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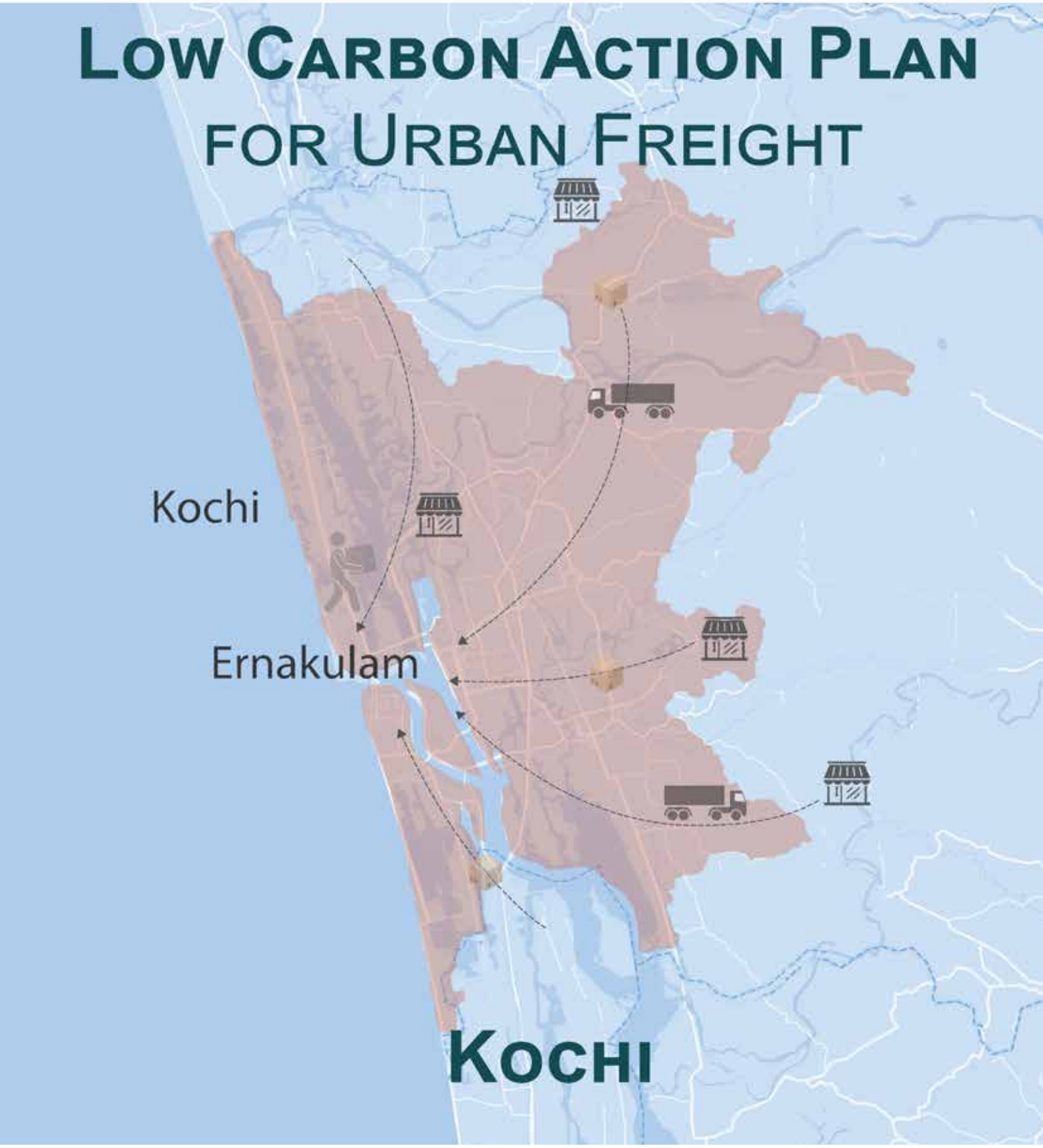
based on a decision of the German Bundestag

KOCHI METRO RAIL LIMITED

EcoLogistics

Low carbon freight for sustainable cities

Low Carbon Action Plan for Urban Freight



ICLEI
Local Governments
for Sustainability

This document is a deliverable of the "*EcoLogistics: Low carbon freight for sustainable cities*" project. The strategies discussed in the action plan were validated with the members of multi-stakeholder working group and subsequently well received by Kochi Municipal Corporation (KMC).

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 KMC, Transport Department, Government of Kerala, Kochi Metropolitan Transport Authority and other stakeholders in the city. We would like to acknowledge the support of ICLEI Sustainable Mobility Team, EcoLogistics project partners, Despacio, Zaragoza Logistics Center and Smart Freight Centre, through their valuable comments and inputs, this report was made possible.

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Disclaimer

The information in this report is based on the findings of the report *"Low Carbon Urban Freight Action Plan for Kochi under 'Eco Logistics – Low Carbon Freight for Sustainable Cities' Project",* and close consultation with various stakeholders in Kochi. ICLEI South Asia does not, guarantee the accuracy of the information in this document and does not accept responsibility for consequences of their use. For further information, please contact iclei-southasia@iclei.org.

FOREWORD

I am extremely happy to present the Low Carbon Action Plan for Urban Freight for Kochi which has been developed under the EcoLogistics project being implemented in India by ICLEI – Local Governments for Sustainability, South Asia, and supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), Germany, through its International Climate Initiative (IKI).

Adv. Shri Anil Kumar

Mayor, Kochi

Kochi is a port city, which also has a network of roads and railways, an inland waterway system, seaports, and airports, all of which help to connect several agricultural, industrial and natural resource areas, as well as employment centers and international gateways, making it a key hub for import and export-related activities. The market demands of an expanding population in the city is met by goods transported from other areas. Therefore, urban freight definitely plays a crucial role in the sustainable development of the city.

This action plan lays out the status quo in Kochi's freight sector and makes recommendations for key actions that the city needs to take in the short, medium and long term to overcome the barriers to ensuring clean, safe and efficient freight transportation. However, this is only the first step towards achieving the vision of sustainable urban freight; 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. The Kochi Municipal Corporation (KMC) needs to take a leading role in coordinating action between many stakeholders such as the relevant boroughs, suppliers, operators, servicing companies, businesses, informal sector organizations and customers, among others.

The city of Kochi is committed to mainstreaming sustainable freight management, which is vital not only to reduce environmental externalities but also promote efficient goods movement to help support the economy and create employment opportunities and this report will greatly assist the city in making informed decisions.

I wish to express my appreciation for all the efforts put in by the ICLEI- Local Governments for Sustainability, South Asia, and Centre for Heritage, Environment and Development (C-Hed) in developing the action plan.


