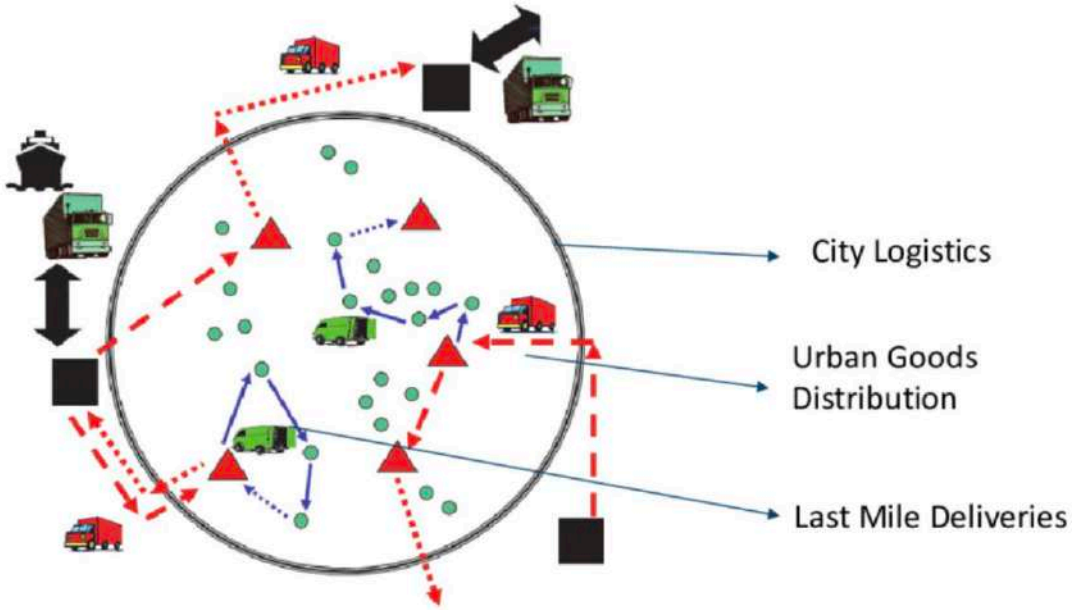
Description

Urban logistics spaces (ULS) are developed within the urban core to temporarily store goods prior to urban deliveries. The goods are then efficiently delivered using different vehicle segments for the final mile delivery. Thus, a ULS increases the delivery efficiency and reduces resource consumption.
Urban logistics spaces and hotels require land within urban core with high potential for critical urban logistics delivery.

When is this measure most effective?

ULS are most effective when: [1]

- Existing logistic centers are far away from the urban core and cost of delivery is extremely high.
- City can own or decide on the use and rent of the spaces identified as ULS.



Source: Cardenas, et al. "City logistics, urban goods distribution and last mile delivery and collection." Competition and Regulation in Network Industries 18.1-2 (2017): 22-43.

Sources: 1. Dablanc, et al. "City Logistics Best Practices: a Handbook for Authorities" (2015).

Urban logistics spaces and logistics hotels

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. This is also linked to negative externalities such as high delivery distances or high usage of heavy vehicles.

Implementation Process

The following can be done to set up Urban Logistics Spaces in the cities: [2]

1. Identifying accessible places, with low rental costs in core urban areas of the city, e.g., multistorey car parks.
2. Inviting applications from tenants stating interest, potential benefits, and quote.
3. Shortlisting of tenants and designing terms of reference based on criteria to reduce congestion, pollution, and efficiency of the system of urban distribution.
4. Operating the ULS using a Public Private Partnership (PPP) model.

Chronopost Logistics Delivery[1]

Case Study: Paris, France[3]

Paris facilitated urban consolidation by making available parking garages (between 100 and 250 square meters) as urban logistics spaces. These spaces are typically used by delivery companies to bundle deliveries within its own supply chain. Chronopost, a French parcel delivery company, which is the main tenant of one such facility, is massing and pooling its flows, while coming closer to recipient. Thus, it is reducing the VKT (vehicle kilometers travelled), traffic congestion, and carbon footprint. [3]
Paris also introduced another similar concept larger in scale than the ULS, called the **Urban Logistics Hotel**, for use by multiple tenants.

Sources: 1. Mairie De Paris. "Sustainable urban logistics: City of Paris".
2. Dablanc, et al. "City Logistics Best Practices: a Handbook for Authorities" (2015).
3. Le Groupe la Poste. "How Urban Logistics Can Contribute to Sustainable Cities" (2019).

Logistics developments and logistics parks

Context

There is a need for organized hub where activities related to logistics are consolidated and centralized. **Logistics developments and logistics park** include warehousing infrastructure, transportation infrastructure and customer services.

