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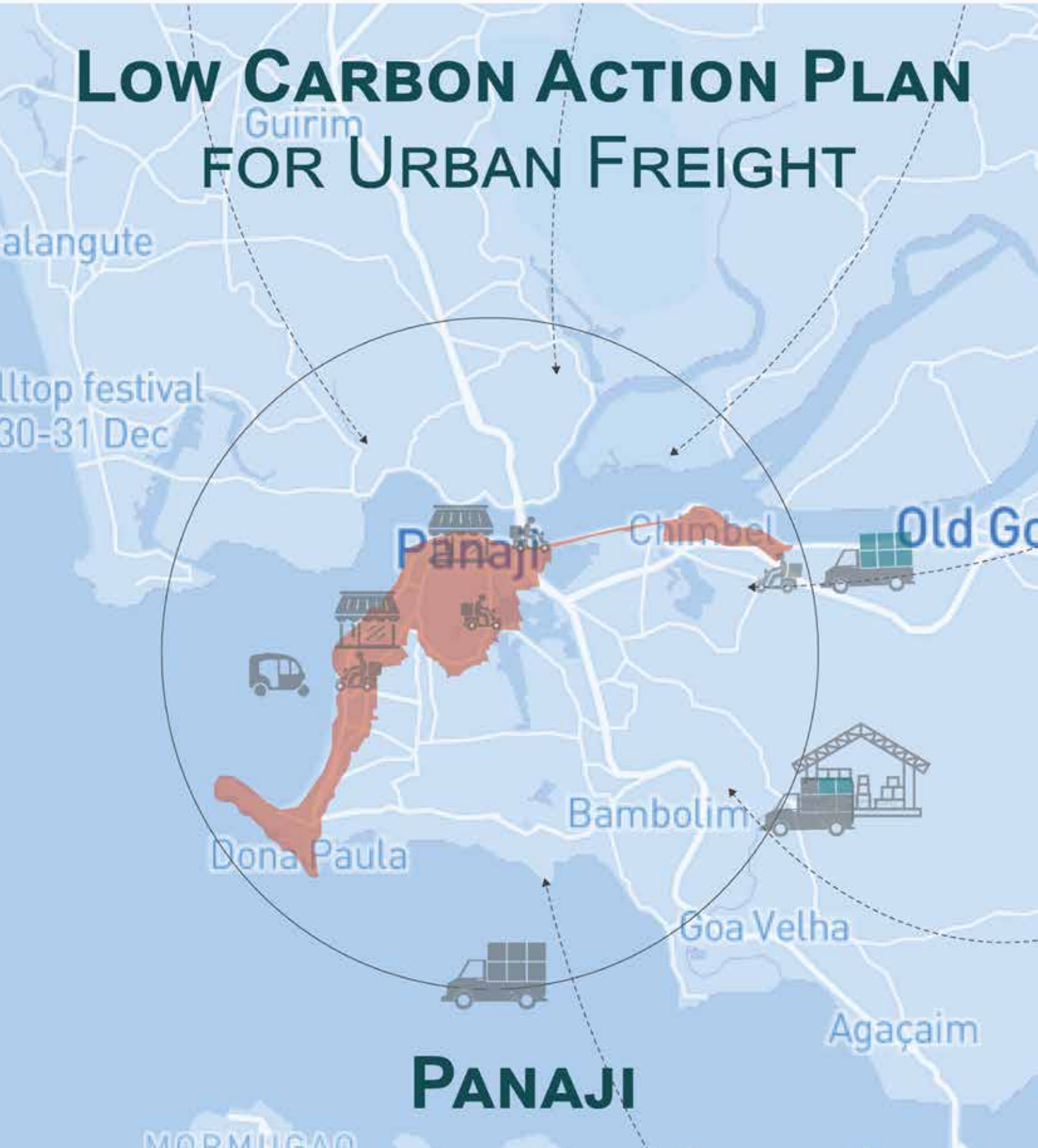
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EcoLogistics

Low carbon freight for sustainable cities

LOW CARBON ACTION PLAN FOR URBAN FREIGHT



Local Governments
for Sustainability

This document is a deliverable of the “EcoLogistics: Low carbon freight for sustainable cities” project. It is an illustrative version of the technical report “Consolidating Urban Freight Baseline and Conceptualizing Low Carbon Urban Freight Action Plan for Panaji under ‘Eco Logistics – Low Carbon Freight for Sustainable Cities’ Project”. The findings of the technical report were validated by members of the multi-stakeholder working group formed under EcoLogistics project and subsequently accepted by the CCP.

About the EcoLogistics project

Supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through the International Climate Initiative (IKI), ICLEI’s EcoLogistics project (2017 - 2021) aims to increase the capacity of governmental and non-governmental actors to build strategies and policies to promote low carbon and sustainable urban freight in Argentina, Colombia and India, involving nine cities and regions:

- Argentina: Córdoba, Rosario, Santa Fe de la Vera Cruz (Santa Fe)
- Colombia: Capital District of Bogotá, Metropolitan Area of the Aburrá Valley (AMVA), Manizales
- India: Kochi, Shimla, Panaji

For more information, please visit: sustainablemobility.iclei.org/ecologistics

About ICLEI - Local Governments for Sustainability

ICLEI – Local Governments for Sustainability is a global network working with more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, we influence sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development.

Acknowledgement

ICLEI South Asia would like to acknowledge the support of CCP Goa and other stakeholders in the city. We would like to acknowledge the support of ICLEI’s Sustainable Mobility Team, EcoLogistics project partners, [Despacio](#), [Zaragoza Logistics Center](#) and [Smart Freight Centre](#). Their invaluable comments and inputs made the development of this report possible.

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Disclaimer

The information in this report is based on the findings of the report “Consolidating Urban Freight Baseline and Conceptualizing Low Carbon Urban Freight Action Plan for Panaji under ‘EcoLogistics – Low Carbon Freight for Sustainable Cities’ Project”, and close consultations with various stakeholders in Panaji. ICLEI South Asia does not guarantee the accuracy of the information in this document and does not accept responsibility for any consequences of its use. For further information, please contact iclei-southasia@iclei.org.

FOREWORD

Urban freight plays an essential role in economic and social development of cities. There is a whole world of goods transportation supporting citizens' lives: from an e-commerce order delivered on doorstep, waste collections, fresh goods delivered to the Kirana store, the paper for the office printer, or the concrete mixer trucks for new buildings and construction. Urban freight is all around us." However, moving goods within cities is a complex task with mounting challenges. As cities compete on various parameters such as Swacch survekshan, Ease of Living, Municipal Performance Index etc, they do not always consider the impact of growth on their ability to effectively move goods.

Increase in population and economic growth increase the demand for goods and services, while at the same time increasing competition for scarce road and sidewalk space. Cities are also struggling with underinvestment and aging infrastructure. The latest report of the Intergovernmental Panel on Climate Change (IPCC) shows that urban freight is also responsible for a large share of CO2 emissions in cities. As per the report published by NITI Ayog, freight sector contributes to around 7 per cent of CO2 emissions in India. The high environmental externalities are further increased due to the absence of a comprehensive understanding of supply chain and freight in the urban area. Lack of freight related data results in difficulty in planning and integration of freight management related strategies. Thus, there is an urgent need for a greater understanding about goods movement in Panaji focusing on its environmental externalities and challenges.

To this end Corporation of the City of Panaji (CCP) in partnership with ICLEI South Asia is working on EcoLogistics-Low Carbon Freight for Sustainable freight with support from the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, through its International Climate Initiative (IKI) programme. I am pleased that the current Low Carbon Action Plan for Urban Freight has been approved by council meeting in March 2022.



Agnelo A.J. Fernandes

Municipal Commissioner
Corporation of the City of Panaji



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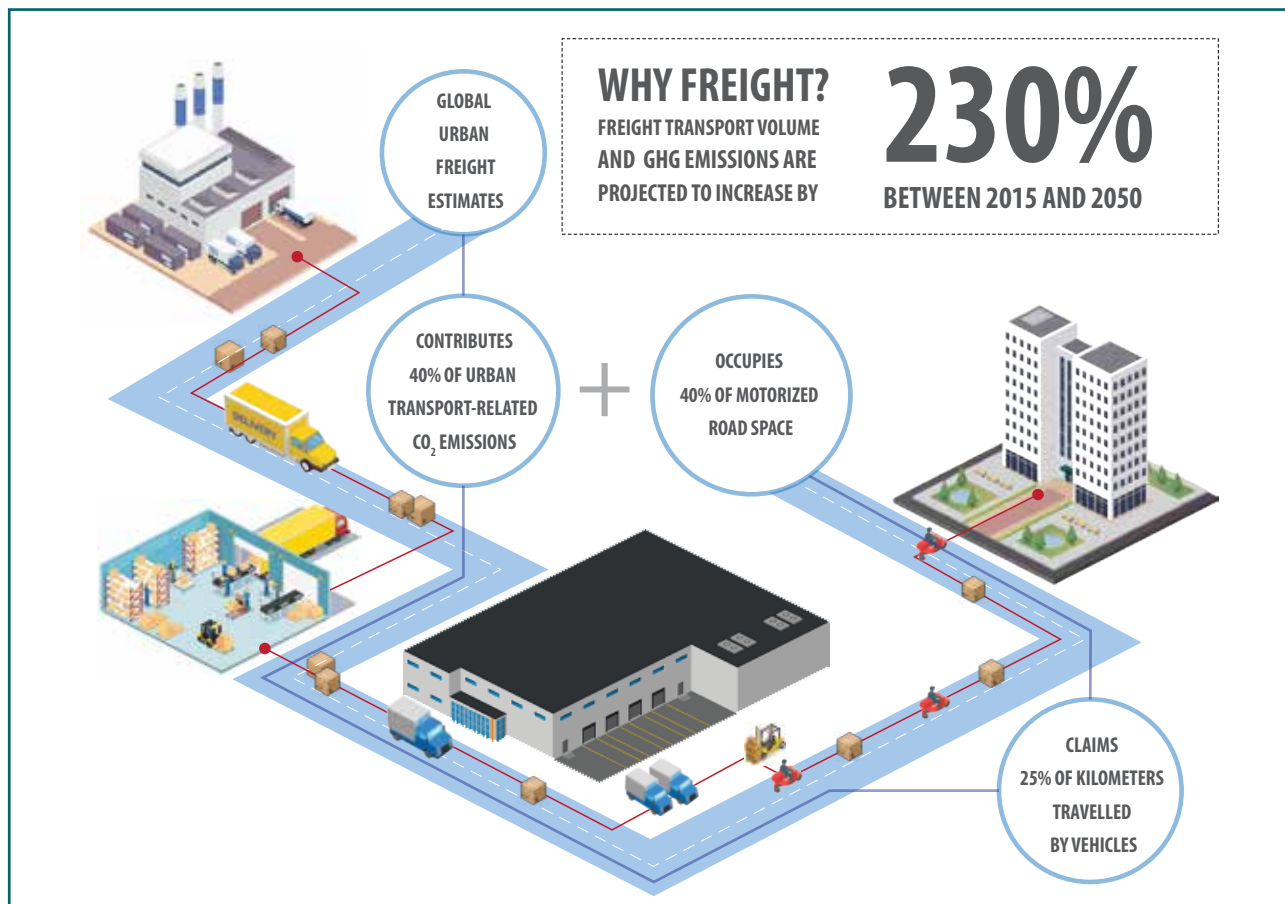
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1. INTRODUCTION - WHY URBAN FREIGHT MATTERS

Urban freight is an integral part of a city's functioning, providing both citizens and businesses with products they need daily; right from food, FMCG products and e-commerce deliveries to construction material. However, urban freight transport has significant environmental and social impacts like greenhouse gas emissions, poor air quality, noise pollution, road accidents and traffic congestion, which hamper urban life quality. Globally, urban freight transport represents up to 25 per cent of urban vehicles, takes up to 40 per cent of motorized road space and contributes up to 40 percent of urban transport-related CO₂ emissions.



1.1. EcoLogistics Project

Indian cities are characterized by an extensive dense network of over 12 million retail outlets serving the surrounding residential areas. This retail outlets are unorganized and typically operate from a multitude of small independent carriers, creating a complex and inefficient system that lowers the efficiency of goods delivery and increases the environmental impacts. In recent times, growing use of the internet has led to the rapid development of e-commerce, which is expected to grow at over 20 per cent per annum over the next decade. In the national capital city, Delhi, urban freight is responsible for 67% of the total PM2.5 emissions, 61% of the total SO₂ emissions, and 62% of the total NO_x emissions from the transportation sector. The high environmental externalities are further increased due to the absence of a comprehensive understanding of supply chains and freight in urban areas among planners and decision-makers (city, state and national level). It is resulting in transport-related policies and facilities being planned merely from the passenger transport perspective, without considering the needs of goods movement. Moreover, there is a significant disconnect observed between industry and the government bodies that handle city transport network operations. The entire urban freight is predominantly dominated by informal private operations.

In this context, ICLEI is implementing the EcoLogistics project in three Indian cities of Kochi, Shimla and Panaji. The project focuses on enhancing capacities, strategies and policies to promote low-carbon urban freight through local action. A first-of-its-kind global initiative, the project is assisting cities to develop Low Carbon Action Plans for Urban Freight, support the implementation of demonstration projects in cities, and suggest national policy recommendations for the urban freight sector. The project is supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU) through its International Climate Initiative (IKI) program.

The EcoLogistics project promotes transportation of goods by giving priority to health, safety, low-emission, and people-centered urban development. It encourages circular and regional economies, while limiting the environmental impact of freight transport. Through the EcoLogistics initiative, ICLEI aims to transform the urban logistics in cities through effective regulatory planning and administrative instruments at all levels of government. The goal of this project is to promote low-carbon urban freight (EcoLogistics) policies and practices, thus contributing to climate change mitigation and towards meeting the ambitions of the Nationally Determined Contributions (NDCs) in Argentina, Colombia and India. It follows the strategy of:

- Avoid (and reduce) the freight volume and haul distance,
- Shift (and maintain) to more sustainable modes of freight transportation, and
- Improve the logistics operations by use of technologies and better operations.