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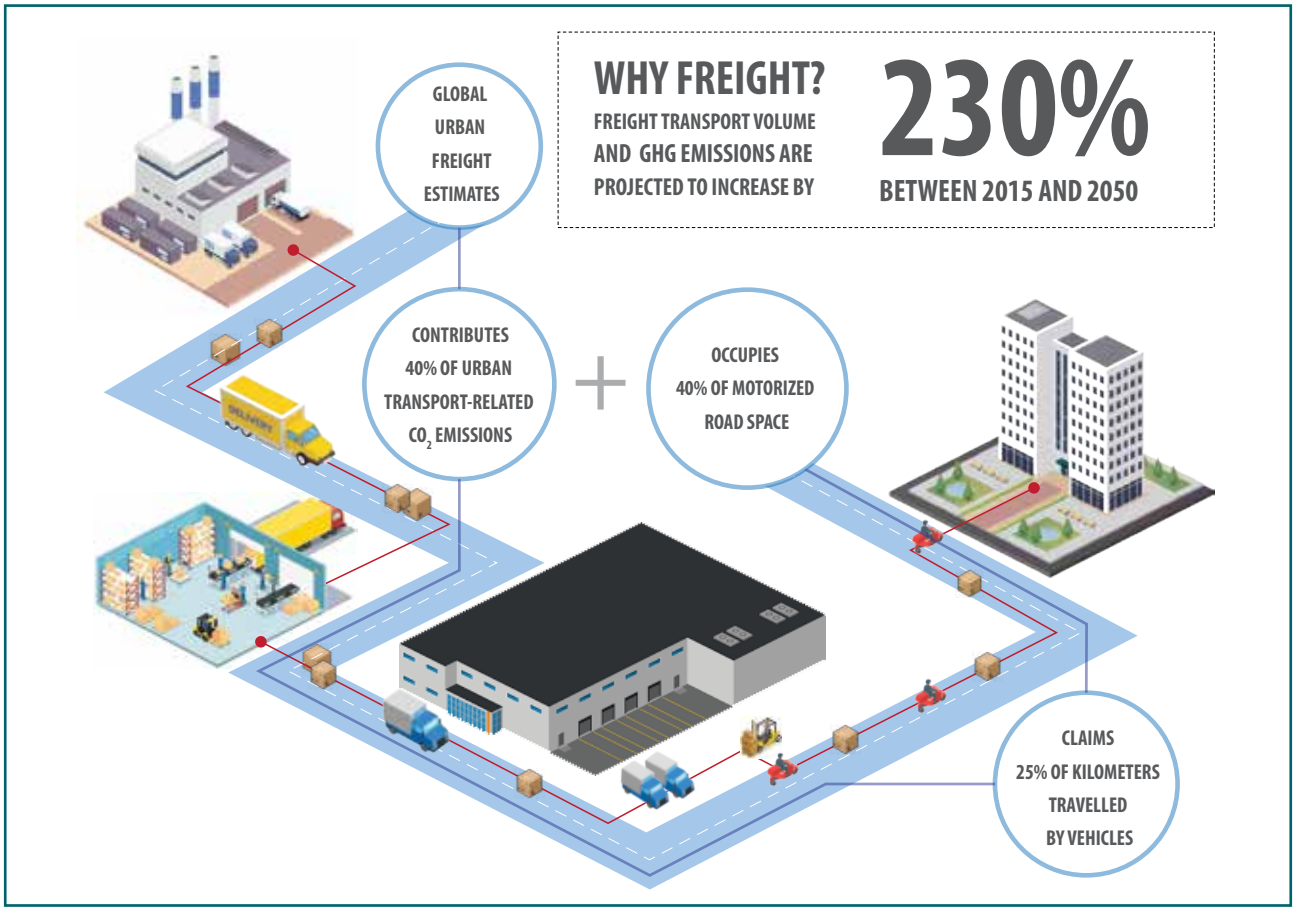
1. INTRODUCTION - WHY URBAN FREIGHT MATTERS

Urban freight is an integral part of a city's functioning, providing both citizens and businesses with products they need on a daily basis, including food, fast moving consumer goods, e-commerce deliveries and 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% of urban vehicles, takes up to 40% of motorized road space and contributes to up to 40% of urban transport-related CO_2 emissions.



1.1. EcoLogistics Project to Advance Effective Regulatory, Planning and Logistical Instruments to Support Low-carbon Urban Freight

Indian cities are characterized by an extensive and dense network of over 12 million retail outlets that serve the nearby residential areas. These outlets are unorganized and typically from a multitude of small, independent carriers, creating a complex system. In the past few years, e-commerce has developed rapidly, and is expected to grow further at over 20% per annum over the next decade. In the national capital city of Delhi, urban freight is responsible for 67% of the total PM2.5 emissions, 61% of the total SO2 emissions and 62% of the total NOx emissions from the transportation sector. The high level of negative environmental externalities are further exacerbated by the absence of a comprehensive understanding of urban supply chains and freight 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 the freight sector. 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 operators.

With the above background ICLEI is implementing EcoLogistics project in three Indian cities Kochi, Shimla and Panaji. The project is focused 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 Plan for Urban Freight, support implement of demonstration projects in cities, and suggest national policy recommendations for urban freight sector. The project is supported by German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU) through its international Climate Initiative (IKI) program.

The 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.

1.2. Introduction of Kochi City

Kochi is a major port city on the south-western coast of India. It is part of the district of Ernakulam, in Kerala, and is thus alternatively called Ernakulam, the mainland part of the city. With a population of 6.01 lakhs, Kochi is the most densely populated city in the state and is part of an extended metropolitan region with a population of 2.1 million, the largest urban agglomeration (UA) in Kerala.

The decadal population growth of Kochi city in 2011 was less than 1%, but at same time, the growth rate of the UA was around 74%, which is well above the national average of 17.64%. In the last three decades, the UA experienced a high decadal population growth rate mainly due to its trade growth and accompanying opportunities.

The overall population density has been stagnant in Kochi city due to a lack of land availability, which has contributed to the urban sprawl. New growth is being witnessed in the city's suburbs.

Kochi has been an important spice trading center since the 14th century. The presence of the major port has ensured the growth of trade and tourism, which has benefitted the city's economy. Kochi is a major exporter of spices and is home to the International Pepper Exchange, where black pepper is globally traded. The Spices Board of India and World Spice Organization's headquarters are also located in Kochi.