Description

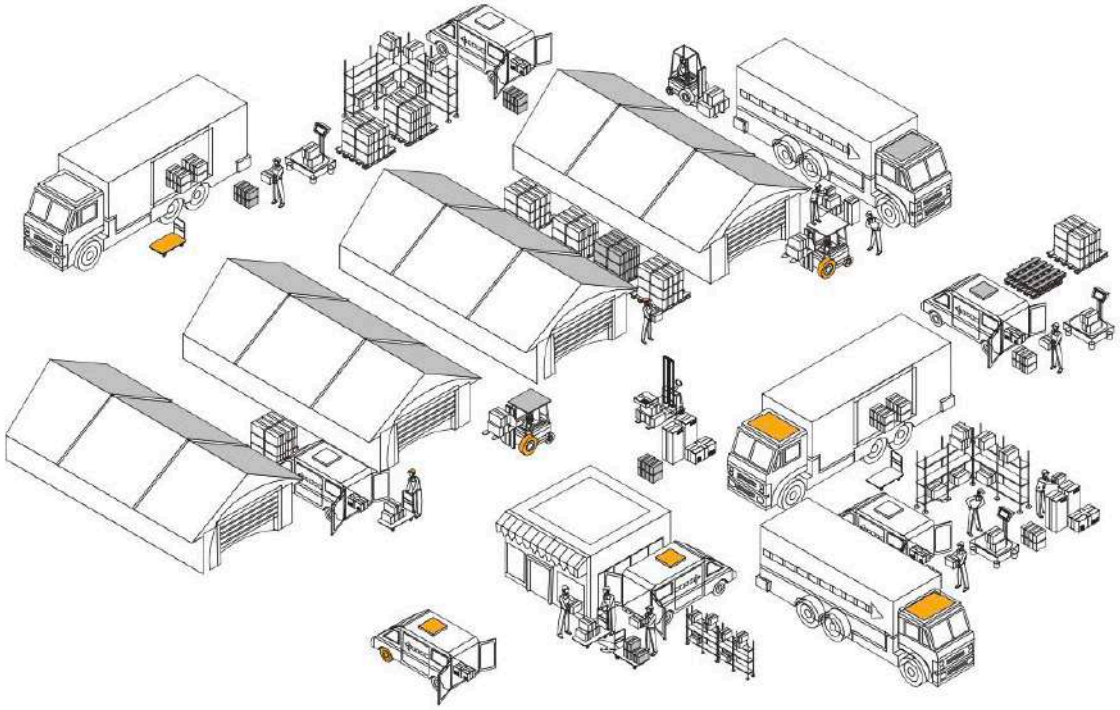
Logistic Parks allows the aggregation of industrial and logistics activities at a single facility. Thus, it enhances load factors, enabling multimodal transport, and making transportation of bulk freight cost-effective to improve competitiveness. Logistics park at strategic locations can provide: [1]

- Infrastructure enabling multimodal freight transfer (railside or portside)
- Mechanized material handling and specialized storage solutions viz., cold storage.
- Value added service (viz., customer clearances) and post-manufacturing activities (viz., sorting, grading).

When is this measure most effective?

Logistic Park is most effective when:

- Land is owned by cities and 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 waterways.



Source: Ministry of Housing and Urban Affairs and RMI. "Efficient Urban Freight" (2019).

Sources: 1. Mitra, et al. "Developing Multimodal Logistics Parks in India" ADB Briefs No. 142 (2020).

Logistics developments and logistics parks

Monitoring Metric

Logistics park evaluation includes assessment of (1) state of the logistics park viz., accessibility, finance, (2) operation of the facility viz., scale and activities and (3) social and environmental contribution viz., employment, carbon footprint

Implementation Process

Cities in consultation with State Government will need to undertake the following steps: [2]

1. Conduct feasibility study for developing logistics park, especially at locations that provide direct connection with rail freight and other multimodal transport.
2. Stakeholder consultation to identity barriers and prepare a strategy for efficient multimodal freight transfer.
3. Develop a public-private partnership framework identifying responsibility of the city and private players.
4. Shortlist eligible projects and set operational mechanisms.

Multi modal logistics park[3]

Case Study: Jogighopa, Assam[3]

In 2017, the Government of India approved 34 multimodal logistics parks across the country. The largest logistics parks to come up in Bengaluru, Chennai, Nagpur, Vijayawada, Surat, Hyderabad, and Guwahati. Jogighopa Multimodal Logistics Park, Assam is located in the Boitamari tehsil of Bongaigaon district, near Jogighopa town of Assam. The project is ~150 km from Guwahati and is 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/consolidation center for the North-Eastern states as well as a center for cross-border trade with Bangladesh, Bhutan, Nepal and Myanmar.