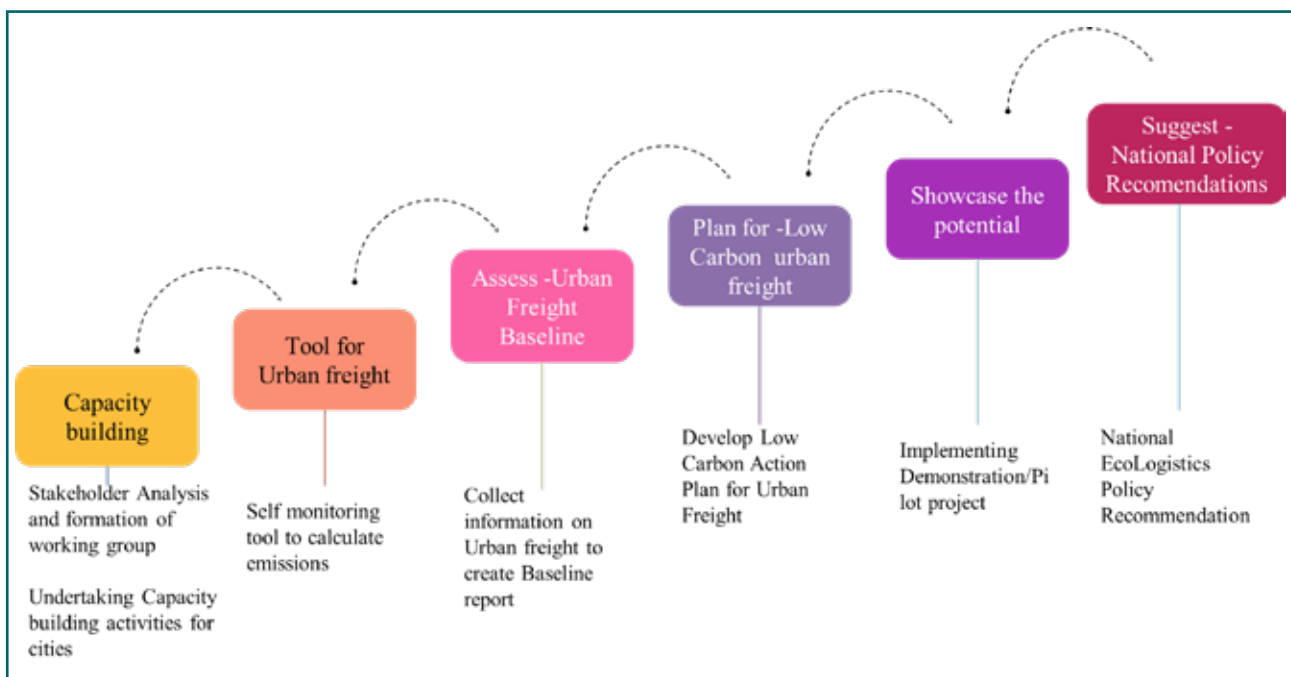


Figure 1: Activates under EcoLogistics project

1.2. Introduction to Panaji City

Panaji is the capital of Goa, the headquarters of North Goa district and a prime tourist destination for national as well as international tourists. It is located on the west coast of India, in Tiswadi Block of North Goa district. Panaji has bordered by the River Mandovi in the north, the Arabian Sea in the northwest and a few villages on its eastern and southern sides. The city has coastal plains with marine landforms in the west (coastal area).

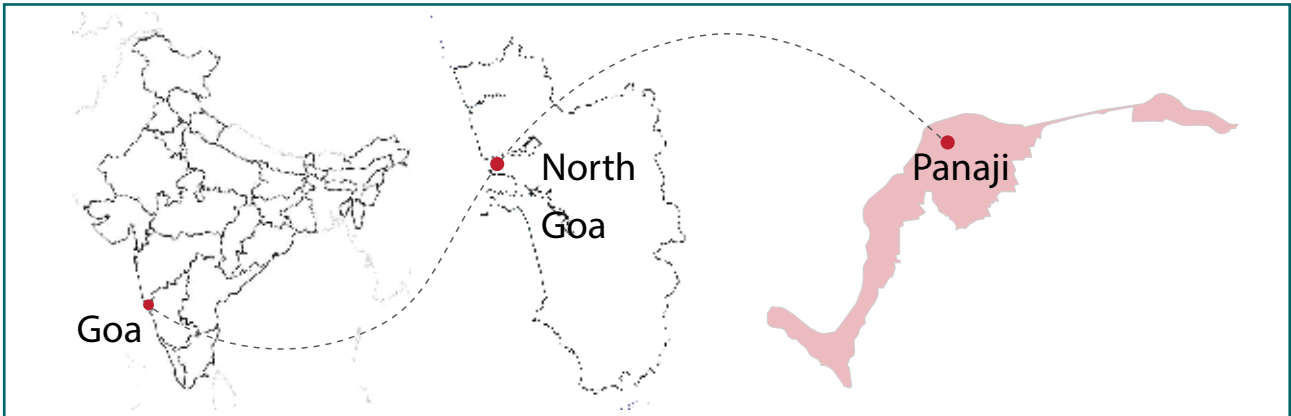


Figure 2: Location map of Panaji

The city is surrounded by other urban centers, including Porvorim, Chimbol, Mercês, Santa Cruz, Talegaon and Bambolim, which are part of its urban agglomeration, shown in Figure 3.

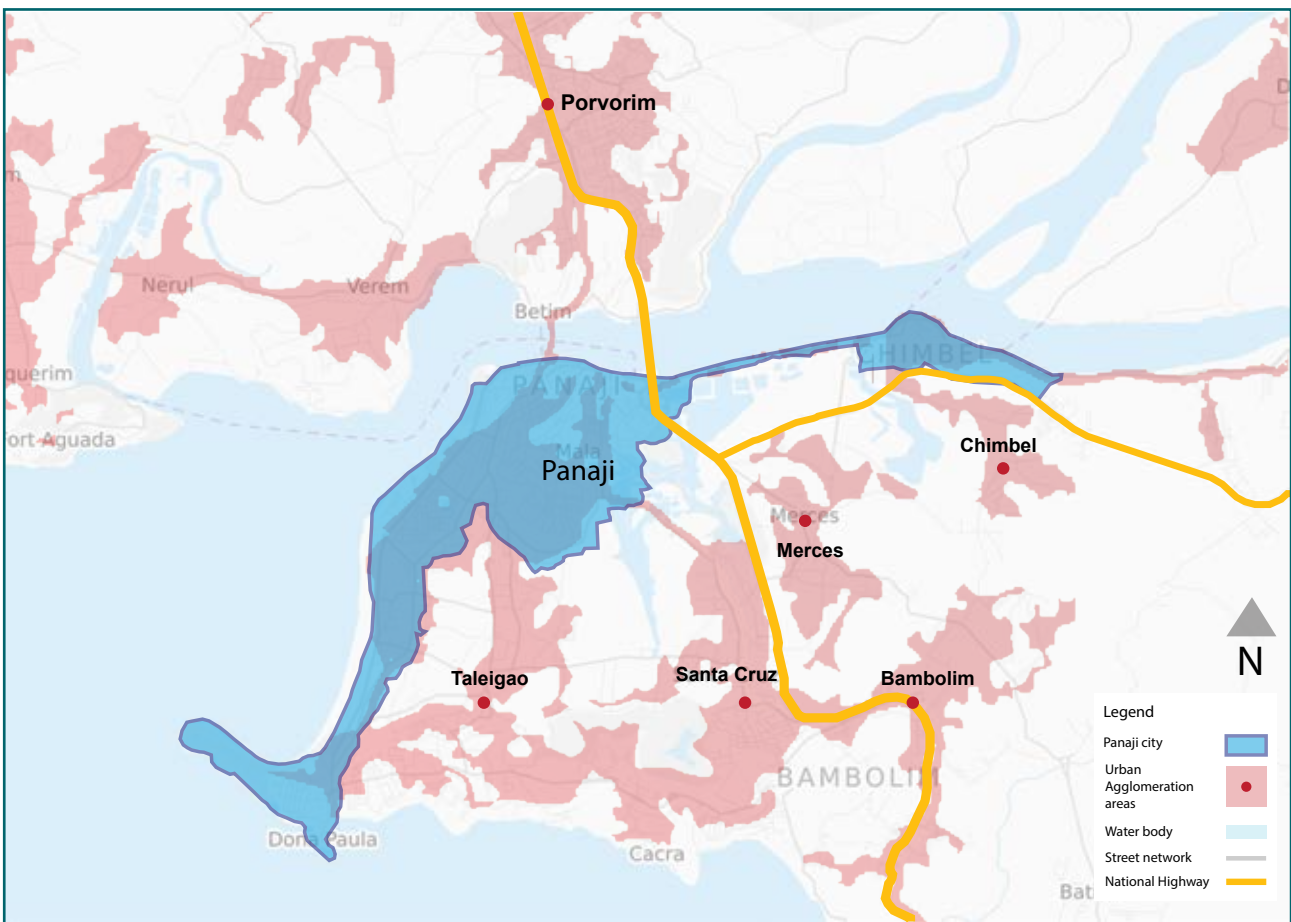


Figure 3: Panaj urban agglomeration area

Panaji's economy is based on tourism which includes the sectors of hospitality, restaurants, trade, and commerce. The city is also a major trading center of agricultural products and other commodities from the neighboring cities. It also serves as the educational and medical hub for the district.

Table 1: Demographics snapshot of Panaji

Indicators	Panaji
City Size (km ₂)	City: 8.12 sq. km.
Population density (People/km ₂)	4880/km ²
GDP/Capita	NA
Freight motorization Index (registered vehicle/1000 population)	N. A
No of administrative wards	30
Mode share (Tons)	
Road	244677 (2019-20)
Water	Negligible for urban freight
Rail	Negligible for urban freight
Freight accident fatality share	
Freight emission intensity (g/Kg km)	39.09
Urban freight emissions share	9.74 percent (of Transport emission)

Freight is transported in Panaji through national highways and three ferry routes, among which the Choroa to Ribandar ferry route carries the maximum. Inside Panaji, the primary and secondary road networks help to carry the freight traffic considering their width, ability to accommodate vehicles and connectivity to other parts of the city. Also, different freight sectors use different routes in the city, depending on their area of business.

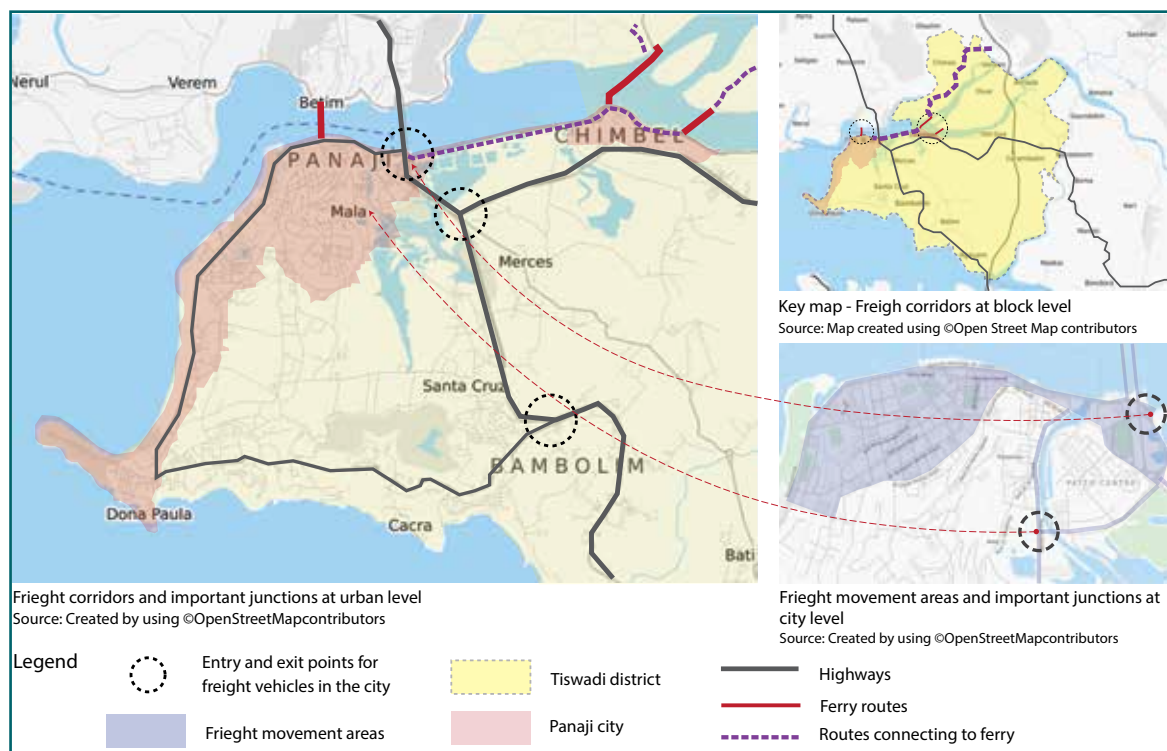


Figure 4: Major freight routes in Panaji

1.3. Formulating Urban Freight Baseline for Panaji:

In Panaji, the high environmental externalities increase further due to the lack of a comprehensive understanding of supply chains and freight in urban area by planners and decision makers. It is resulting in transport-related policies and facilities being planned merely from the passenger transport perspective, without considering the needs of goods movement. Moreover, there is a significant disconnect to be observed between industry and the government bodies that handle city transport operations. Urban freight is largely dominated by informal private operations. Additionally, the data regarding urban freight is scarce and scattered. Moreover, there is a major issue of informal markets in Indian cities, where it is difficult to assess the goods movement. Therefore, consolidating the urban freight baseline was the first step towards formulating the action plan. The baseline report gives technical insights into the freight sector, commodities, freight links (first-mile to last-mile deliveries), freight capacity, freight emissions in Panaji and the impact of freight traffic on congestion. The baseline forms the basis for the identification of strategic options, leading to a low-carbon future for urban freight in Panaji. The process for preparing the baseline is listed in Figure 5.