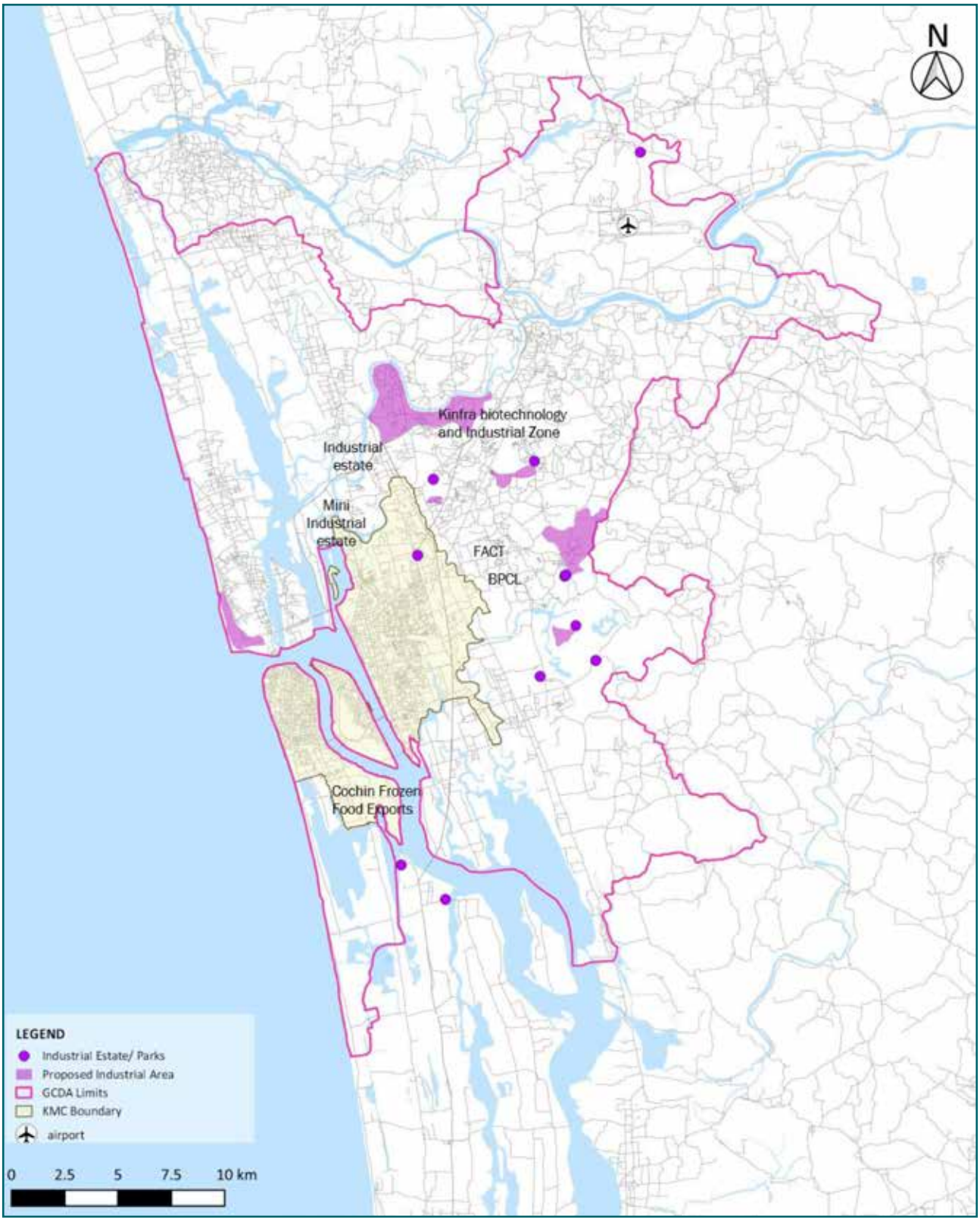


Figure 1: Outline map highlighting study area

Figure 2: Population growth for Cochin City and Urban Agglomeration (UA)

2. LOW CARBON ACTION PLAN FOR URBAN FREIGHT IN KOCHI - TO ACT NOW

Urban freight is the movements of goods to, from, through or within an urban area, and includes service, construction as well as waste and reverse logistics. It includes a variety of freight operations, commodities, freight formats, time demands and vehicles used to connect a myriad of places of origin and destination for different products. It is a critical enabler of the economic activity of cities.

The Low Carbon Action Plan highlights the importance of improving the efficiency of freight movement in the city. Its goal to reduce greenhouse gas emissions runs parallel to the goal of ensuring efficient freight operations. This document is a follow-up to the baseline developed as part of the EcoLogistics project. The action plan introduces urban freight with the dual purpose of positioning policymakers to reduce GHG emissions from the sector, and mitigating externalities while improving efficiency. This document will introduce basic concepts and terminology, describe the benefits of promoting low-carbon urban freight and provide an overview of the urban freight policy landscape in India. The action plan includes a variety of measures that need to be undertaken in the short/ medium/ long -term to ensure effective implementation and outcomes.

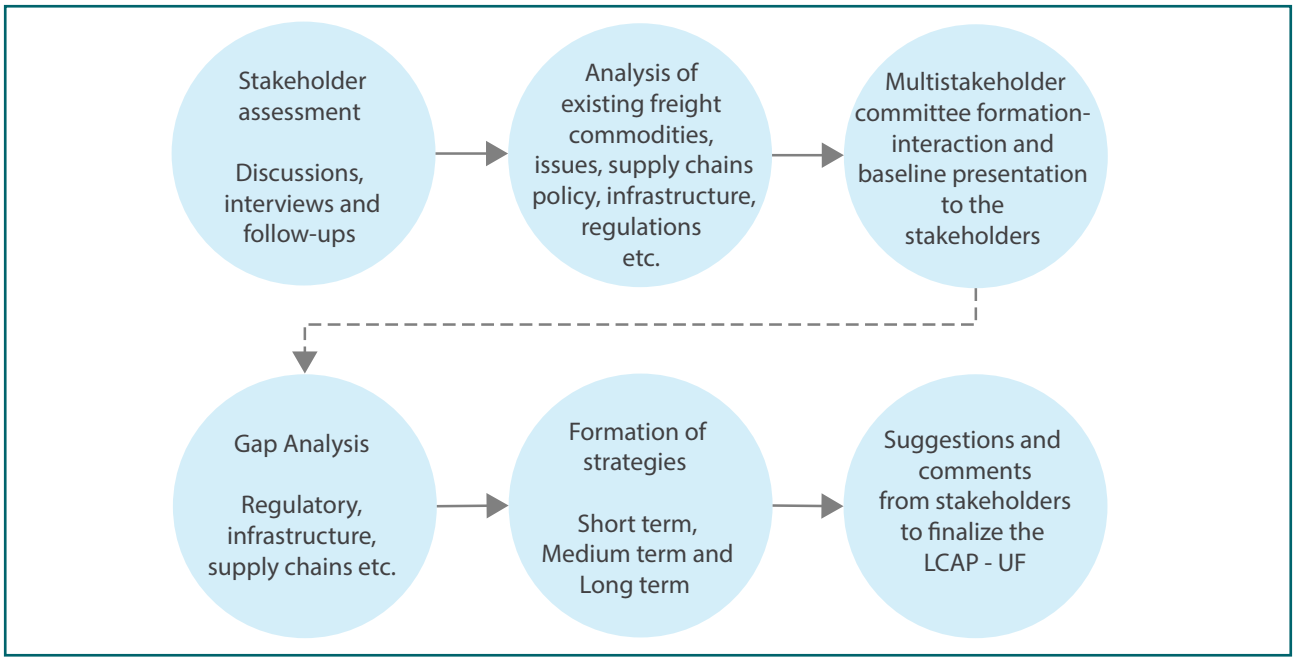
Freight activity has implications for the livability of Kochi. Existing freight transport systems in urban areas cause a variety of negative economic, environmental and social impacts. These include:

- **Economic impacts:** congestion, inefficiency and resource waste.
- **Environmental impacts:** pollutant emissions, including the primary greenhouse gas carbon dioxide; the use of non-renewable fossil fuels and the creation of waste products such as tires, oil and other materials.
- **Social impacts:** the impact of pollutant emissions on public health (death, illness, hazards), injuries and death resulting from traffic accidents, noise pollution, visual intrusion, and other quality of life issues (including the loss of greenfield sites and open spaces in urban areas because of transport infrastructure development).

As the gross domestic product, online shopping and the demand for same-day home deliveries increase, it is expected that more freight vehicles will be on the roads, contributing not only to emissions but also to traffic congestion, noise and air pollution, and greater competition for curbside space. Therefore, in 2020, the Kochi Municipal Corporation (KMC) adopted the baseline developed as part of the EcoLogistics project. This action plan is based on the baseline targets for reducing the externalities from urban freight in the city and for increasing the overall efficiency.