Sources: 1. Yingxiu, et al. "Evaluating the Performance of the Logistics Parks: A State-of-the-Art Review" (2017).
2. Mitra, et al. "Developing Multimodal Logistics Parks in India" ADB Briefs No. 142 (2020).
3. Bitrax Media. "Multi-Modal Logistics Park, Assam" (2020).

Parcel Delivery Terminals

Context

Final mile transport cost is high, sometime even 50% of the total transportation cost. This is because of the multiple delivery points and delivering 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 and thus, decreasing number of trips made and increasing delivery productivity. The terminals could be of two ways:

- Truck drops boxes at terminal in off-peak hours and bikes/scooters would make final deliveries during the day.
- Recipients collect their boxes from the terminals.

When is this measure most effective?

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

Source: Post and Parcel

Parcel Delivery Terminals

Monitoring Metric

Delivery productivity can be used to evaluate the effectiveness of Parcel Delivery Terminals. It is measured by the number of deliveries done per day or per hour.

Implementation Process

The following steps need to be undertaken to ensure smooth operations of parcel delivery terminals:

1. Identifying use cases for delivery terminals.
2. Consultation with potential private players/local communities interested in setting up such terminals.
3. Identifying land/area for installation of terminals, taking into consideration different factors such as cost, convenience, time and efficiency.
4. Installation of automated Smart Parcel Lockers suited to the delivery products.
5. Operation and monitoring of the Parcel Delivery terminals

Smartbox Concept[1]

Case Study: Smartbox, India[1]

Smartbox is an automated parcel delivery terminal available 24x7. Smartbox provides customized parcel locker solutions that solve last-mile delivery issues. Customers can register their Smartbox for parcel deliveries. As soon as their parcel is delivered, customers get a one-time password that can be used to unlock their delivery box while collecting packages. Smartbox also offers a card swipe on delivery service or cash on delivery options. Smartbox is operational in Delhi, Mumbai, Bangalore and Hyderabad.

Source: 1. Smartbox

Demand and land use planning

8. Industrial planning
9. Bypasses and ring roads planning
10. Modal shift planning
11. Parking and unloading zones
12. Low-emission zones

Industrial planning

Context

Setting up large industrial facilities in cities has the potential to create employment opportunities. However, it also contributes negatively to urban life by generating heavy truck traffic as well as noise and air pollution near residential/recreational areas. Long-term industrial land-use planning mitigates these impacts without compromising on jobs.