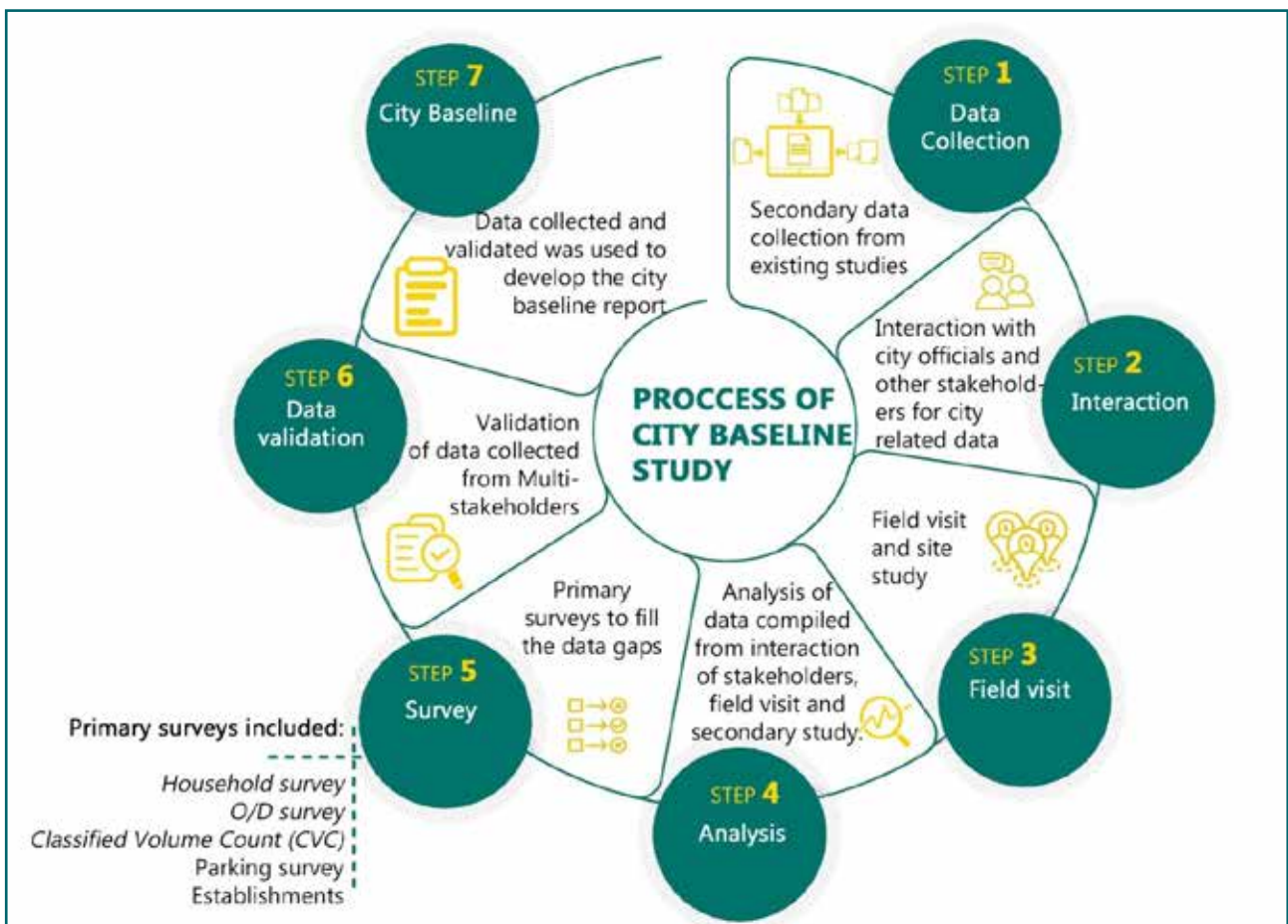
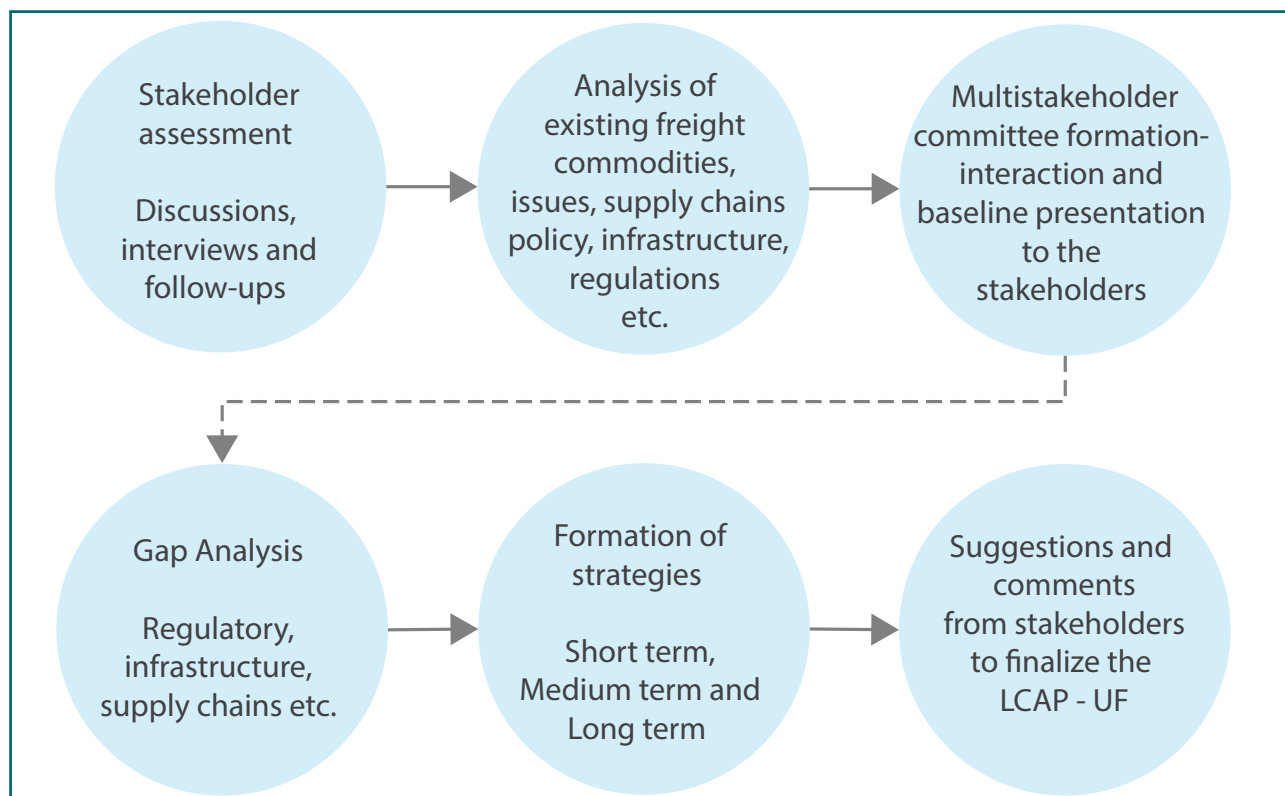


Figure 5: Baseline process of Panaji

2. LOW CARBON ACTION PLAN FOR URBAN FREIGHT IN PANAJI

2.1. Low Carbon Action Plan - Methodology

Six steps are identified in the study framework for developing a Low Carbon Action Plan for Panaji, as shown in the graphic below.



The process for the LCAP development involved continuous interaction and engagement with stakeholders to ensure awareness, and meetings with authorities for consultation on the development of strategies and to further improve the adoptability of the document.

- Workshops/ meetings with stakeholders and authorities of freight-related departments were conducted to understand the freight operations in the city.
- The baseline assessment of the city was conducted through secondary data analysis, and the primary survey included freight vehicle operators, shop owners, freight-related associations, traffic police and other authorities as respondents. Visual observations were also part of data collection.
- The collected data was analyzed to understand the barriers and challenges in freight operations.
- A multistakeholder consultation group was established at the city level to improve the coordination and communication among various departments and related sectors for better understanding of the sector.
- The discussions and development of strategies for the city's freight sector was improved and streamlined because of the existence of this multistakeholder consultation group.
- The issues and impacts of the freight operations in the city were identified for developing better understanding of the next steps towards strategy development. Literature study, meetings with authorities and stakeholder consultations helped to identify the strategies that may mitigate the negative externalities of freight operations.
- The strategies are categorized under short-term, medium-term, and long-term strategies. Ease of implementation was also considered while developing strategies and recommendations.

The action plan was presented to stakeholders and verified to increase its reliability.

2.2. Scope of this Document - Influence Area

The area considered for the project is the Panaji Urban Agglomeration, which consists of Panaji city and five surrounding village panchayats of Talegaon, Santa Cruz, Bambolim, Mercês and Chimbêl.

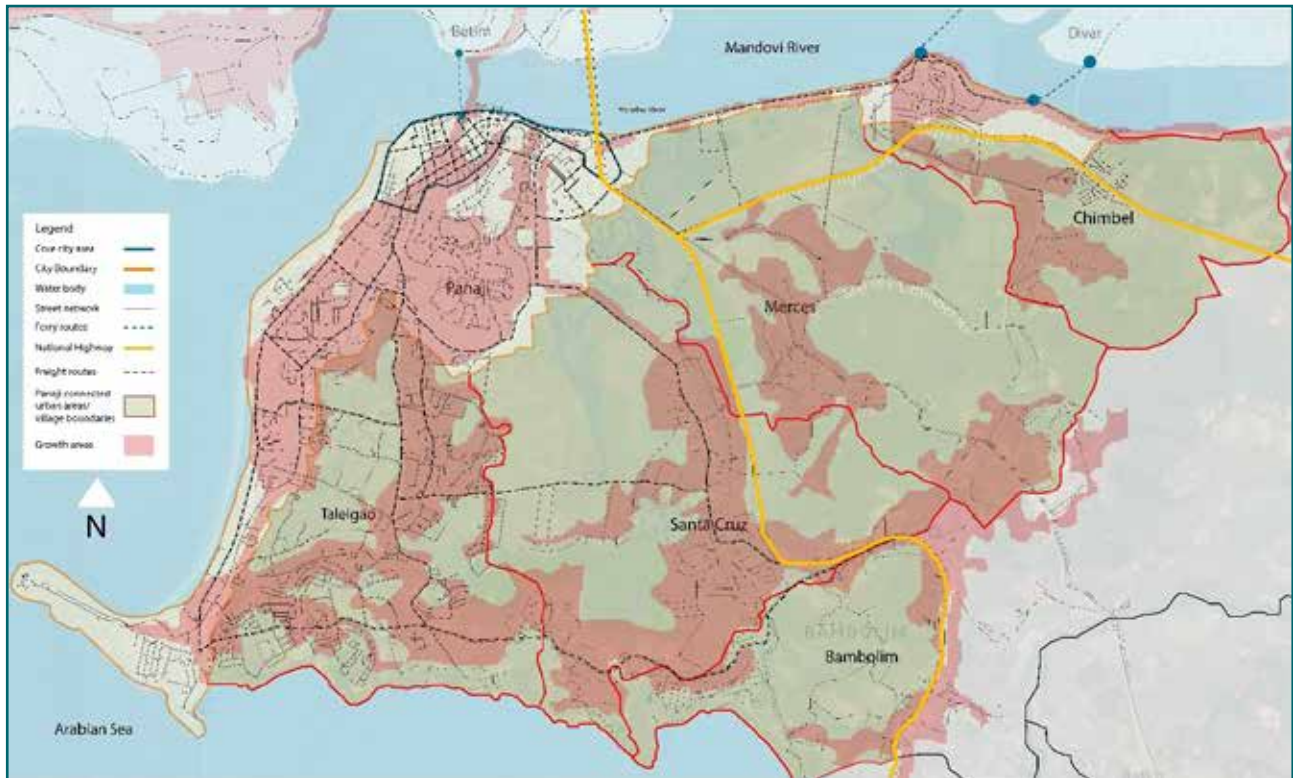


Figure 6: Growth areas around Panaji

Parameters	Geographical area (Village Panchayat/ Corporation)
Important market areas	Panaji
Important godowns/ warehouses	Panaji, St. Cruz
Transport contractors	Panaji, St. Cruz, Mercês
Freight vehicle activity	Panaji, Taleigao, St Cruz
Nearest highway intersections	Panaji, Mercês, St. Cruz, Bambolim
Inbound entry points to Panaji	Panaji, St. Cruz, Bambolim
Potential development areas for freight related projects	Mercês, Chimbêl
Important freight routes (excluding highway)	Panaji, St. Cruz, Taleigao
Freight hotspots	Panaji, Mercês
Ferry routes	Panaji
Connected growth areas to Panaji	Taleigao, St. Cruz, Mercês

This document aims to raise awareness and increase knowledge about urban freight issues and challenges among policy makers. The action plan is intended to help decision-makers identify sustainable urban freight strategies to tackle major challenges affecting livability in Panaji. The objective of the plan is to introduce innovative solutions regarding the traffic flow from the freight

logistics, efficient distribution of goods, environmental and noise pollution, hazards for pedestrians cause by freight logistics services and road disturbances.

This action plan will help city authorities to identify the mix of most appropriate strategies for them, but does not claim to be an exhaustive document covering all aspects related to the freight system. Measures and initiatives are organized and presented for policy makers to draw on for ideas and suggestions to be transferred to their specific contexts. Measures have been grouped into six categories of initiatives: stakeholder engagement, regulations, market-based initiatives, land-use planning, new technology-driven measures and “ecologistics” awareness-raising measures. The LCAP offers city authorities and planners a mix of possible and tested solutions that can be implemented in the city, together with an indication of potential positive and negative impacts.