2.1. Low Carbon Action Plan - Methodology

Six steps have been identified in the study framework for developing an LCAP for Kochi. The first step is to associate with the site by identifying a study area boundary and getting an overview for developing an inception report. The next step is to identify the dataset required for generating a baseline. It involves identifying data availability and constraints and listing all stakeholders. This is followed by surveys and interviews based on the data gaps, after which the data collected is assessed and a draft baseline report prepared. Recommendations and proposals are identified on the basis of the baseline, which then cumulatively comprise an LCAP. **The Kochi LCAP was presented to stakeholders and verified to increase its reliability.**



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

- Workshops/ meetings with stakeholders and authorities of freight-related departments to understand the freight operations in the city.
- Baseline assessment of the city through secondary data analysis, and a primary survey of freight vehicle operators, shop owners, freight-related associations, traffic police and other authorities as respondents. Visual observations were also part of the data collection.
- Analysis of the collected data to understand the barriers and challenges in freight operation.
- Establishment of a multistakeholder consultation group at the city level to improve coordination and communication among various departments and related sectors.
- Improved and streamlined discussions and development of strategies focused on the city freight sector because of the existence of the multistakeholder consultation group.
- Identification of issues and impacts of freight operations in the city for developing better understanding of the next steps towards strategy development. Literature studies, meetings with authorities and stakeholder consultation assisted in identifying the strategies that might mitigate the negative externalities of freight operations.
- Categorization of the strategies under short-, medium- and long-term strategies. Ease of implementation was also considered while developing strategies and recommendations.

"Urban freight today is not always sustainable. It is responsible for a substantial share of CO2 emissions. In the business-as-usual scenario, the environmental footprint of urban freight will continue to grow as it is impacted by fast urbanization trends and the increase in direct delivery of products to households through e-commerce."

2.1.1. Scope of this document - influence area

This document is aimed at raising awareness and increasing knowledge of urban freight issues and challenges among policy makers. The action plan is intended to help decision-makers in identifying sustainable urban freight strategies to tackle major challenges affecting the livability of Kochi. The

plan aims to introduce innovative solutions to deal with the freight logistics traffic, ensure efficient distribution of goods, and reduce environmental pollution, noise and hazards for pedestrians.

This action plan will help city authorities to identify the most appropriate mix of strategies, but does not claim to be an exhaustive document covering all aspects related to the freight system. Measures and initiatives are organized to allow policy makers to draw ideas and suggestions that can be transferred to their specific contexts. The 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 for implementation in the city, together with an indication of potential positive and negative impacts.

3. SUMMARIZING FREIGHT SCENARIO IN KOCHI

Kochi, being a major port city, has substantial trade activity that lead to heavy freight movement in addition to the demand for freight by local consumers. About 30% of the medium and large-scale industries in Kerala are located in Ernakulam district, with a majority of the industrial estates located on NH66 outside the Kochi Municipal Corporation (KMC) area, in Kalamaserry, Kakkanad and Ambalamugal. The Ernakulam market is one of the major places of origin/ destination of goods within the Greater Cochin Development Authority (GCDA) limits and is located in the city center. Kochi is well connected by road, rail and water transport networks, but road transport claims the largest share in freight transport.

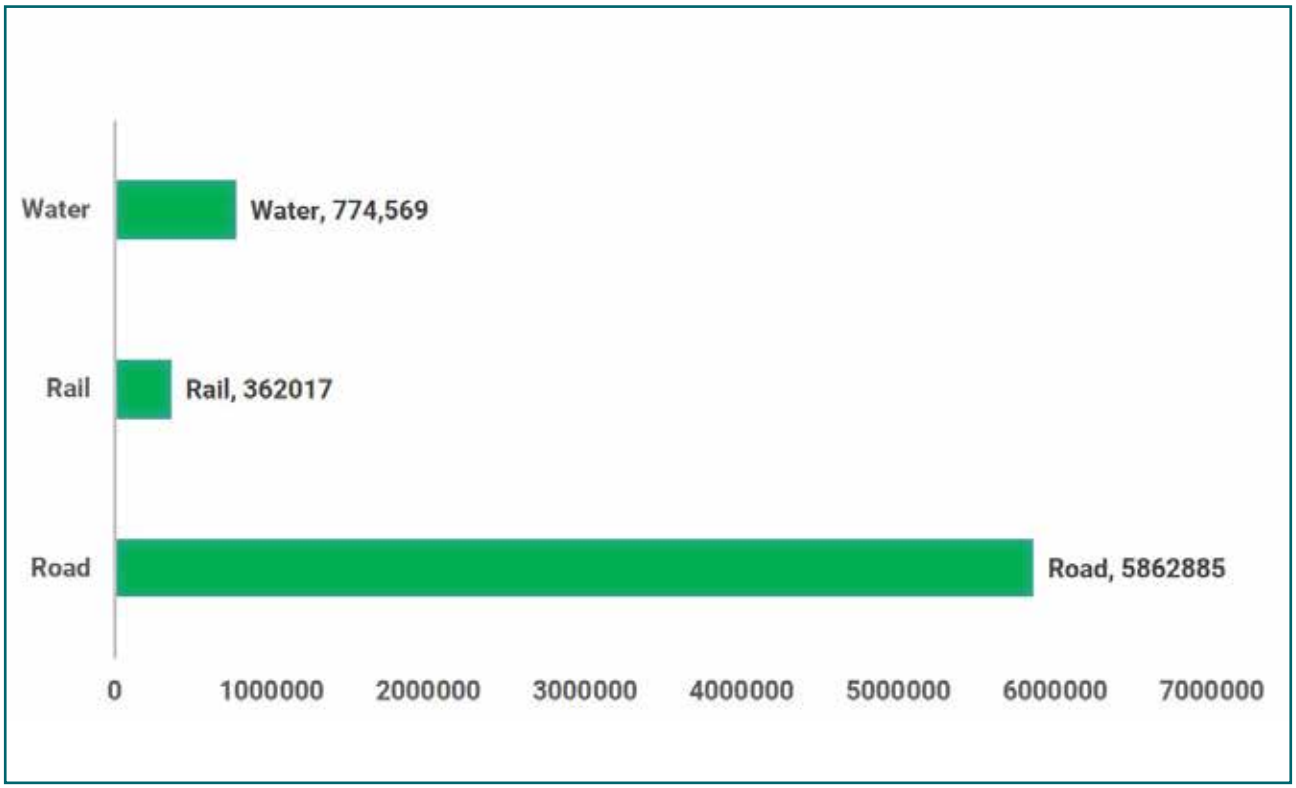


Figure 3: Freight handled by different modes during 2017-18 in Tons

Freight Characteristics

Freight vehicles contribute 14% of the total vehicles registered in Kochi. Considering the passenger car unit (PCU) value of goods vehicles, it is observed that they comprise almost 47% of the total registered vehicles. As evident from Figure 4, the majority of freight activities are conducted during daytime. The largest number (6%) of goods vehicles enter and exit the city between 7am and 8am. However, 35% of the goods movement is registered between 10 am and 4 pm.