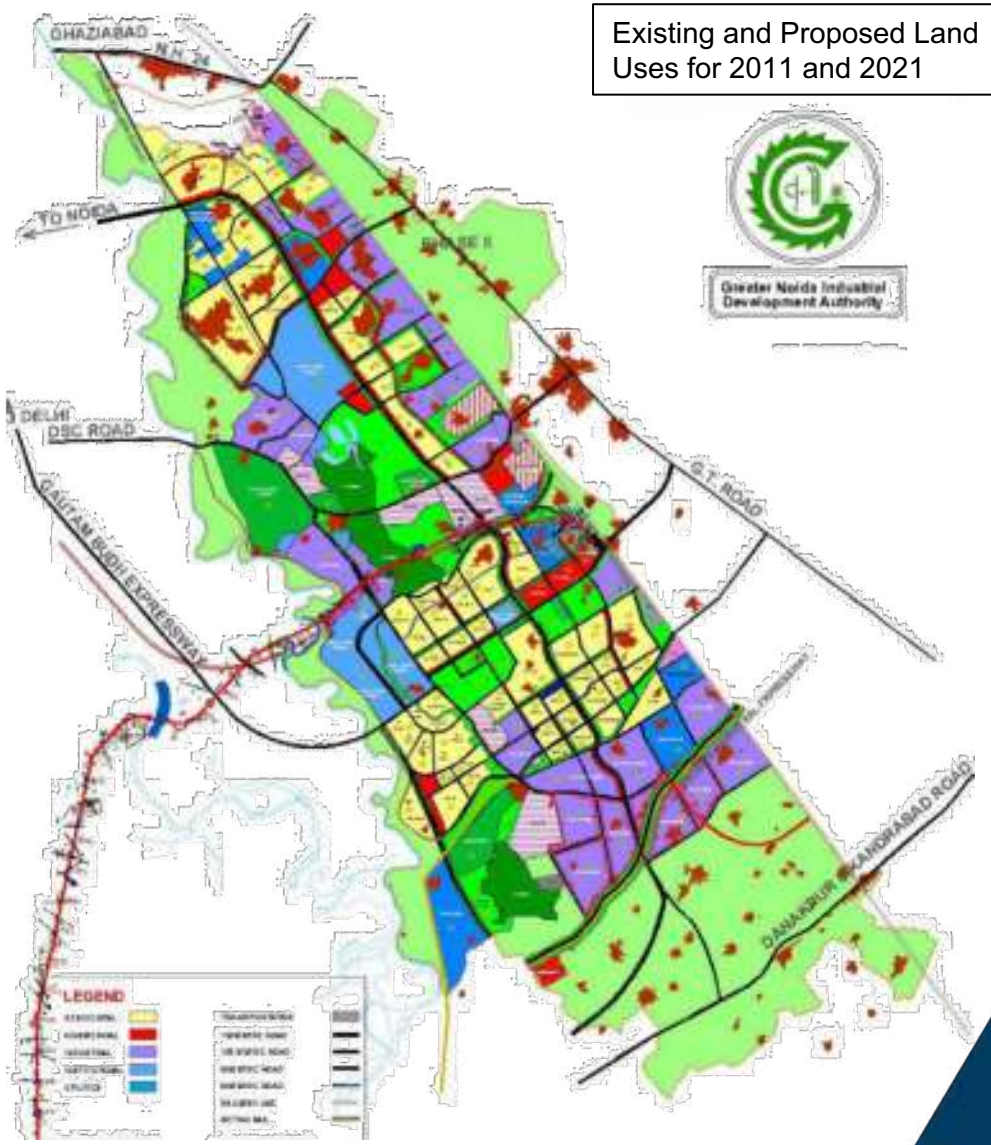
Description

Long-term **industrial planning** sets a vision for land-use in the city. Planning authorities designate manufacturing/industrial units in areas planned specifically for such activities. Industrial areas are 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.

Existing and Proposed Land Uses for 2011 and 2021



Source: Greater Noida Authority. "Existing and Proposed Land Uses for 2011 and 2021."

Industrial planning

Monitoring Metric

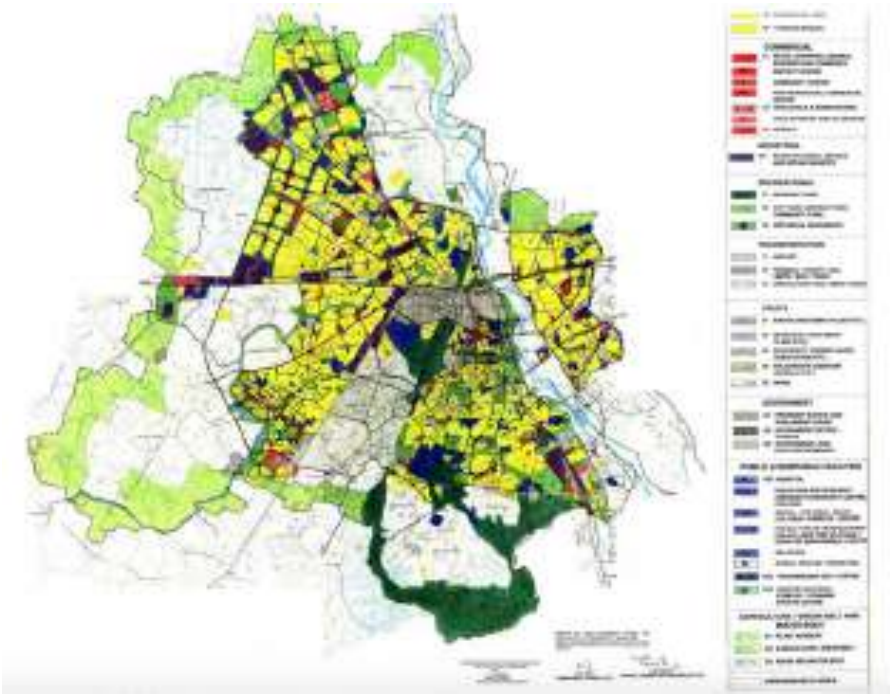
Freight intensity of the GDP is used to measure performance of this metric. Different industry produce distinct freight movement and thus, adding differently to cities GDP, e.g., heavy industry produce high freight demand per unit of GDP.

Implementation Process

Industrial planning firstly must be recognized as a long-term policy measure led by planning/development authorities but requiring the perspectives of various stakeholders for success. The following steps can be followed:

1. Conducting community surveys and analysis of existing land use policies.
2. Consulting with government departments, industry, CSOs, and residents to understand current challenges and future needs of the city.
3. Engaging urban planners to propose options of a future industrial plan.
4. Revising proposed plan based on feedback from stakeholders.
5. Creating action plans for implementing industrial plan.
6. Setting up monitoring, reporting, verification processes to ensure compliance.