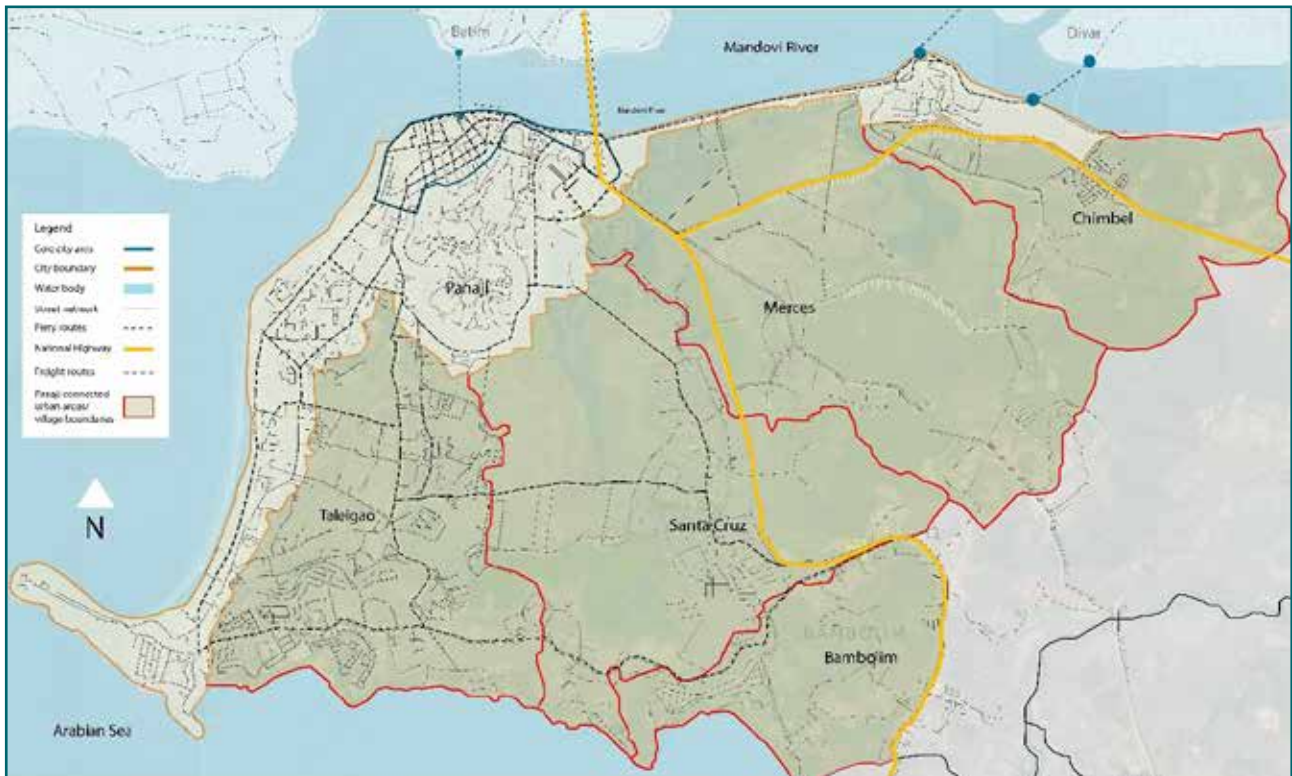


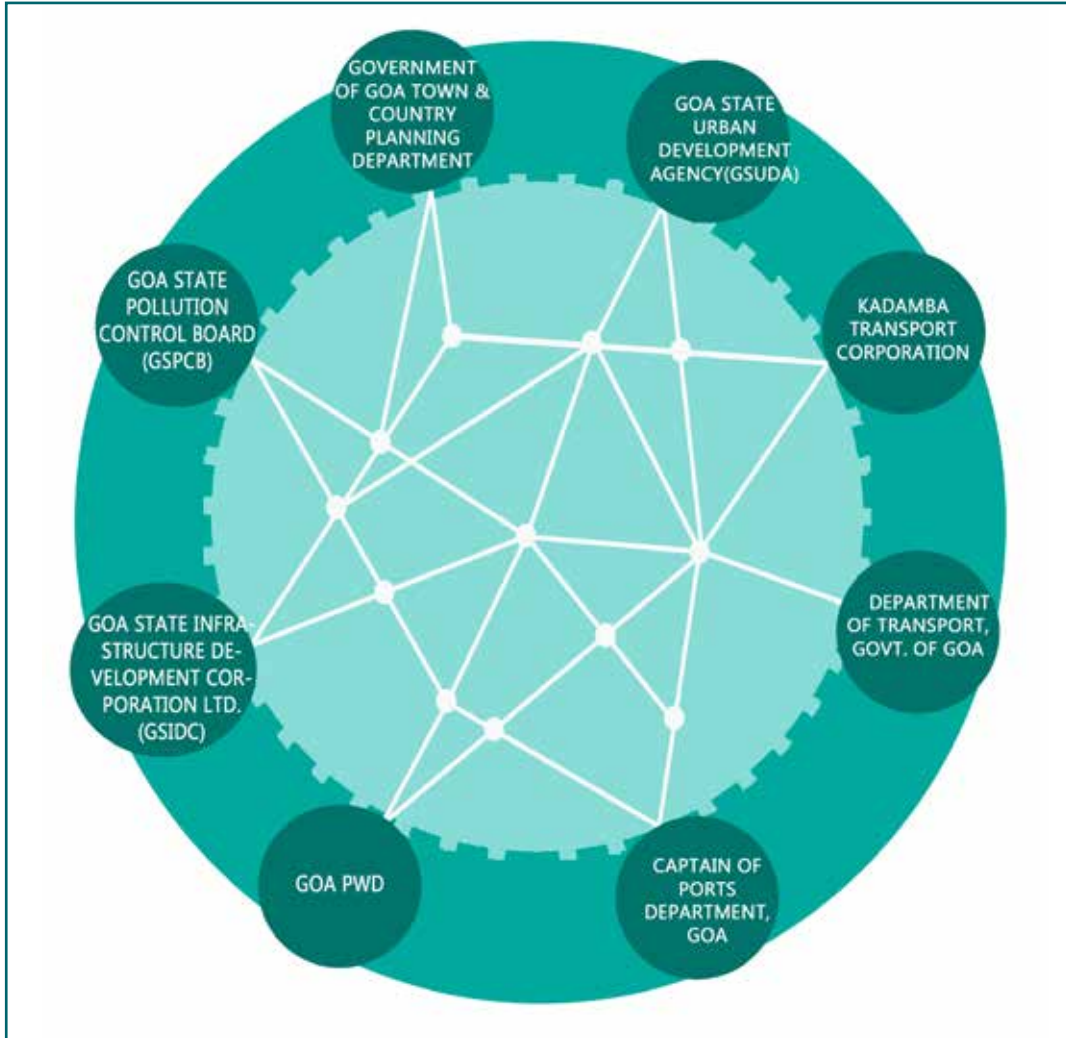
Figure 7: Proposed influence area for the Low Carbon Freight Action Plan – Urban Freight



3. SUMMARIZING FREIGHT SCENARIO IN PANAJI

3.1. Who is Responsible for What

The image below represents the stakeholder associated with urban freight governance in the city.



The table below summarizes the goals:

Stakeholder	Goals
Corporation of the City of Panaji.	<p>Local Economic Development</p> <ul style="list-style-type: none"> ● To provide designated commercial and trade areas ● To incorporate logistics advisory committee for taking decisions on freight movement and trade ● To work with freight rental vehicle owners to provide them equal economic opportunities.
	<p>Traffic and transportation</p> <ul style="list-style-type: none"> ● To improve parking facilities for freight vehicles in the city ● To promote sustainable freight mobility in the city ● To manage and reduce the street-level freight traffic congestion by incorporating planning and design-based solutions ● To reduce and limit the movement of heavy-duty vehicles in the core city of Panaji ● To improve the road geometry and street design for smooth freight movement ● To introduce holistic freight guidelines for freight operations in Panaji ● To promote alternative delivery systems such as night deliveries for freight movement ● To promote freight activities during non – peak hours ● To subsidize the use of electric bikes or similar eco-mobility modes for last-mile delivery in the city ● To reuse brownfield sites by allocating them to logistics users for use as godowns/ warehousing/ freight-related spaces, etc. ● To promote tax incentives for electric freight vehicles
	<p>Urban environment</p> <ul style="list-style-type: none"> ● To introduce a low carbon zone for Panaji city ● To develop zones/ breathing spaces in the city to improve quality of life
Goa Police	<ul style="list-style-type: none"> ● To create awareness amongst freight drivers about safe driving practices ● To understand the gaps and improve traffic circulation for freight vehicles ● To reduce the number of accidents and fatalities related to freight vehicles ● To create a network of new signage and improve existing signage on the movement of freight vehicles ● To develop a database of freight movement in the city
Department of Civil Supplies and Consumer Affairs	<ul style="list-style-type: none"> ● To formulate and implement fool-proof arrangements for identification of the poor for delivery of food grains. ● To promote transparency and accountability in the distribution of essential commodities to all beneficiaries. ● To protect and guard the interest of consumers in Goa ● To make the overall supply chain cost- and time-efficient ● To assist loaders and unloaders by providing them with sophisticated equipment to ease their work ● To make technically advanced storage areas ● To provide appropriate facilities to freight movers

Stakeholder	Goals
Department of Transport	<ul style="list-style-type: none"> ● To revitalize and simplify various functions and activities and to make them more people friendly. ● To revise existing parameters for issuing freight vehicular permits ● To introduce stricter pollution control guidelines for freight vehicles ● To revise road safety measures for pedestrians and vehicles, considering the freight movement ● To provide subsidy for developing freight-related infrastructure near cities, which can help to meet the growing demand by improving the overall freight efficiency
Goa state Pollution Control Board	<ul style="list-style-type: none"> ● To create policies to prevent and reduce freight-related emissions ● To promote green modes of freight transport to reduce emissions ● To introduce technically advanced mechanisms to reduce emissions
Goa Investment promotion and Facilitation Board	<ul style="list-style-type: none"> ● To promote and facilitate investment related to warehousing/ transport hubs/ consolidation centers/ freight-related infrastructure projects ● To develop a logistics policy for Goa ● To bring in more investment related to the logistics industry
Kadamba Transport Corporation Limited	<ul style="list-style-type: none"> ● To provide safe, reliable, comfortable, punctual, effective and efficient passenger transport to the public ● To make transport affordable for all commuters ● To opt for eco-friendly vehicles/ buses
Town and country planning	<ul style="list-style-type: none"> ● To focus on efficient and low-carbon industrial planning, which can mitigate the negative impact on the natural environment ● To focus on the integration of logistics activities into development plans ● To revise transport plans to route heavy vehicles via highways and outer roads without congesting the city centers ● To study and plan freight routes in the state, which can make use of existing ferry routes to curb emissions and related externalities ● To include freight transport in the regional master plan - To demarcate land for the logistics use/ freight transport hubs/ consolidation centers/ warehousing/ highway truck stops etc. in the regional master plans/ Outline Development plans ● To develop planning strategies at the state level to promote low-cost and low-carbon intermodal transport of goods
Collectorate North Goa	<ul style="list-style-type: none"> ● To make necessary amendments to the existing freight notifications ● To work with the local government to improve freight parking management and to notify the same ● To make holistic policies/ notifications related to freight operations for Panaji and the North Goa district ● To prioritize allocation and management of land for freight-related infrastructure projects, such as warehousing/ truck terminals/ consolidation centers, etc. ● To work with the local government and the state government departments to make freight-related changes to the current built environment in terms of infrastructure, policy, design and planning ● To reuse brownfield sites by allocating them for logistics user as godowns/ warehousing/ freight-related spaces, etc.

Stakeholder	Goals
Wholesalers/ Distributors (Based on the understanding, interviews, and discussions)	<ul style="list-style-type: none"> ● To focus on efficient delivery of goods - optimum utilization of freight vehicles and labor ● To increase operational efficiency and to reduce empty running of freight vehicles ● To have reserved and sufficient parking for freight vehicles ● To have accessible godowns/ storage area for goods ● To promote congestion-free market areas ● To resolve issues related to traffic fines in the city areas ● To provide resting areas/ toilet facilities to drivers/ cleaners hauling over long distances ● To promote freight infrastructure projects such as truck terminals/ consolidation centers to improve operational efficiency ● To promote collaborative warehousing/ consolidation centers ● To focus on routing efficiency
Transporters	<ul style="list-style-type: none"> ● To provide godowns/ spaces next to the highway ● To provide sufficient parking spaces in the city areas ● To resolve issues related to traffic fines ● To ensure efficient freight operations
Retailer	<ul style="list-style-type: none"> ● To have improved loading – unloading facilities and areas ● To ensure easy goods delivery management

3.2. Urban Freight Hotspots

The core areas of Panaji city sees major freight activities. Figure 8 shows five freight hotspots inside and near the city:

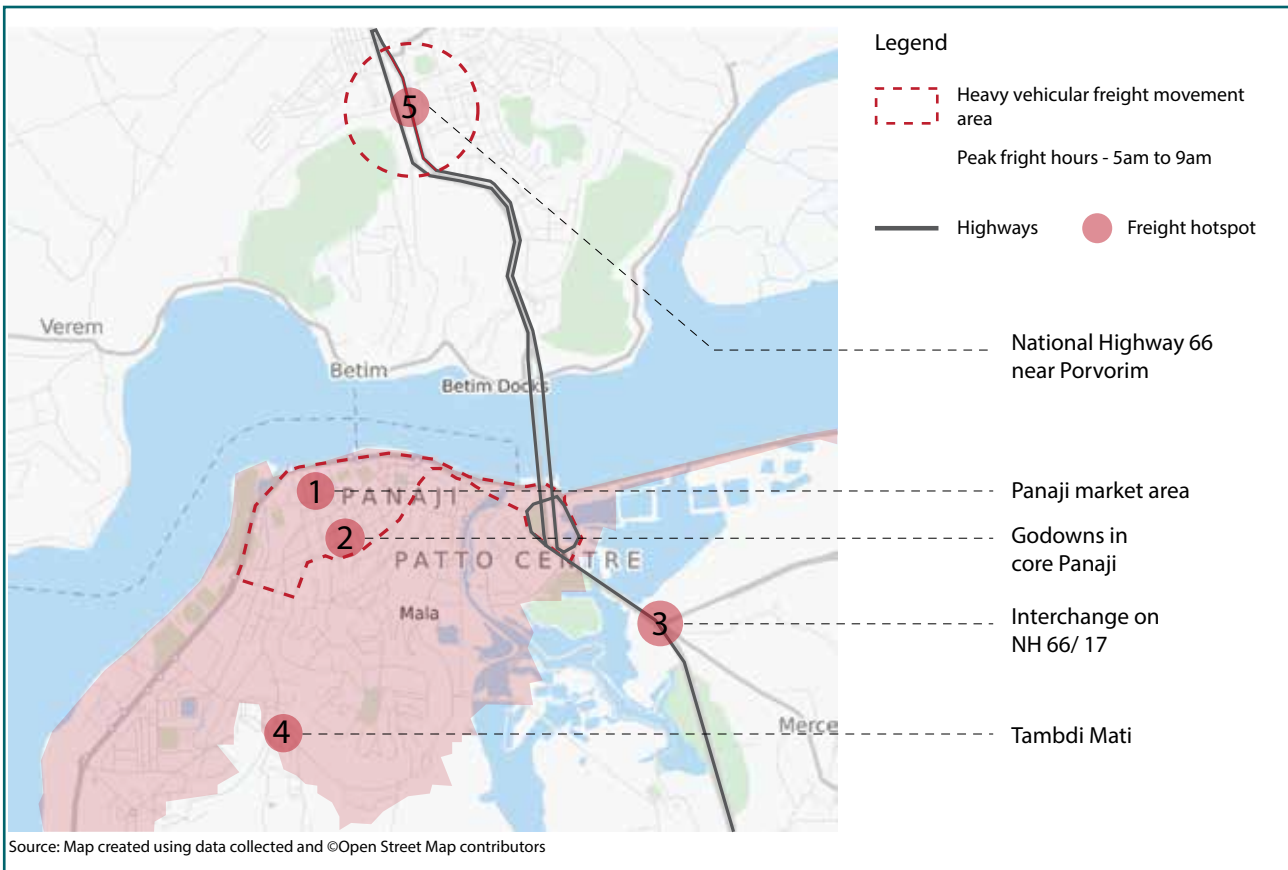
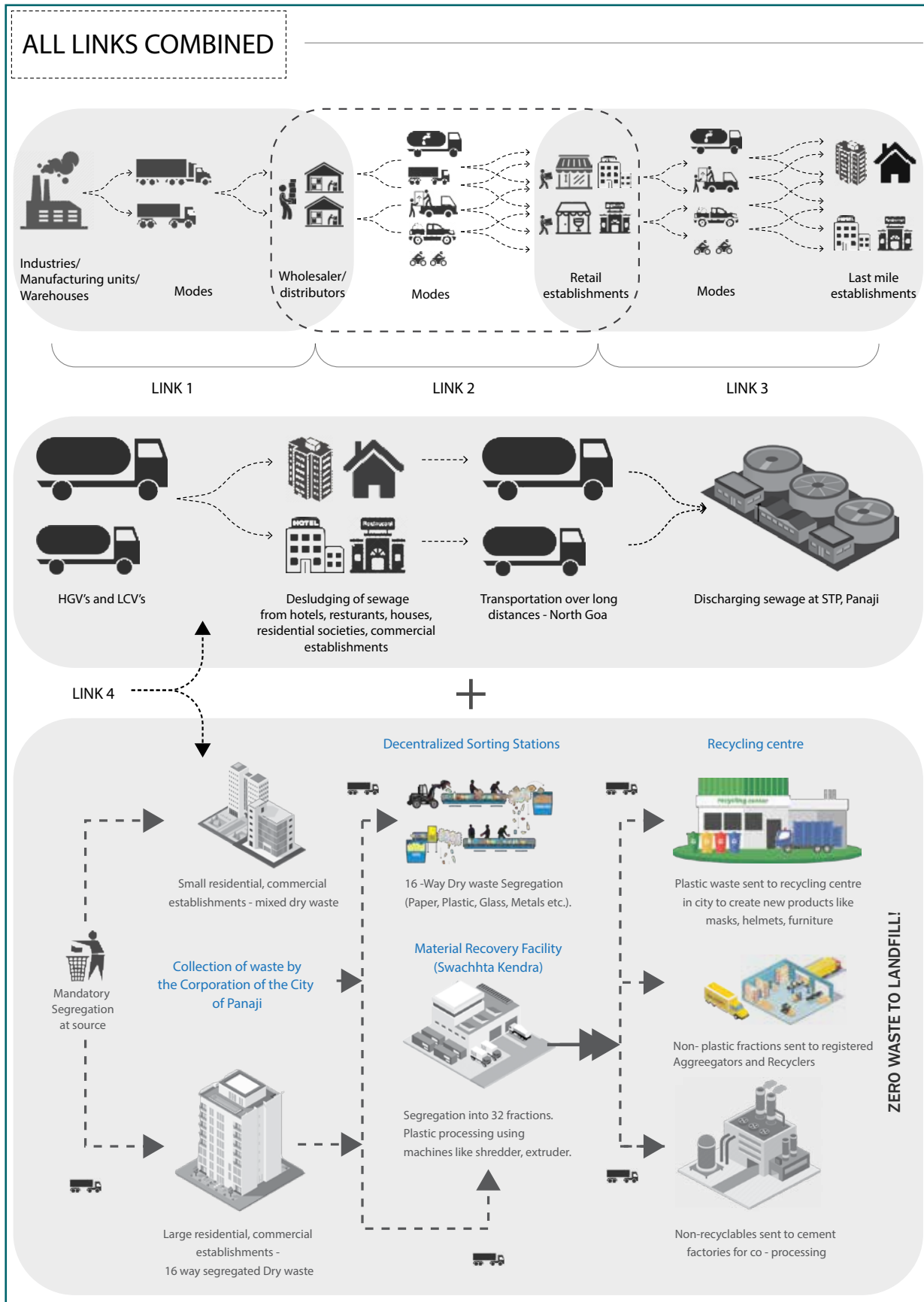


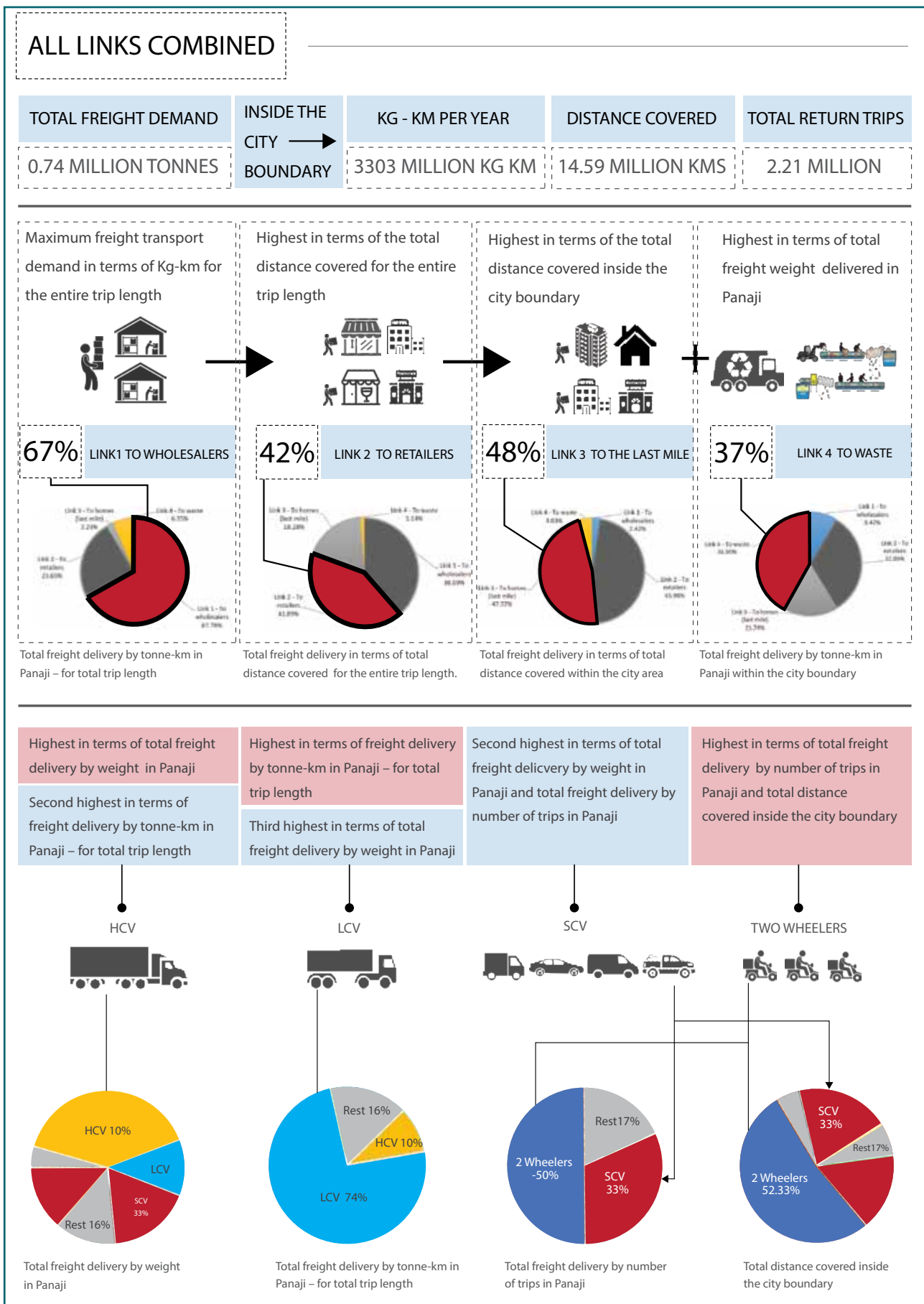
Figure 8: Location of urban freight hotspots in the city and outside the city

3.3. Synthesis of Urban Freight Situation in City

The following image maps the entire supply chain i.e. first mile to last mile. Different links were studied to document the freight movement.



The following image shows the findings of urban freight scenario in the city.



3.3.1. Summary of findings:

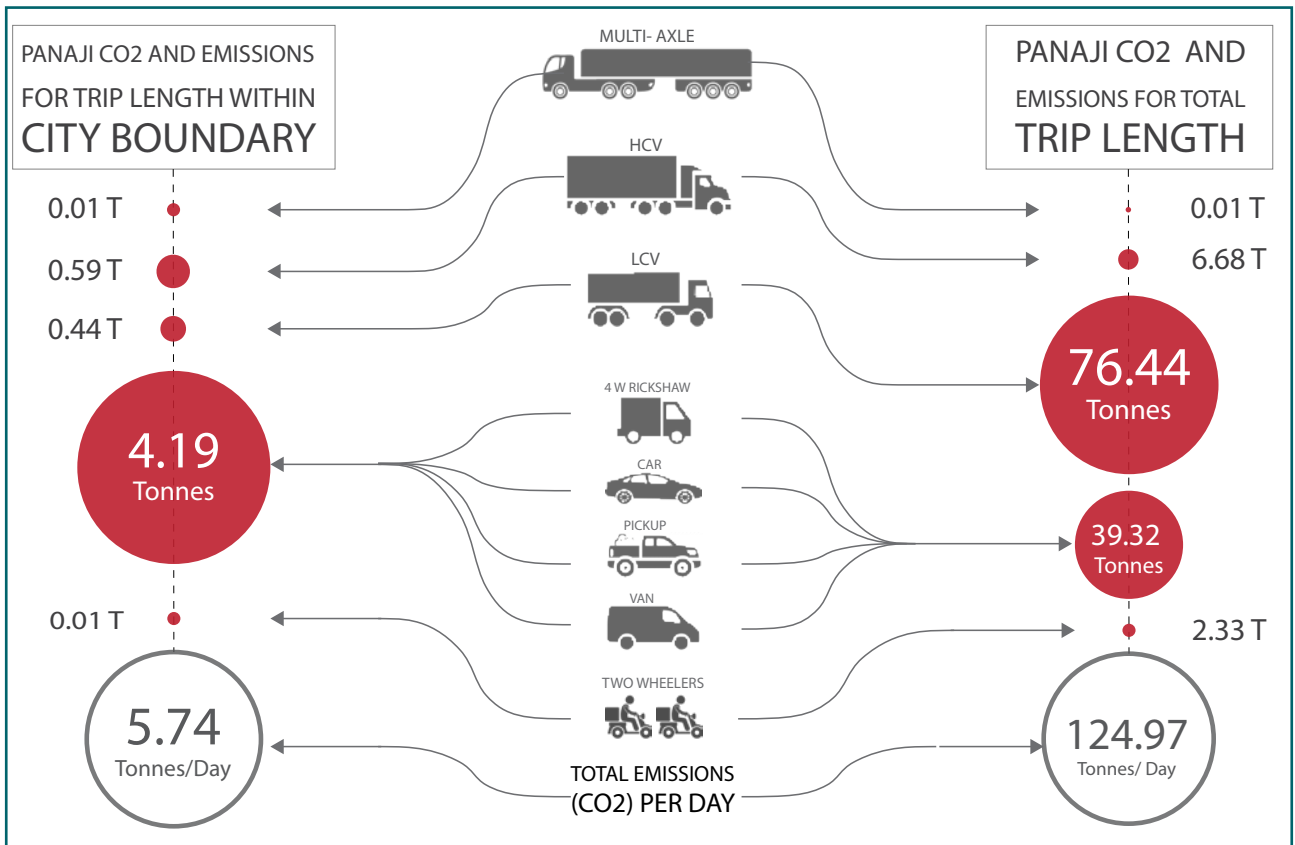
The total weight of the goods delivered to retail establishments in Panaji is estimated to be 670 tons per day. These deliveries, amounting to 2,807 freight trips (per day), are made by 13 different modes of transport.