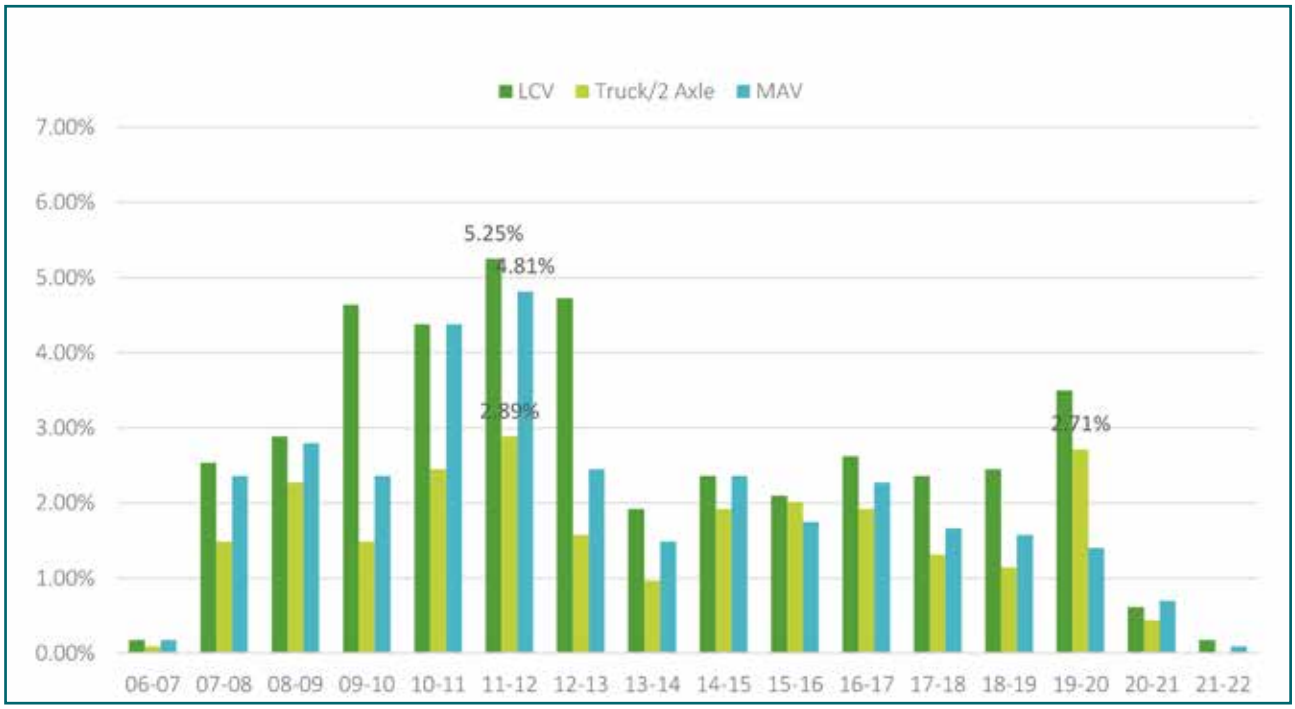


Figure 4: Goods vehicles entering the city during different time periods

Commodities distributed in Kochi

Figure 5 shows the different categories of goods transported by freight vehicles. It is found in the study area, 20% of the vehicles making the trips were empty, 15% of the trips involved transport of building materials, 12% of food grains, vegetables and cereals and 11% of stone and coal. However, at Ernakulam market, 75% of the trips were made to transport vegetables, fruits and milk, etc., 7% to transport finished consumer goods and only 4% of the trips involved empty vehicles. From the commodities transported within the city, 37% of the trips load whereas 47% unload.