Delhi Master Plan 2021[1]



Case Study: Delhi[1,2]

The Delhi Development Authority created the Delhi Master Plan, Vision 2021 in 2005, and in 2021 approved the Delhi Master Plan 2041. The plan provides a framework to guide future growth in the capital, enabling stakeholders to know the policies that apply to land parcels. The 2041 Plan particularly hopes to reduce pollution in the city, divides the urban region into residential, commercial, and industrial zones. It reinforces zoning restrictions to ensure negative health impacts to residents from industries are reduced.

Source: 1. Delhi Development Authority.

2. Aujaz, Rumi. "Master plan for Delhi 2021-2014: Expected scope and challenges" Observer Research Foundation (2021).

Bypasses and ring roads planning

Context

Goods moving through a city are often neither produced nor consumed in the area. This “through-freight” movement generates truck traffic without contributing significantly to the urban economy. **Bypasses and ring roads planning** provides a way to re-route this traffic away from the city.

Description

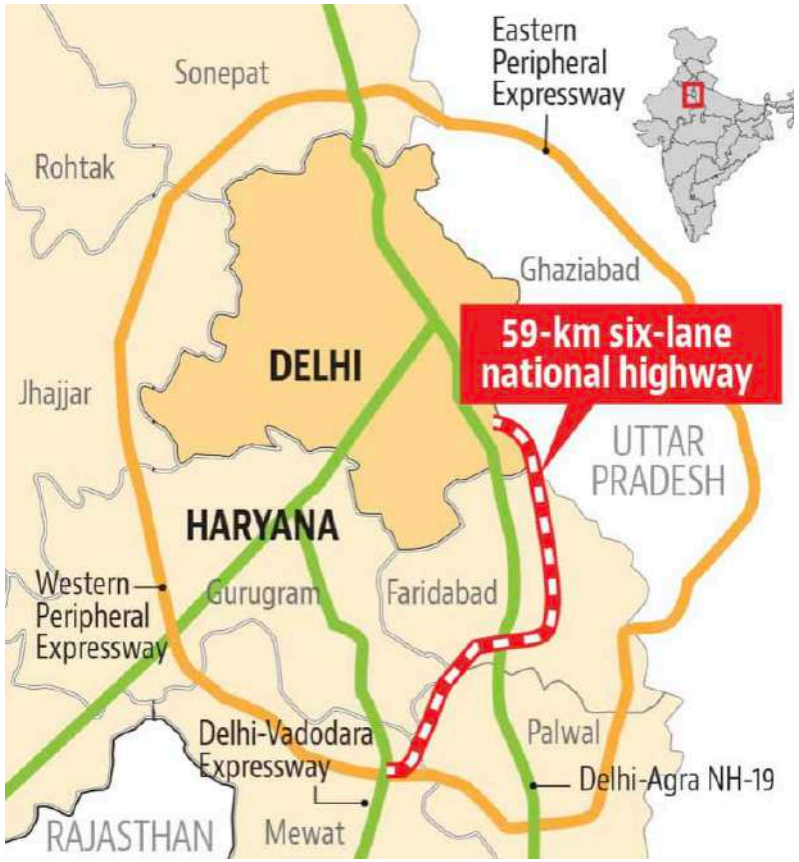
Bypasses and ring roads planning creates routes for heavy transport around a city rather than through it. They are a common tool to manage demand by minimizing the need for travel in inner streets which may be designed for lower capacities. Hence, they directly reduce the negative impacts of freight for residents living within city limits.

When planned well, bypasses and ring roads can also improve 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 without majority of the trips originating or terminating within it.

Eastern Peripheral Expressway to divert trucks from Delhi



Source: Hindustan Times

Bypasses and ring roads planning

Monitoring Metric

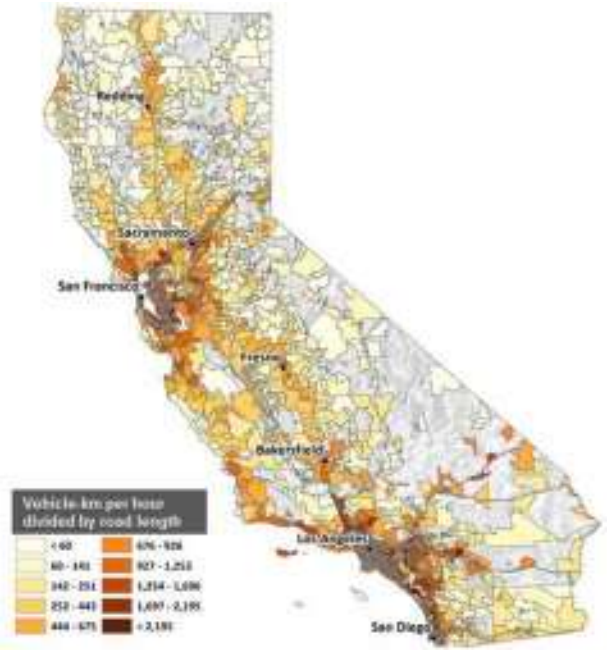
The effectiveness of bypasses and ring roads can be measured by **ton-through/total tons,** which looks at the share of through-freight in total freight tons.