- About 159,597 km of inward freight delivery (to retail establishments) journeys are undertaken per day by all freight transport modes put together. Of this, about 18,374 km of cumulative freight delivery distance is covered within the city, while the rest is outside the city.
- The largest proportion of the total freight weight delivered in the city is by LCVs (25.82%) followed by 'pickup trucks' (19.51%).
- 4W rickshaws are estimated to deliver an average of 254 kg (per establishment) over an average return trip distance of 78 km (total trip length, including outside the city boundary).
- The largest proportion of goods delivered over the total trip length of delivery in terms of kg-km is by LCVs (41%) followed by pickup trucks (15%). A majority of the deliveries made by LCVs (in terms of total kg-km) are for courier and e-commerce services.
- LCVs are estimated to deliver an average of 298 kg per establishment
- The largest number of freight trips are made by two-wheelers' (57%), followed by '4W rickshaw' (10%).

3.4. Emission from Urban Freight in Panaji



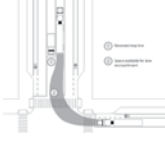


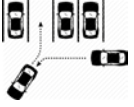
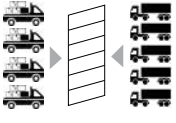








The EcoLogistics self-monitoring tool for urban freight transport was developed by ICLEI SA under the EcoLogistics: Low carbon freight for sustainable cities project in 2019. The tool helps in estimating the GHG emissions from urban freight transport at the city level. The data collected from primary and secondary sources for this study (as presented earlier) has been used to derive the input values for estimating the annual carbon emissions from freight in the EcoLogistics Tool. The outputs of the self-monitoring tool suggest that the GHG emissions generated by LCVs <3.5t is 76.44 tons, which is the highest from urban freight (road) transport sector when the total freight trip length is counted. Within the city boundary, the highest emissions are being generated by medium-sized vehicles (<0.75t tempo equivalent) such as cars, four-wheeled rickshaws, pickup trucks and vans. It accounts for 61% (from LCV <3.5t) of the total emissions from all modes, when the total trip length of freight trips is counted, and 73% (from four-wheeled rickshaws, pickup trucks, vans and cars (<0.75t tempo equivalent) when only the length of the trips within the city boundary is considered.





4. MAJOR ISSUES, BARRIERS AND OPPORTUNITIES

A summary of the identified issues is presented in the table below.

 <p>Conflict of street activities</p>	 <p>Conflict between freight and cars</p>	 <p>Unsuitable road geometry for freight vehicles</p>	 <p>Portable Generator vehicles usually parked on the road sides</p>	 <p>Absence of truck terminal</p>
 <p>Encroachment on freight parking by cars</p>	 <p>Absence of sufficient parking/unloading bays at the Panaji Municipal Market</p>	 <p>Congestion due to onroad unloading at Panaji Fish Market</p>	 <p>Absence of sophisticated unloading equipments</p>	 <p>Irresponsible Driving</p>
 <p>Inadequate freight signages</p>	 <p>Missing Landing / Birthing facility</p>	 <p>Unplanned and unsignalized junctions</p>	 <p>Absence of Traffic Barriers</p>	 <p>Traffic congestion due to on road loading - unloading activity</p>



4.1. Detailed Issues Related to Urban Freight in Panaji

Type	Micro-level issues (Note: Green cells - specific issue; Yellow cells - general issue)	Impact	Locations
Street and traffic management	Freight vehicles entering Panaji municipal market, fish market and meat market use the same road which has narrow carriage way. This is also one of the roads used by pedestrians used to enter and exit the market cluster. Freight vehicles entering are obstructed by parking, pedestrians, and other marker activities.	Congestion, emissions, road safety, and noise pollution	Road approaching backside of Panaji Municipal Market from Dayanand Bandodkar Marg
Traffic Management	Passenger vehicles, specifically four-wheelers, enter from the back of the market, randomly park or halt their vehicles there and exit from the front side of the market. The entry road at the back is specifically meant for freight vehicles and is too narrow to accommodate both cars and freight vehicles together.	They obstruct the movement of freight vehicles, which causes congestion, occupy the parking spot reserved for freight vehicles, and cause increased emissions	Panaji Municipal Market
Street design	Absence of reserved parking bays for freight vehicles. HCVs and LCVs especially face difficulties in finding parking or halting spaces.	Increases idling time, congestion, emissions, blocking of pedestrian pathways and puts pedestrians at risk. Some foodgrain wholesalers are forced to reserve the space for incoming freight vehicles early in the morning because of the pressure of private cars occupying this space.	Panaji Market area, Civil supplies, and consumer affairs godown, Goa Sahakar Bhandar
Urban design/ street planning and design/ planning regulations	Trucks do not get the required turning radius in the core city area. Random parking of vehicles or a wrong street design obstruct heavy and medium-sized vehicles from getting the needed radius. Freight vehicles also find it difficult to make turns due to a variety of visual obstructions.	Congestion, Emissions	Panaji Core City area - Panaji municipal market, meat market, clothing market area

Type	Micro-level issues (Note: Green cells - specific issue; Yellow cells - general issue)	Impact	Locations
Laws/ Regulations	Encroachment by private vehicles on reserved freight parking bays.	When freight vehicles do not get space, they stand/ park on the road and this causes more congestion and emissions.	Near Panaji market area
Infrastructure/ management	Market has only five unloading/ parking bays, which is not enough to accommodate all trucks entering it. Approximately 12 to 14 trucks and 15 to 20 small-sized freight vehicles enter Panaji Municipal Market daily.	Trucks park near Campal area. Parking and halting of multiple freight vehicles in a small space causes congestion, and inefficient loading - unloading processes	Panaji Municipal Market back entry
Infrastructure/ management	There are no unloading bays/ area in the Panaji fish market. Unloading of goods takes place on the street.	Obstruction of traffic (especially of trucks and passenger vehicles); more emissions; inefficient unloading process	Panaji fish market entry
Infrastructure/ Technology	As there is no sophisticated/ efficient technology for unloading of goods from HCVs, the unloading process takes 3 to 5 hours for each vehicle.	Increases labor costs; parking space is occupied for more than the required time	Panaji Municipal Market, Civil Supplies Godown, Liquor and foodgrain wholesalers
Infrastructure/ Street design/ Management	Unsafe intersections result in road accidents and obstruction of traffic flow	Results in casualties, congestion, and possible damage to infrastructure and vehicles	KTC circle, Heera petrol pump intersection, highway interchange
Laws and Regulations	Irresponsible driving by freight vehicle drivers results in road accidents (as mentioned in the police records)	Results in casualties, and possible damage to infrastructure and vehicles	No specific place
Infrastructure/ management	There aren't enough unloading spots/bays in the city, resulting in random parking of vehicles on the street and unloading of goods, leading to obstruction of traffic.	Freight vehicles, specifically LCVs or HCVs, are larger than passenger vehicles. Even if a single such vehicle halts on the narrow roads of Panaji for unloading of goods, it can cause traffic congestion within seconds. The more time it takes to unload goods, the greater the labor costs and emissions.	Panaji Core City area - Specify the street names
Infrastructure/ management	There are no rest and refreshment stops for freight vehicle drivers and laborers who are hauling goods over long distances, including resting areas, washrooms and canteens.		No specific location or place

Type	Micro-level issues (Note: Green cells - specific issue; Yellow cells - general issue)	Impact	Locations
Infrastructure	Inadequate signage about freight movement. Placement of existing signage does not follow guidelines.	Increased idling time, emissions, congestion, and increased time spent in logistics processes	No specific location or place
Infrastructure/management	Narrow roads. The Panaji core city is characterized by narrow roads, dense built environment, and agglomeration of commercial activities. The roads are too narrow to carry heavy and medium-size freight vehicles, in addition to passenger vehicle traffic, parking and halting of vehicles, and pedestrian movement.	Congestion due to agglomeration of vehicles in the small space.	Panaji core city
Management/technology	Laborers manually carry goods over long distances as freight vehicles are unable to get parking or halting spaces near the shops or delivery points. Inefficient delivery practice.	Increases delivery time and reduces road safety	No specific place
Infrastructure	There are no landing facilities at ferry terminals, making it difficult for freight vehicles to access them, and forcing them to take longer routes to reach Panaji.	Increases the delivery time	Route - Betim jetty to Panaji
Infrastructure	Dona Paula to Vasco ferry has stopped operations	There are more freight vehicles on the road, which could have been carried by ferries	Dona Paula/Vasco
Infrastructure/Stakeholder partnerships	Last-mile delivery via bicycles is difficult due to the topography and climatic conditions. Electric bicycles are expensive (not affordable).	A small percentage of delivery executives are interested in using bicycles, as it is strenuous and inefficient work, and increases delivery time	Panaji urban agglomeration area
Management	Weak links between rental freight vehicle owners and potential clients.	Rental freight vehicles do not get sufficient business	No specific location or place
Infrastructure/management	Unplanned and unsignalized junctions	Results in more congestion, emissions, accidents, and casualties	No specific location or place

Type	Micro-level issues (Note: Green cells - specific issue; Yellow cells - general issue)	Impact	Locations
Policy/ regulations	Existing freight notification is largely restricted to regulations about entry- exit locations and timings of the freight movement.	Other important aspects and issues related to urban freight in Panaji are not recognized and are ignored. The focus remains only on existing regulations specified under the current notification.	NA
Management	Location of godowns and markets in the city centre	Inward, outward and intracity movement involving godowns brings several freight vehicles to the city centre. This causes congestion, emissions, noise pollution, affects air quality.	Panaji Core City area
Infrastructure	Absence of road safety traffic barrier on the highway and inner-city roads	Greater risk of casualties from road accidents due to unchecked freight vehicle movement	Specify the names
Infrastructure	Road infrastructure details missing, such as road markings, bollards, ramps, cats' eye		No specific location or place
Infrastructure/ management	Insufficient parking space for LPG freight vehicles (LCVs). LPG vehicles are parked on the main streets and adjacent streets.	Adds to the congestion as parking reduces street space, puts pedestrians at risk.	Space in Panaji fire brigade office
Infrastructure/ management	Unloading - loading activities take place by the wayside on highways due to absence of consolidation centre/ area.	Inefficient loading - unloading process, reduced road safety	NH66
Infrastructure/ Supply chain management	Smaller freight vehicles travel long distances outside the city to get the goods. The locations cannot be specified. (Specifically, FMCG sector)	Increases cost of logistics operations, travel time, emissions, congestion on the street, noise pollution	High wayside
Management/ regulations	Panaji Market vendors are paying the APMC (cess) for the yard, but they are not getting any facilities	Congested market space	Panaji Market
Regulations	Unregistered / illegal water tankers are operational in the city. Illegal extraction of water and its supply.	Increases emissions, congestion, tax evasion	No specific location or place
Traffic management	Water tankers halt/ park on the narrow roads of Panaji for a longer period.	More congestion, emissions, and reduced road safety	Core city area of Panaji

Type	Micro-level issues (Note: Green cells - specific issue; Yellow cells - general issue)	Impact	Locations
Infrastructure/management	Unloading - loading of courier packets in the space behind KTC bus stand	Poor road safety, inefficient freight operations, more emissions	Parking for luxury vehicles behind KTC bus stand
Infrastructure/management	Cash logistics vehicles face parking issue. 10 to 12 cash logistics vehicles are parked by the wayside on streets	Spillover of parked vehicles on the street, loading - unloading on the street, obstructs pedestrian pathway	Tambdi Mati, Madhuban Circle, Panaji
Parking Management	Several portable generator vehicles are parked in the specific area of the core city. The vehicles are parked in narrow lanes.	Encroach on street space, adds to congestion, obstructs pedestrian pathway	Dr. Dada Vaidya Road, near CCP.
Management	Unloading - loading of cement takes place in a specific street in the core city area.	Occupies street space, obstructs flow of traffic, reduces road safety	Menenzes Bregança road near Café Mojo
Traffic management	Liquor vehicles unload goods in the narrow lanes of the core city	Possibly causes more congestion, emissions, and obstructs pedestrian pathway, impacts road safety	Near the Immaculate Church, near Panaji market and near Bhosale square
Infrastructure/management	As Goa receives heavy rains, the process of unloading and of goods loading becomes difficult in open spaces	Can cause damage to goods; increases time needed for loading, unloading and delivery of goods, leading to inefficient freight operations	No specific location or place
Management	Emergency vehicles can find it difficult to access the Panaji market cluster in case of fire or a medical emergency	Can result in possible casualties and damage to public, private or semi-public property	Panaji Municipal Market
Traffic management and regulations	Trucks are driven at uncontrolled speed. There are no signboards on freight vehicle speed limits. Standard limits: shared street – 20km/h; urban street - 30km/h.	Increases possibility of accidents, resulting in casualties	Primary street network
Management/technology	Truck movement in the city	Wear and tear of truck tires lead to increase in particulate matter	NA
Management/technology	Low utilization of vehicles. The overall utilization of freight vehicles in the city is estimated to be 23%. Almost every type of vehicle, except fuel tankers, achieves less than 50% of its total freight loading capacity.	Increase in number of freight trips and in emissions add to the congestion, noise pollution, inefficient freight operations, increased costs of logistics operations etc.	No specific location or place

Available Opportunities

The Action Plan discusses the reduction of externalities from urban freight in the city. It aims to improve the logistics operations by using better technology and operations. Opportunities are assessed as per various visions and goals, such as:

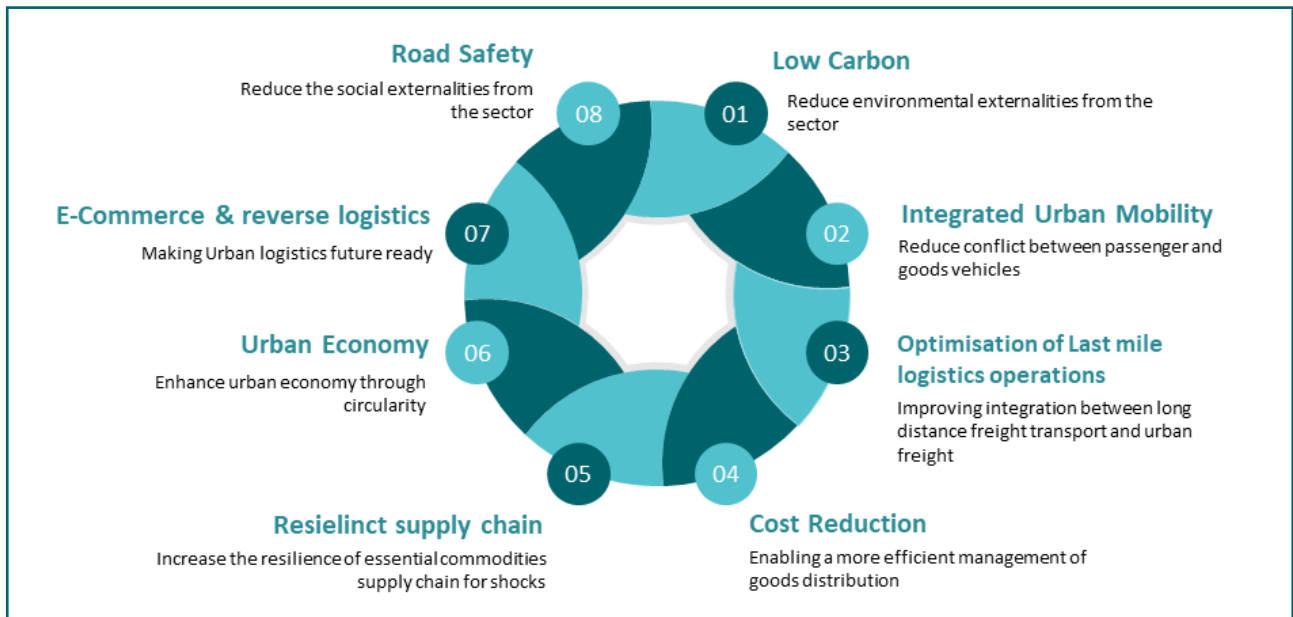
- What are the potential avenues to reduce emissions;
- How can efficiency be improved;
- How can the informalities in sector be reduced, and the framework include integrated planning?

Based on the above priorities identified by the multistakeholder working group, six broad recommendations have been made, and a low carbon action plan is suggested. These recommendations are directed towards achieving long-term decarbonization of the urban freight sector in the city of Panaji, and addressing the negative externalities of this sector in the broader region in general, and in the traffic conditions of the city. These recommendations include:



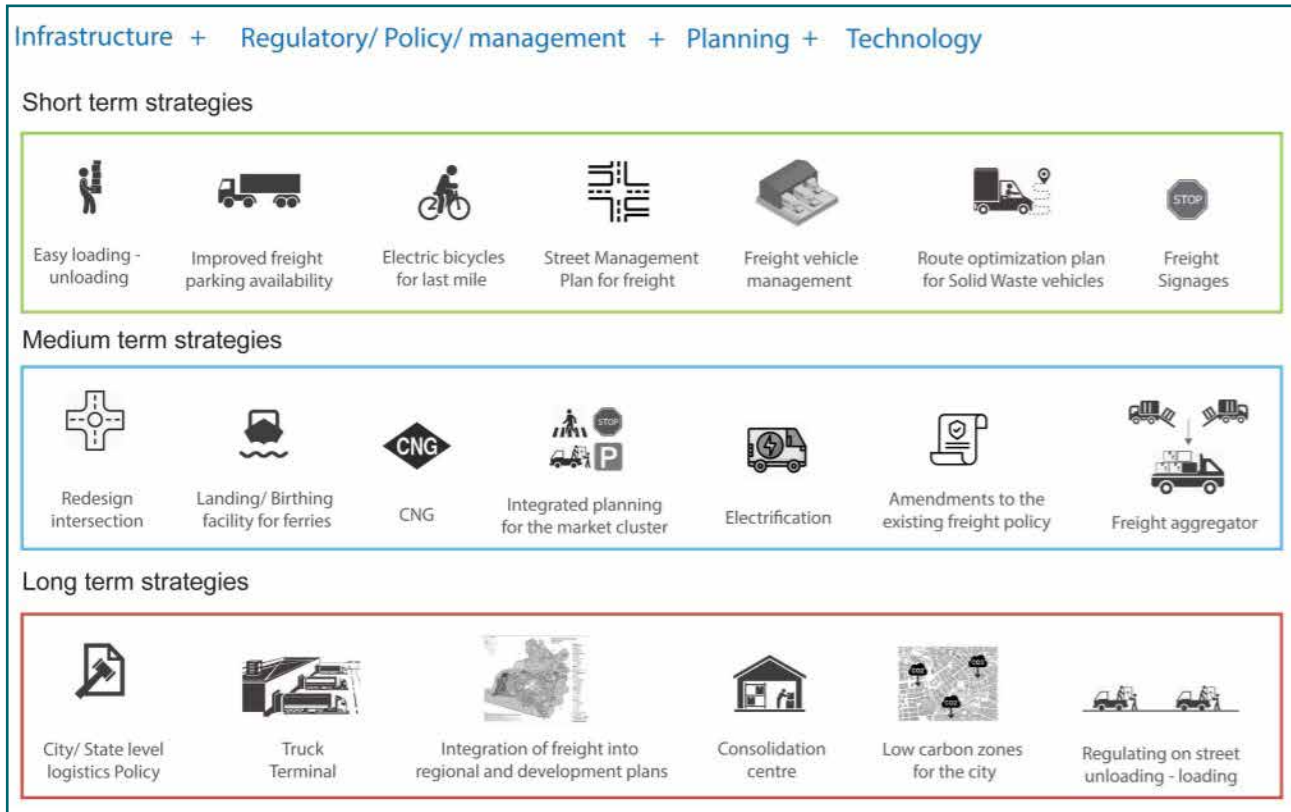
5. LOW CARBON STRATEGIES AND ACTIONS FOR URBAN FREIGHT IN PANAJI- TO ACT NOW

The Action Plan highlights the importance of improving the efficiency of freight movement in the city. Its aim to reduce greenhouse gas emissions runs parallel to that of achieving efficient freight operations. The plan introduces urban freight with the dual purpose of positioning policymakers to reduce GHG emissions from the sector, mitigate externalities and also improve efficiency in the sector. To formulate specific actions, it was crucial to identify key goals of various stakeholders associated with the urban freight sector.



5.1. Proposed Low Carbon Strategies for Panaji

Freight movement in a city is an inevitable process of trade and economy. The action plan is prepared in consultation with stakeholders, such that the city will benefit from the actions to meet the emission reduction targets of the Low Carbon Action Plan. This section describes a set of specific objectives and related actions to implement the general objectives. Actions are defined activities and interventions with a specific objective, budget, timeframe and output. The following strategies and actions are being proposed to meet the targets.



The following table presents the list of suggested strategies

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Technology based	Last-mile delivery of food/ e-commerce/ courier within city limits via electric bicycles	<ul style="list-style-type: none"> Promotion and planning for electric vehicles in the city. Provision of subsidy for the end users with relevant benefits. Conversion of old non-electric bicycles into electric bicycles (Upcycling - recycling). 	<ul style="list-style-type: none"> Reduction in two-wheeler volume and congestion on the street Reduction in emissions Walkable streets 	High cost , Long term	Enhances environmental sustainability	Cost requirement is high
Technology based	Improving the utilization and efficiency of freight vehicles through development of freight aggregator model for Panaji	<ul style="list-style-type: none"> Promote load polling among distributors by using technology such as apps Collaborations with private sector 	<ul style="list-style-type: none"> Reduction in logistics cost Economies of scale can be leveraged Sharing of freight costs Reduced vehicle km Efficient freight operations Reduction in emissions 	High cost, short term	Enhances environmental sustainability	Cost requirement is high
Technology based	Introduction of Compressed Natural Gas for freight movement to promote cost-effective and green fuel for freight transport, which results in reduced emissions	Promotion and planning for CNG-run freight LCVs in the city	<ul style="list-style-type: none"> Reduction in emissions 	High cost, medium term	Enhances environmental sustainability	Cost requirement is high
Stakeholder engagement	Development of logistics policy for Goa	Formulation of state-level sustainable logistics roadmap for Goa, which can be further strengthened to develop as state logistics policy	<ul style="list-style-type: none"> Improved economic growth for the city/ state Structured and regulated growth of freight sector User friendly ecosystem for the logistics sector Enhanced efficiency of logistics value chain Innovative planning for logistics operations 	Low cost, medium term	Opportunity to achieve worthwhile results at a relatively modest cost	Not always an easy approach or solution to urban freight transport problems since it is difficult to include all types of required stakeholders

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Stakeholder engagement	Committee comprising CCP, traffic police and all major stakeholders from public and private sectors to interact as and when required for addressing freight management issues			Low cost, medium term	Good level of acceptance expected due to the institutional role of the designated committee	Few lessons learned; new tool, not yet implemented
Stakeholder engagement	Improving the efficiency of freight movement by organizing the informal freight sector	<ul style="list-style-type: none"> ● Formation of multistakeholder committee ● Promotion of aggregator model for share goods delivery 	Improved economic benefits to individual freight rental vehicle owners	Low cost, medium term	Corporation of the City of Panaji, Panaji traffic police, North Goa Collectorate. Panaji Municipal Market Tenants Association, Fish and meat market vendors, City based organizations working in transport sector	
Regulation based	Provision of segregated space for loading - unloading of courier and freight vehicles to improve the time-bound loading - unloading of goods and to reduce the land use conflict	<ul style="list-style-type: none"> ● Redesigning the parking area ● Creation of temporary/permanent/ transformative parking/ halting spaces for freight vehicles on the street ● Strict enforcement of traffic rules 	<ul style="list-style-type: none"> ● Reduced activity and land use conflict ● Efficient and organized loading - unloading activity ● Reduction in emissions 	Low cost, medium term	Improves reliability; Improves availability of parking space; increases efficiency; Enhances environmental sustainability & safety	Requires enforcement, acceptance by public and private sectors, and coordination with other parties; May require additional parking space due to high demand

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Regulation based	To improve management of freight parking and to assist freight vehicle drivers in finding parking/unloading/ halting spaces by integrating parking of freight vehicles into the smart pay parking.	<ul style="list-style-type: none"> Physical redesign of parking space for segregation of freight vehicle and car parking. Provision of signage, road markings and other necessary transportation requirements 	<ul style="list-style-type: none"> Reduction in vehicular congestion Reduced vehicle kilometers travelled and emissions Time-efficient delivery of goods Reduction in fuel consumption Enhanced user experience Lower management costs 	Low cost, short term	Improves reliability; Improves parking space availability; Increases efficiency; Enhance environmental sustainability & safety	Requires enforcement and acceptance by public and private sectors, and coordination with other parties. Parking spaces segregated for freight vehicles may remain unoccupied during off peak hours leading to inefficient utilization of parking area.
Regulation based	To develop an implementable routing plan for the Solid waste collection fleet operated by Corporation of the City of Panaji focusing on improving operational efficiency.	Develop route map for Panaji	<ul style="list-style-type: none"> Reduction in emissions Time, fuel and cost-efficient 	Low cost, short term	Enhances environmental sustainability and safety; Increases efficiency; Provides useful info and guidance to drivers Discourages unnecessary truck movement in sensitive areas	Requires proper communication, education and enforcement by authorities; Requires high level of coordination

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Regulation based	Amendments to the existing freight policy – to reduce road conflict between freight and passenger vehicles and to improve the freight vehicle circulation by regulating the movement of private vehicles in certain parts of the city.	<ul style="list-style-type: none"> ● Installation of signage ● Development of time restrictions 	<ul style="list-style-type: none"> ● Reduction in halting of vehicles on the street ● Organized and time-efficient activity ● Reduction in congestion and emissions 	Low cost, medium term	Enhances environmental sustainability and safety; Increases efficiency; Provides useful info and guidance to drivers; Discourages unnecessary truck movement in sensitive areas	Requires proper communication, education and enforcement by authorities; Requires high level of coordination
Regulation based	Regulating the on-street unloading – loading activity	<ul style="list-style-type: none"> ● Inclusive and holistic policy/ notification for freight operations. ● Notifications can include but are not limited to regulations regarding designated spaces for freight vehicles, loading and unloading zones facilities, entry - exit points, timings etc. 	<ul style="list-style-type: none"> ● Reduction in halting of vehicles on the street ● Organized and time-efficient activity ● Reduction in congestion and emissions 	Low cost, medium term	Enhances environmental sustainability and livability; improves accessibility and safety; reduces infrastructure damage	Requires coordination; Very hard to enforce; High probability of unintended consequences
Regulation based	To streamline freight movement, reduce congestion and freight related emissions in the city by developing city-level policy/ notification/ guidelines for freight operations	<ul style="list-style-type: none"> ● Inclusive and holistic policy/ notification for freight operations. ● Notifications can include but are not limited to regulations regarding designated spaces for freight vehicles, loading and unloading zones, parking zones, rest areas for workers/ drivers, storage area facilities, entry and exit points, timings etc. 	<ul style="list-style-type: none"> ● Reduction in vehicular congestion and emissions ● Walkable and cycle-friendly streets ● Improved local economic activity ● Reduced accidents and fatalities 	Low cost, medium term	Low investment	Enforcement may be challenging