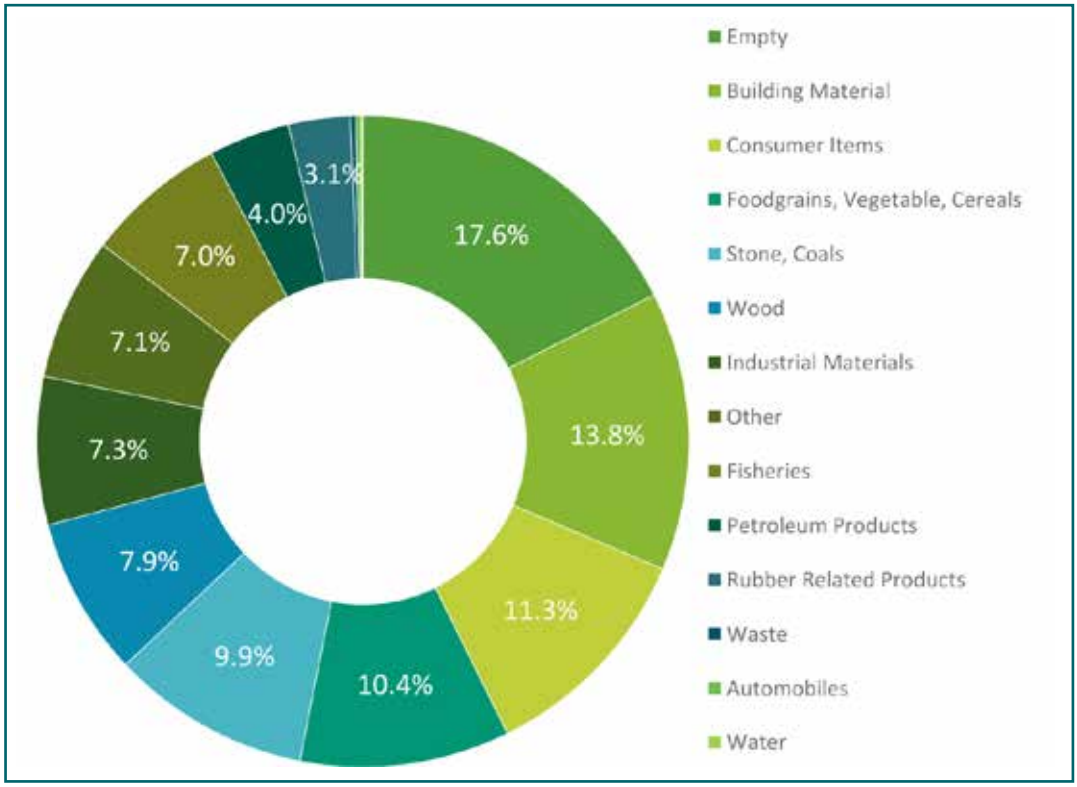


Figure 5: Commodities captured at cordon points

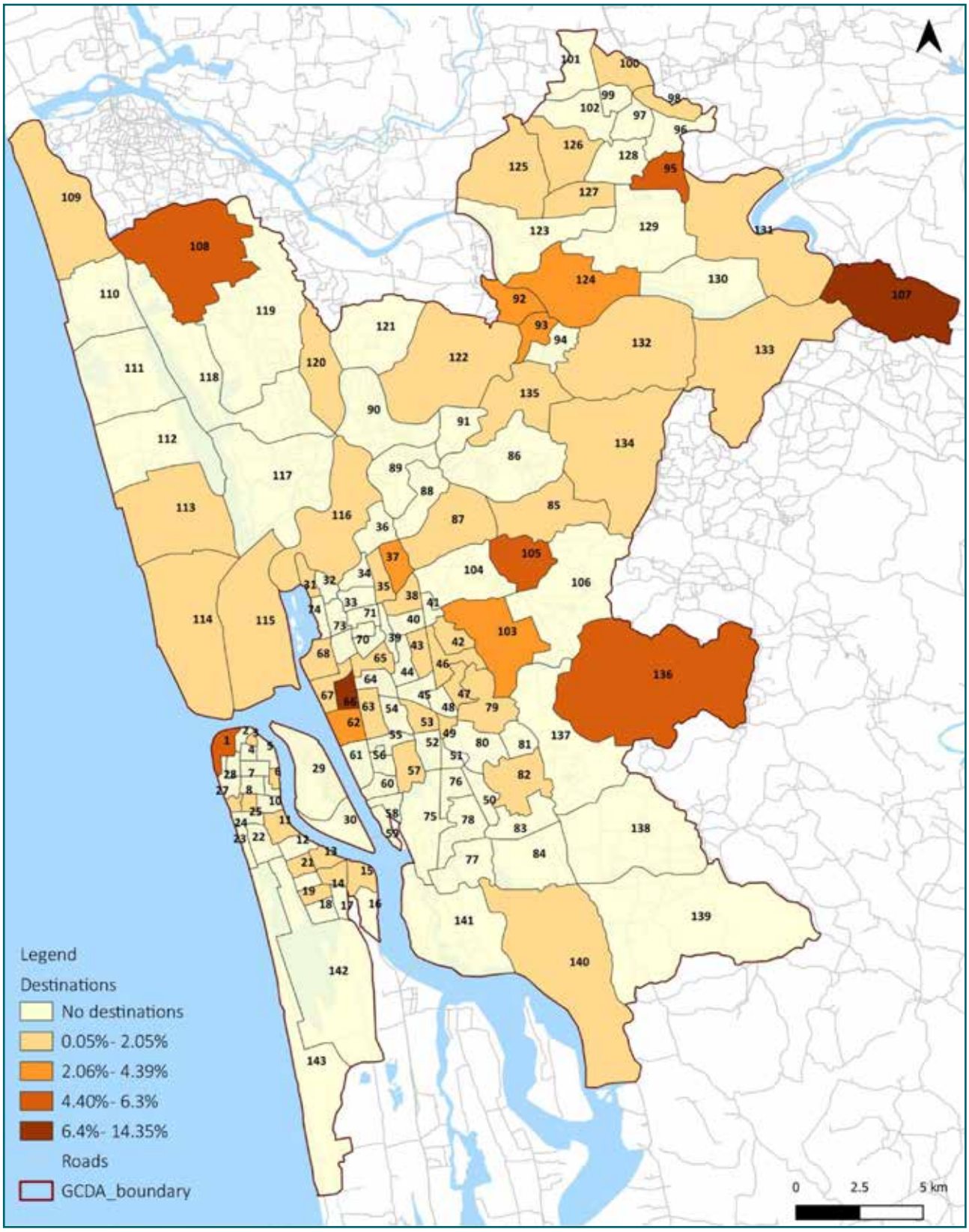


Figure 6: Maximum trip terminator TAZs

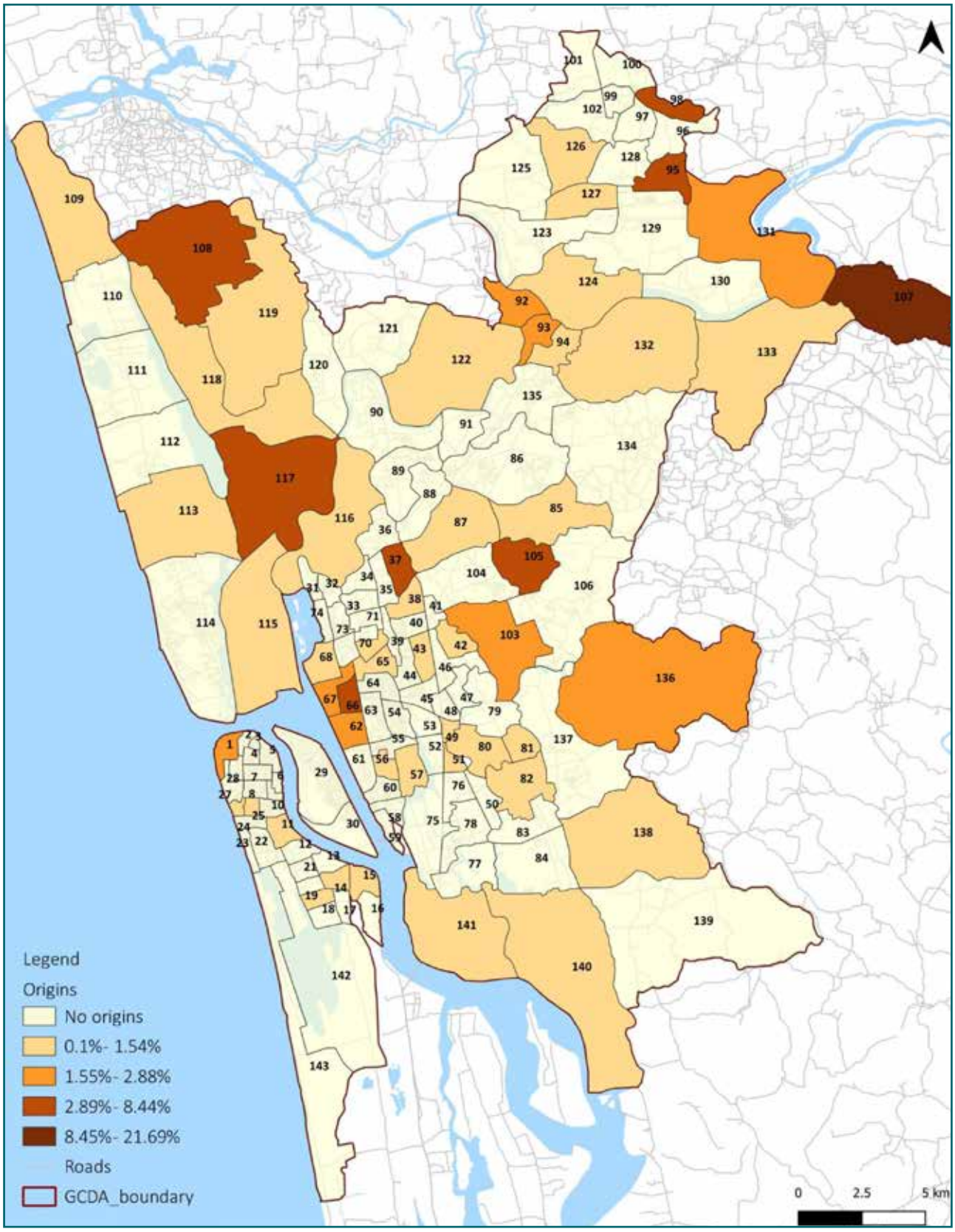


Figure 7: Maximum trip originator TAZs'

Mode Share of road-based freight vehicles in Ernakulam market

It is estimated that autos comprise 14.29% of all vehicles that transport goods to and from the market. Between 6 am and 10 pm, 1500 autos are recorded daily at the Madhav Pharmacy junction and Hospital Trust junction on the periphery of the market. Commodities are transported to the market mostly by trucks (59%) of which 80% enter the market daily for delivery, while 73% of the trucks transporting goods to and from the market enter and leave it between 9 pm and 7 am. A majority of the trucks bring fruits and vegetables. Figure 8 shows the share of different goods vehicles at 11 inner cordon points.

Freight traffic observed within KMC area

Figure 9 lists the total PCUs (public transport, private vehicles, goods vehicles, and slow-moving vehicles) and freight PCUs recorded at all 24 junctions. 82% of the total PCUs counted at Irumpanam junction were freight vehicles. The junctions within the KMC area are highlighted in green. Goods vehicles comprise 37% of the total PCUs recorded at Palarivattom bypass junction, which along with Edapally junction, is the entry point to Banerjee Road. Similarly, Vytilla junction is an entry point to SA road and also has a mobility hub in the vicinity. These two roads lie in the CBD area and see a high volume of traffic. Palarivattom Bypass and Edapally junction within the KMC area are among the top five junctions that register the highest number of PCUs as shown in Figure 5-32. Of 24 junctions surveyed, those within the KMC account for 30% of the freight traffic. About 43,000 freight vehicles are observed in the KMC area daily, between 6 am and 10 pm. Of this, 73% vehicles are recorded at the Palarivattom, Edapally and Vytilla junctions.