Implementation Process

Developing bypasses and ring roads requires significant investments and approvals from state and central level agencies. To implement this measure following needs to be done:

1. Extensive research on the need, benefits, investments, tradeoffs, etc.
2. Prepare a plan comprising land and cost estimate, time frame, key stakeholders, etc.
3. Undertake extensive stakeholder consultations to seek inputs on the plan.
4. Submit plan to state/central agency for approval.
5. Roll out and monitoring of the plan.

State of California: Traffic Density by Zip Code[1]



Case Study: California, USA[2]

In order to overcome severe truck bottleneck in California, CalTrans analyzed the need for a bypass in the state. The bypass can provide multiple benefits such as time and cost saving for logistics vehicles, and over 8 per cent return on investment (RoI). Other than the RoI, the bypass could provide other advantages viz., reduction in congestion by diverting trucks to the bypass, ease goods movement in the San Francisco Bay Area and California Central Valleys, resolve choke points, and improve reliability of goods movement.

Source: 1. California Environmental Health Tracking Program and the Office of Environmental Health Hazard Assessment
2. Caltrans

Modal shift planning

Context

Even in cities with potential of freight movement via train or on water, majority of the freight delivery happens via road. In order to efficiently use other modes such as rail or waterways, there is a need for **modal shift planning**.

Description

Modal shift planning builds the capacity of existing railways or waterways in order to shift freight movement from roads. Rail is a more efficient method of freight movement over long distances (over 250 kms) and is relatively isolated from the urban core. For cargo that needs to be moved between port cities, shifting modes to water is also a viable option.
Hence, improving alternate modes of infrastructure mitigates negative transport externalities viz., congestion and carbon emissions, without having negative influence on time and cost of logistics delivery, if planned efficiently.

When is this measure most effective?

The measure is most effective when majority of the freight is through-freight, and there is presence and underutilization of existing rail or waterway infrastructure.

Source: Inter India Group

Modal shift planning

Monitoring Metric

The effectiveness of modal shift planning can be measured by **ton-through/total tons,** which looks at the share of through-freight in total freight tons. It can also be assessed through proportion of freight moved by road vs. other modes.

Implementation Process

Cities need to closely work with states and central agencies to implement this measure:

1. Identify the use cases with potential of modal shift, especially to rail.
2. Investigate the feasibility and assess the potential benefits of mode shift.
3. Prepare a modal shift plan comprising infrastructure and cost requirements as well as operation and legal mandates.
4. Undertake extensive stakeholder on the modal shift plan.
5. Seek approval from state/central agency.
6. Build required infrastructure to implement the plan.
7. Roll out and monitoring of the plan.

Alameda Corridor[1]

Case Study: Alameda Corridor, USA[1]

Los Angeles and Long Beach port manage 20% of shipments entering the US. This causes movement of enormous through-freight in LA, leading to congestion and air pollution. Before 2002, the port had only four low speed railway lines with multiple crossings, limiting the rail capacity and further congesting roads for traffic waiting for trains to pass. In order to overcome this, Alameda Corridor, a high capacity below-grade rail line was constructed, with capacity of 150 trains daily. This eliminated ~12 million truck trips of through-freight per year.