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Regulation based	To make city-center free of congestion, safe and walkable for pedestrians and emissions-free through introduction of low-carbon zones in Panaji city	<ul style="list-style-type: none"> Issue notification about restrictions on vehicles Promote Off-Hour deliveries Regulate entry of private vehicles. Street redesign - speed breakers, road markings, signage, pedestrian pathway markings 		Medium cost, medium term	Low investment	Enforcement may be challenging
Regulation based	To integrate freight transportation into regional and development plans	<ul style="list-style-type: none"> Develop state-level roadmap Form multistakeholder committee Mandate each city to formulate city-level action plan 	<ul style="list-style-type: none"> Increased road safety Reduction in accidents and fatalities Improved vehicular circulation Reduction in congestion and emissions 	Low cost, medium term	Low investment	Enforcement may be challenging
Land use planning	Develop an effective street management plan to reorganize the conflicting street functions, which can focus on the efficiency of on-street activities and freight operations, segregation of pedestrian movement and vehicular traffic, and reduction in externalities such as emissions and congestions	<ul style="list-style-type: none"> Regulating the entry of private vehicles. Designate space for parking and halting of private vehicles Street redesign - speed breakers, road markings, signage, pedestrian pathway markings 	<ul style="list-style-type: none"> Reduction in conflict between various activities Efficient and smooth freight operations Reduced congestion and emissions Increased local economic activity Improved safety for pedestrians and cyclists Improved accessibility to various services 	Low cost, short term	Low probability of unintended consequences; High impact	May require political consensus on updating of planning standards
Market based	To ease and improve loading - unloading process	<ul style="list-style-type: none"> Segregation of freight vehicle and car parking Ensuring parked cars do not encroach into freight parking areas. Strict enforcement by traffic police Road markings and signage for parking of private vehicles and freight vehicles 	<ul style="list-style-type: none"> Optimized efficiency; Reduction in time required for loading - unloading activity 	Low cost, short term	Can be implemented independently	Likely to be difficult to design and implement

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Market based	To promote inland waterways for goods transport and efficacious movement of goods	<ul style="list-style-type: none"> Upgradation of landing facility at Betim and Dona Paula Jetty Upgradation of Dona Paula and Vasco jetty to restart the ferry service. 	<ul style="list-style-type: none"> Reduction in vehicular volume and congestion Reduction travel distances for vehicles and emissions Efficiency and time-bound delivery of goods 	Medium cost, medium term	Achieves predefined environmental or traffic-related targets	Likely to be difficult to design and implement
Infrastructure	Integrated planning, design and implementation of road safety measures	<ul style="list-style-type: none"> Redesign of intracity intersections Strict enforcement of traffic rules Installation of traffic infrastructure elements at the important intersections, turns, junctions and roads 	<ul style="list-style-type: none"> Increased road safety, specifically for pedestrians and cyclists Reduced accidents and fatalities Improved and organized vehicular circulation Improved walkability Reduction in encroachment of footpaths by vehicles 	Low cost, Long term	Low probability of unintended consequences; High impact	May require political consensus on updating of planning standards
Land use planning	To control and curtail heavy truck movement and congestion through relocation of large godowns/ warehouses on the outskirts/ out of the city	<ul style="list-style-type: none"> Shifting large warehouses/ godowns outside the city boundaries 	<ul style="list-style-type: none"> Reduction in freight vehicle volume and congestion in the core city Reduction in emissions Improved air quality 	Low cost, Long term		May require political consensus on updating of planning standards
Infrastructure based	Reorganize and reactivate the urban street space by redesigning streets with emphasis on increased economic activity, green space, reduced environmental footprint, smooth movement of goods, provision of loading-unloading areas, safer movement of commuters and pedestrians etc.	<ul style="list-style-type: none"> Planning and redesign for better circulation of private vehicles, freight vehicles and pedestrians. Identifying and reserving sufficient space for freight parking and halting Maximize pedestrian areas. Limit private vehicle parking in the market area 	<ul style="list-style-type: none"> Better walkability and cycling Increased traffic safety Efficient freight operations Enhanced environmental quality Reduced emissions 	Low cost, medium duration	Low probability of unintended consequences	May require retrofitting of existing infrastructure; requires public and private-sector acceptance

Parameters	Strategies	Actions	Nature of problem addressed	Investment required & Implementation	Strength of intervention	Weakness
Infrastructure based	Infrastructure improvements of landing/ berthing facility at ferry points	<ul style="list-style-type: none"> ● Upgradation of landing facility at Betim and Dona Paula Jetty ● Upgradation of Dona Paula and Vasco jetty to restart the ferry service. 	<ul style="list-style-type: none"> ● Improved accessibility ● Reduced vehicle kilometers ● Reduced emissions ● Improved road safety 	High cost, medium term	High visibility and impact	May require retrofitting of existing infrastructure ; requires public and private-sector acceptance
Infrastructure based	Redesigning important/critical junctions/intersections	<ul style="list-style-type: none"> ● Redesign of streets and intersections in the core city ● Creating sufficient space for heavy vehicles to turn ● Clearing out parking/ halting at junctions. ● Provision of signage, road markings and other necessary transport details 	<ul style="list-style-type: none"> ● Decrease in number of accidents and fatalities; improved road safety 	Low cost, short term	Low probability of unintended consequences	May require retrofitting of existing infrastructure; requires public and private-sector acceptance
Infrastructure based	To redesign and redevelop highway intersections and interchanges to reduce congestion, emissions, road accidents and to improve road safety.	<ul style="list-style-type: none"> ● Integrated planning and installation of traffic infrastructure elements at the important intersections, turns, junctions and roads 	<ul style="list-style-type: none"> ● Improve road safety 	Medium cost , short term	Easy to implement; High impact	May require retrofitting existing infrastructure; requires public and private-sector acceptance
Infrastructure based	Development of truck terminal/ consolidation center on outskirts of Panaji	<ul style="list-style-type: none"> ● Regulating loading and unloading of goods on the wayside of highways ● Creating space for loading and unloading of goods, such as under flyovers ● Planning and developing truck terminal/ parking space 	<ul style="list-style-type: none"> ● Provision of godown space to transport companies/ wholesalers ● Reduction in irregular parking on the city streets ● Vehicle repair/ service facility ● Efficient loading - unloading activity 	High cost, medium term	Easy to implement; High impact	May require retrofitting of existing infrastructure; requires public and private-sector acceptance; large investment needed

5.2. Emission Reduction Potential

Vehicle Categories	Characteristics/ indicators	Technology				Policy/ Management/ Enforcement				Infrastructure		
		Fleet Electrification/ CNG	Freight aggregator	Route optimization	Shift in mode	Parking/unloading space availability (Smart Parking)	Easy circulation (Congestion-free movement)	Change in delivery times/patterns (total trip length vs. internal trip length)	Micro consolidation center (Indirect emissions reduction)	Truck terminal (indirect emission reduction)	Shifting of godowns outside CBD	
2W (Bikes/ Moped)	Maximum number of trips undertaken overall freight movement all links combined (50%). Maximum distance covered in terms of cumulative trip length (52%) within city limits	70% reduction (New electric bikes – need subsidy and tax exemption)	40% reduction	25 to 30% reduction (Application can be created to optimize the route to reduce travel distance and fuel costs)	100% reduction (electric cycles - not possible for all deliveries)	NA	10% reduction	NA	20% reduction	20% reduction	29% reduction	
LCV	Maximum distance covered in terms of cumulative trip length (42.23%) for entire trip length. Maximum demand catered to in tonnes – km (74%) for total trip length.	30% reduction	25% reduction	Two ways - internal and for total trip length. (20% and 15%)	40% reduction	30% reduction	12% reduction	15% reduction	30% reduction	20% reduction	12% reduction	
HCV	Maximum weight delivered, all links combined (39.58%)	15% reduction	11% reduction	40% reduction	35% reduction	20% reduction	11% reduction	20% reduction	17% reduction	12% reduction	23% reduction	
4W Rick(goods rickshaw)	Second highest - Total distance covered within the city limits (15.05%)	50% reduction (saving fuel cost)	30% reduction	20% reduction	Possible only for specific deliveries	30% reduction by reducing idling time	17% reduction	30% reduction	20% reduction	20% reduction	32% reduction	
Pick up vehicle	Second highest number of total deliveries in terms of total distance covered in Panaji for entire trip length (12.46%)	12% reduction	25% reduction	15% reduction	31% reduction	10% reduction	15% reduction	30% reduction	15% reduction	15% reduction	27% reduction	
Van	Fifth highest in terms of total freight delivery by weight in Panaji	18% reduction	25% reduction	15% reduction	20% reduction	15% reduction	40% reduction	25% reduction	27% reduction	15% reduction	16% reduction	

5.3. Key Performance Indicators to Measure the Success of Proposed Project

Category	Indicator	Parameter [unit]
Economic – logistics service quality	Level of road infrastructure	Road infrastructure density [lane-kms/km ²]
	Availability of intermodal transport access	Number of intermodal hubs according to type (rail, inland waterway, sea, air) [#]
	Cost of congestion	Average congestion delay [veh-hours/year]
	Road quality	Percentage of road undergoing maintenance per year [%]
	Financial health	Transport budget [INR]
	Level of service for roads	Mean speed of freight vehicles [km/h]
	Reliability of travel time	% trips deviating from mean travel time
	Costs of transport services/ Total costs of delivery	Mean costs (fixed and running costs) per deliveries
	Accessibility for freight vehicles	Percentage of accessible roads per vehicle category [%]
Environmental	Greenhouse gases	Well-to-wheels GHG emissions for UFT [ton-CO ₂ e/year]
	Energy efficiency	Total energy used according to freight traffic volume [MJ/ton-km]
	Air pollution	Total emissions of air pollutants (PM10, NOx) [kg/year]
	Urban area used for UFT	Percentage of urban area used for UFT out of total city area
Social	Traffic safety	Injuries and fatalities involving freight vehicles [#]
	Jobs	Employment in city logistics [#]



6. DEMONSTRATION PROJECTS

Panaji should prioritize and undertake a suitable demonstration project to provide concrete proof of the viability of concepts. This can help to increase knowledge and awareness among decision-makers, municipal staff, stakeholders and potential investors.

The demonstration projects by themselves may not lead to large reductions in GHG emissions due to their limited scale. However, they will introduce innovative concepts, raise awareness, create justifications and opportunities and also potentially unlock resources for the implementation of low-carbon urban freight initiatives on a large scale, to complement low-carbon urban transport projects with the local government's own resources or add-on financing schemes.

Within the EcoLogistics project, it is planned that the model city will finalize the demonstration project based on the projects' recommendation and/ or ongoing projects in promoting low carbon urban freight transport. A set of criteria is developed in the project to rank demonstration projects identified in the consultation process, based on the potential amount of GHG emissions reduced, costs, project implementation time, availability of external resources for the implementation potential and social and economic benefits, among others.

The demonstration project examples were prepared to guide and inspire Panaji towards developing potential ideas of low-carbon freight initiatives. The following aspects were considered:

- Shift from conventional combustion engines to low-carbon alternatives such as electric vehicles
- Local consolidation centers, micro-consolidation centers
- Specific times for freight delivery, off-hour/night deliveries
- Dedicated urban freight corridors

The potential project that could be undertaken on a pilot basis is promotion of collaborative last-mile delivery (load pulling) by electric freight vehicles.

The urban freight baseline for Panaji highlights two critical bottlenecks: a) Low load factor of 26 percent in the low capacity vehicle (LCV) segment (with a gross vehicle weight between 0.5 tonne and 3 tonnes), and b) Dependence on old polluting internal combustion engine (ICE) based fleet of freight vehicles. As per the baseline, LCVs and two-wheelers form over 95 percent of the vehicle kilometers in Panaji.

Therefore, the city should undertake projects that can validate and demonstrate the workability, performance, techno-financial viability of the use of low emission electric freight vehicles, and the load pooling concept for urban freight deliveries. This will develop the case for more rapid electrification of the urban freight fleet. Load pooling will encourage several distributors and traders (shippers) to pool load in a single multi-stop trip and help shippers and carriers (freight vehicle owners) to create optimal delivery outcomes. Pooling will increase the load factor of freight vehicles and thereby increase efficiency by reducing the number of vehicular trips and delivery-related fuel consumption, as well as cut delivery costs, thereby reducing congestion and stress on limited parking spaces in the core city.

7. WAY FORWARD

Panaji will work with the multistakeholder working group and partners to ensure urban freight meets the changing demands of a growing population in a most sustainable way- Mayor

This action plan sets out the existing situation in Panaji and outlines the key actions it needs to take in the short term, medium term and long term to overcome the barriers to developing a clean, safe and efficient freight system. The actions will help the city to achieve the aim of a 10 per cent reduction in emission intensity by 2031, and improve how deliveries are carried out across the city. However, this is only our first step towards achieving the vision of sustainable urban freight for Panaji. Over time, the city needs to continue to monitor the progress of this plan, evaluate the impact of the suggested actions and build its knowledge in order to develop new actions or policies as and when they are needed. CCP needs to take a lead role in coordinating action and partnership between the many parties involved - boroughs, suppliers, operators, servicing companies, businesses, informal sector organizations, customers and others – to ensure Panaji remains at the forefront of clean, safe and efficient freight.

The city also needs to recognize that the urban delivery sector is changing fast, especially due to rapidly evolving technology and demographic shifts. As Panaji grows, the increasing demand for freight will make the situation even more complex. Therefore, new technologies and innovations will be vital for adapting to the changing landscape of the freight sector. In addition to changing customer demands, new business models and emerging technologies may radically change the way the freight industry operates. CCP need to actively seek out new ideas by engaging with market innovators, start-ups, academics, public bodies and the wider industry to understand what is coming, so it can be open to the opportunities that new business models and emerging technologies present.

While demand and technologies evolve, the city's ambitions remain clear – safe, clean and efficient freight that serves a growing Panaji. Looking ahead, the city need to update its strategy as its knowledge, business models and technologies evolve.







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