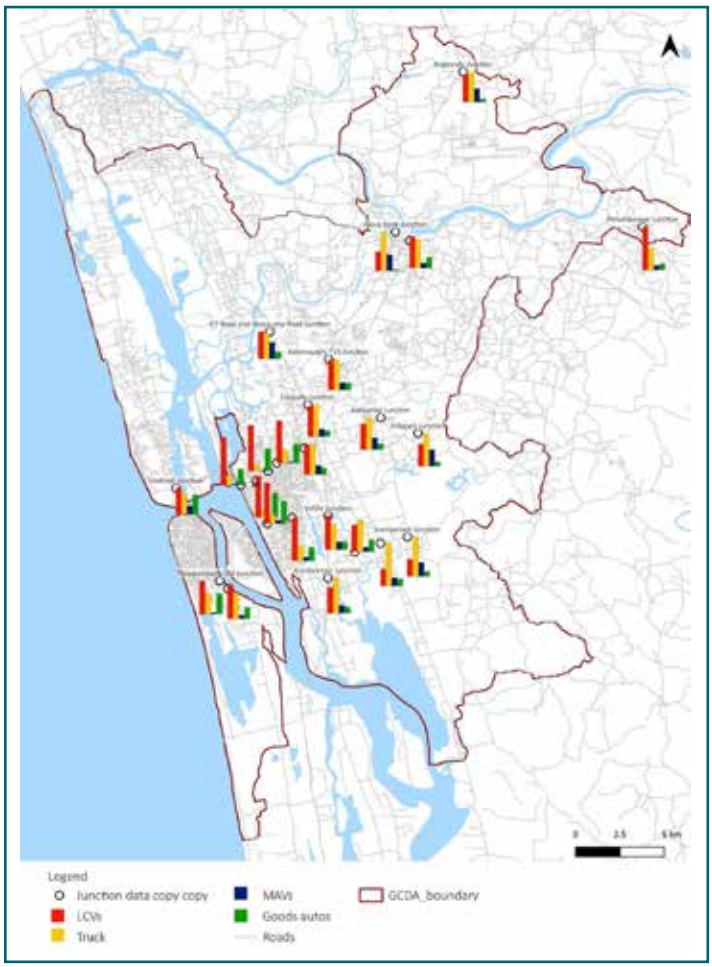


Figure 8: Map showing the share of different modes of vehicles along major cordon points

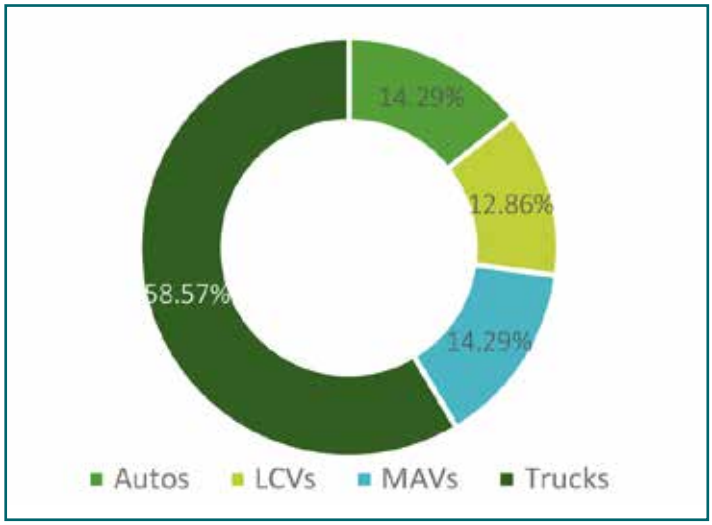
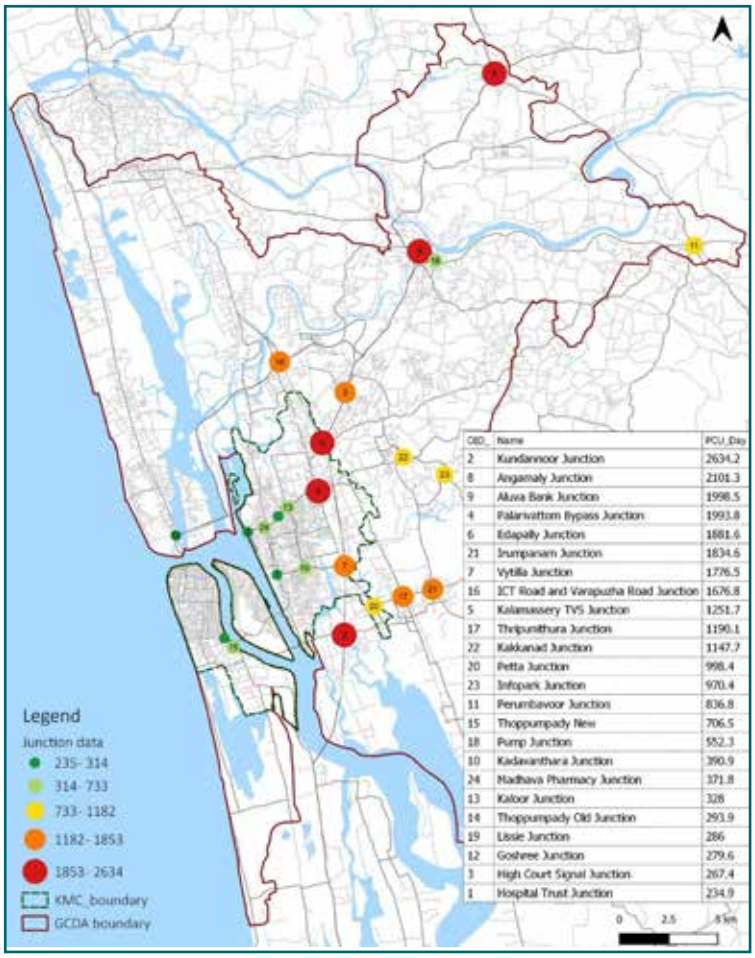


Figure 9: Mode share for freight vehicles in Ernakulam market



OID_	Name	PCU_Day
2	Kundannoor Junction	2634.2
8	Angamaly Junction	2101.3
9	Aluva Bank Junction	1998.5
4	Palarivattom Bypass Junction	1993.8
6	Edapally Junction	1881.6
21	Irumpanam Junction	1834.6
7	Vyttila Junction	1776.5
16	ICT Road and Varapuzha Road Junction	1676.8
5	Kalamassery TVS Junction	1251.7
17	Thripunithura Junction	1190.1
22	Kakkanad Junction	1147.7
20	Petta Junction	998.4
23	Infopark Junction	970.4
11	Perumbavoor Junction	836.8
15	Thoppumpady New	706.5
18	Pump Junction	552.3
10	Kadavanthara Junction	390.9
24	Madhava Pharmacy Junction	371.8
13	Kaloor Junction	328
14	Thoppumpady Old Junction	293.9
19	Ussie Junction	286
12	Goshree Junction	279.6
3	High Court Signal Junction	267.4
1	Hospital Trust Junction	234.9