Source: 1. Alameda Corridor Transportation Authority

Parking and unloading zones

Context

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

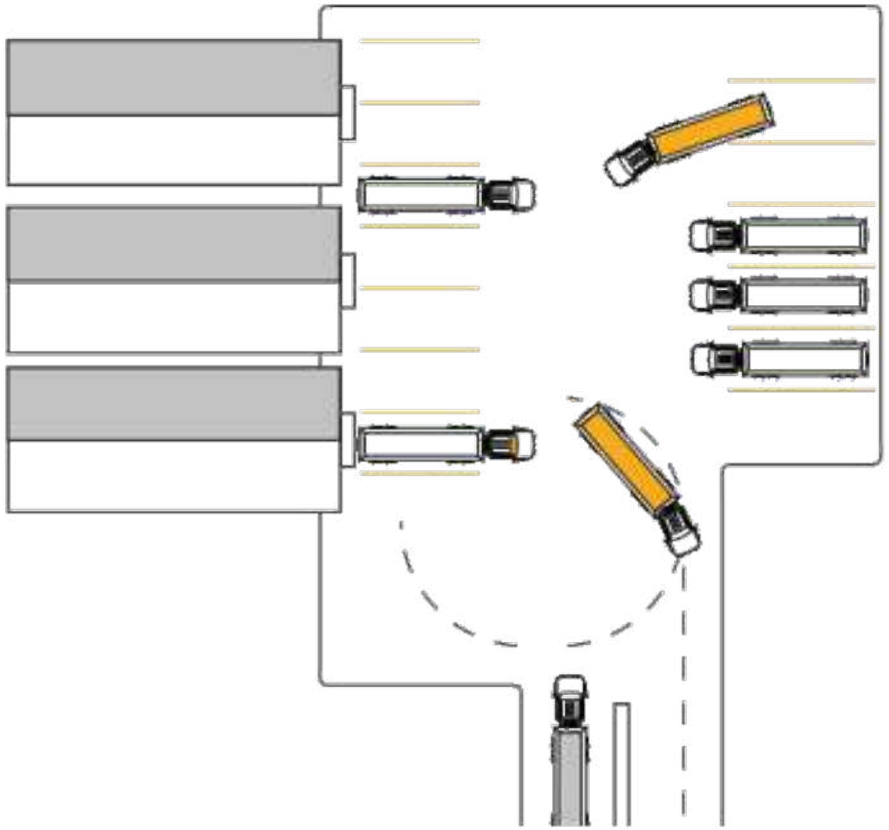
Description

Dedicated parking and unloading zones in cities involves allotting 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 processes easier. This can be done in multiple ways, for example:

- Amending building codes to mandate freight unloading provisions.
- Creating time-of-day restrictions that promote freight parking.
- Allocating dedicated kerb space for parking and unloading.
- Amending parking pricing policies to prioritize freight.

When is this measure most effective?

Parking and unloading zones are most effective when the city experiences congestion and delivery delays due to insufficient and/or haphazard parking.



Source: Ministry of Housing and Urban Affairs and RMI. "Efficient Urban Freight" (2019).

Parking and unloading zones

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

As this measure focuses on regulatory amendments, the focus should be to understand the policy methods that can work in a particular city. Firstly, a stakeholder consultation needs to be organized to understand existing status and plan infrastructure. This consultation should include:

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

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

Multi-use lanes in Barcelona[1]

Case Study: Barcelona, Spain

Barcelona adopted several methods to creating parking and unloading infrastructure along major freight hotspots in the city. Firstly, the city modified its building codes so that commercial establishments were mandated the provision of loading and unloading space for deliveries. Secondly, street design was modified 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 has resulted in a 12-15% reduction in travel times for trucks.

Sources: 1. 2030 Palette. "Complete Streets".
2. Dablanc, et al. "City Logistics Best Practices: a Handbook for Authorities" (2015).

Low emission zones

Context

Logistics vehicles, especially trucks, are a key source of pollution in cities, reducing livability and public health. A diesel truck in India emits 1,300 tons of CO_2 over its lifetime. With increase in demand for goods, the logistics demand is expected to increase significantly. **Low emission zones** (LEZ) regulate freight to meet strict emission criteria in order to operate in the urban core.

Description

Low emission zones are areas in the city where internal combustion vehicles access is constrained. It only allows delivery vehicles meeting strict pollution emission standards . LEZs can provide multiple benefits inside the target area, such as environmental sustainability, improved air quality, reduced noise and congestion. LEZs require effective control and enforcement. It could be:

- camera-based (investment heavy, e.g., London)
- manual visual inspection (personnel heavy, e.g., German cities)
- other technologies (e.g., RFID transponders)

When is this measure most effective?

When vehicular emissions in certain parts of the urban area are disproportionately high and air pollution is city-wide concern.

Source: Making Cities Safer. "Low Emission Zones White Paper" (2020).

Low emission zones

Monitoring Metric

It can be measured by **emissions reduction** in the region.

Implementation Process

Area and scope of the LEZ should be identified based on extensive investigation of major pollutants, exposed population, scale of congestion, local demographics, and vehicle ownership.[2] Once the area is identified, city government will need to undertake the following steps:

1. Stakeholder engagement to analyze the impact of implementing LEZs, both in and outside of the zone
2. Define the geographical extent, scale, allowed vehicle types, emission standards, and enforcement patterns and system for the LEZ.
3. Introduce legal framework to implement LEZs and penalties for non-compliance.
4. Collaborate with business groups, delivery providers, government authorities and civil society groups to gain support and increase awareness.

Low Emissions Zone at Coulsdon in London[1]

Case Study: London, UK

In London, LEZ was introduced in 2008. Since then, the emissions standards and stringency of requirements has been tightened from time to time. Compliance with LEZ mandates require vehicle to be low or zero emitting, which has higher upfront cost than conventional vehicle. For example, going from the Euro III standard to the Euro IV standard costs approximately $4,100. Transitioning to Euro VI would require nearly $7,000.37. This cost of compliance accelerates switching to zero emissions vehicles (ZEVs).

Source: 1. Reuters/Luke MacGregor.

2. C40 Knowledge Hub. "How to design and implement a clean air or low emission zone" Implementation Guides. (2019)

Technology adoption

13. Use of Intelligent Transportation Systems
14. Promoting electrification of urban freight

Use of Intelligent Transportation Systems

Context

Delivery vehicles get struck in unpredictable traffic congestions due to roadwork, traffic incidents, poor weather, etc. This leads to increase in time and inefficiencies in delivery of logistics. **Intelligent transportation system (ITS)** use advanced technology and intelligent decision making to make existing infrastructure for freight transportation more efficient. [2]

Description

Intelligent transportation systems have different applications that process and share information to reduce congestion, enhance traffic management, increase cost benefit, and minimize carbon footprint.[3] The following are key benefits of using ITS:

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

When is this measure most effective?

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

Intelligent transport systems[1]

Source: 1. ETSI. "Intelligent Transport Systems" (2018).

2. ScienceDirect. "Topics: Intelligent Transportation System".

3. AIndraLabs. "What is Intelligent transportation system (ITS): Applications and Examples" (2019).

Use of Intelligent Transportation Systems

Monitoring Metric

Routing efficiency is used as monitoring metric for ITS. Routing efficiency enhances the efficiency of delivery without compromising livability of residents.

Implementation Process

Following steps need to be undertaken to implement ITS for logistics delivery in the Indian cities:

1. Identify the ITS needs of the city viz., congestion management, reduce variability of journey time, effective operation of logistics.
2. Stakeholder consultation between city government and logistic operators to define functional requirements and operating procedure for ITS.
3. Roll out of guidelines for logistic vehicles.
4. Set up mechanisms to collect, process and share information.

ITS combining technologies[1]

Case Study: Michigan Department of Transportation (MDOT), Michigan

Michigan Department of Transportation (MDOT) Intelligent Transportation Systems (ITS) Program has been deploying ITS since the 1960s. In 2014, MDOT deployed First Truck Parking Information System and Integrated Corridor Management Systems in Michigan for efficient management of freight.[2] These are operated by the MDOT's three transportation operation centers and Blue Water Bridge operation Center (BWBOC) to actively monitor roadways and manage traffic incidents. MDOT has partnered with truck driving community, private truck stop operators, other private players to successfully operate the ITS system.

Source: 1. The Constructor

2. HNTB Corporation. "Strategic Plan for Intelligent Transportation Systems" Michigan Department of Transportation (2018).

Promoting electrification of urban freight

Context

Currently, 10 percent of freight emissions are from urban freight in India. This share is expected to grow by 114 percent by 2030. Electric vehicles have zero tailpipe emissions and lower operational cost, which can help improve the air quality, provide associated health benefits, and save money.

Description

India's freight vehicles primarily rely on diesel. With increasing prices of diesel being imported in India. High dependence on diesel is a concern both from environmental and economic perspective. Electric vehicles emit 15-40 percent less CO_2 compared to their internal combustion engine (ICE) vehicles. Furthermore, their operational cost is less as compared to ICE counterparts. Thus, there is a need to promote electrification of freight in Indian cities.

When is this measure most effective?

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

Source: Keith Barry/Wired.com

Promoting electrification of urban freight

Monitoring Metrics

Percentage of electric freight vehicles sold in the city and reduction in delivery **emissions.**

Implementation Process

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

1. **Policy**: Consult with state government to ensure inclusion of freight in EV policies, in particular inclusion of fiscal incentives such as upfront subsidies, road tax and registration cost exemptions, etc.
2. **Regulatory**: Introduce measures such as idle parking and plying allowances, and removal of entry restrictions for freight EVs. Demarcate low-emission zones and preferential registration for EVs.
3. **Charging infrastructure**: Work with electric distribution companies and charging providers to build out charging infrastructure for commercial use in the city.
4. **Awareness**: Develop consumer-facing as well as industry-facing awareness programs on electrification of commercial vehicles.

Tata Ultra T.7 Electric Truck

Source: Gaadiwaadi.com

Case Study: Shenzhen, China [1]

Shenzhen, China, is a global leader in the deployment of electric logistics vehicles (ELVs). At the beginning of 2015, ~ 300 operative ELVs were registered in Shenzhen and by the end of 2018, that number grew to 61,857. Electric commercial vehicles 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 electricity rates have been major drivers in adoption of ELVs.

Source: Crow, et al. "A New EV Horizon" RMI (2019).