Figure 10: Freight traffic intensity along major junctions in Kochi city

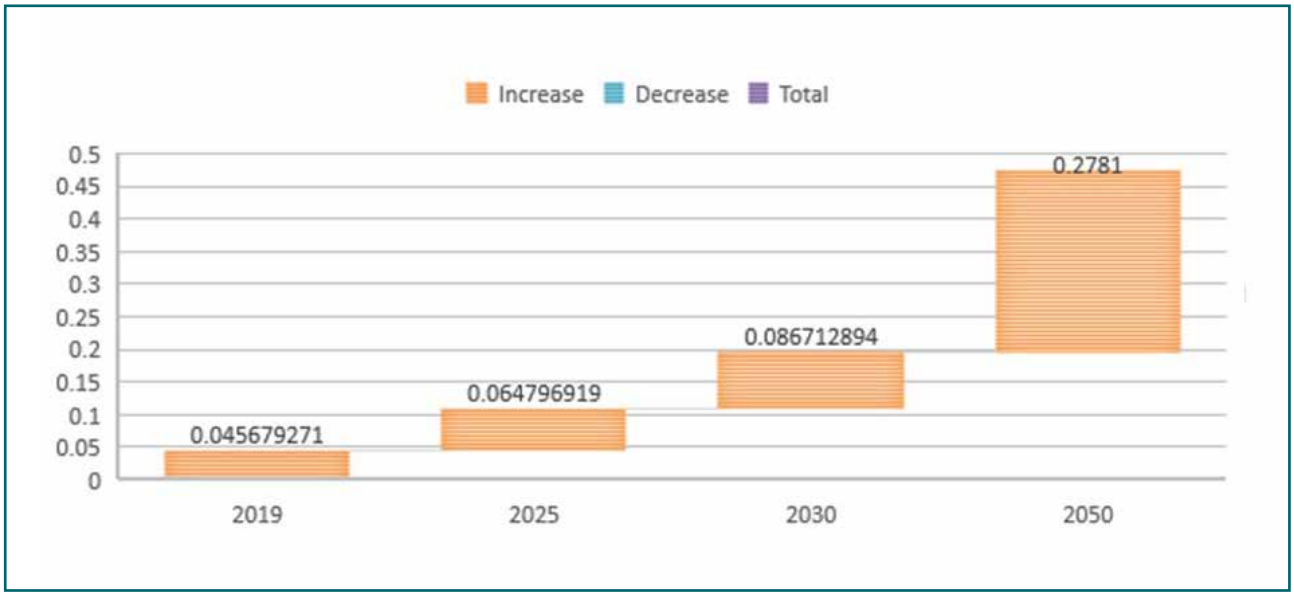


Figure 11: Forecasts for urban freight CO_2 emissions in BAU scenario in Kochi

Who is responsible for what

Freight-related mandates lie mostly with regional and national governments. However, there are multiple departments responsible for different aspects related to the sector.

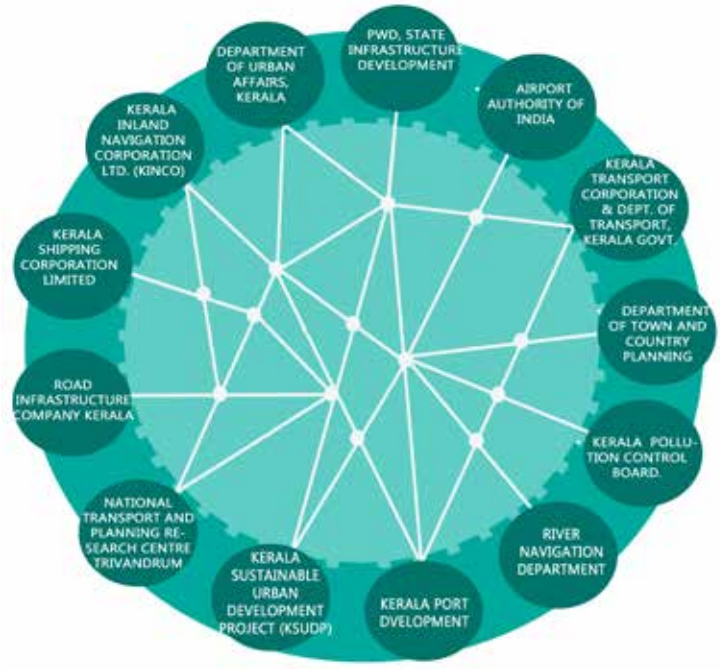


Figure 12: Stakeholders associated with freight in Kochi

Table 1: Priority of different stakeholders associated with freight

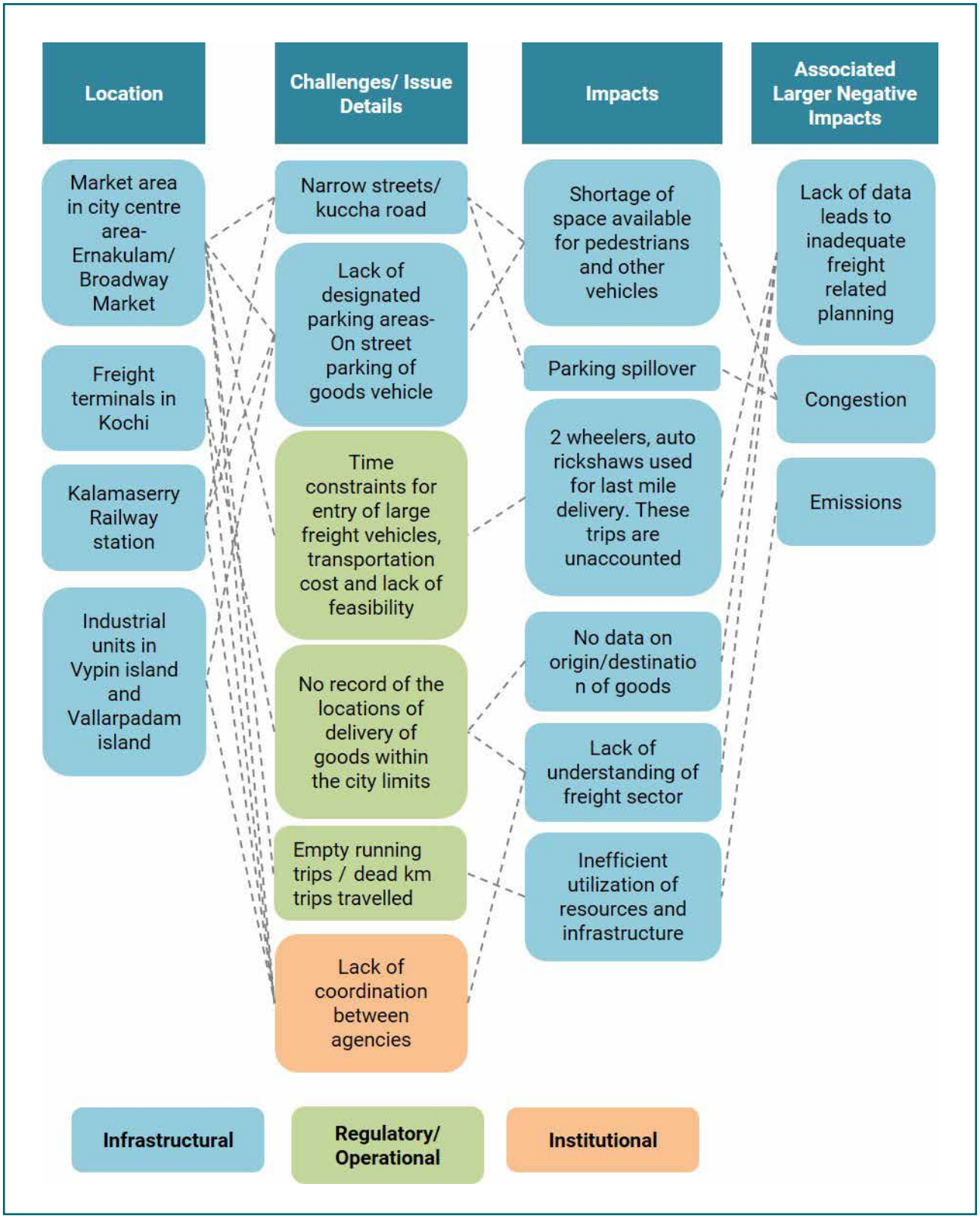
Stakeholder	Sub Goals
Kochi Municipal Corporation	• Reduce congestion on city roads • Efficient transportation and movement of waste and garbage • Increase revenue generation from freight activities • Pedestrian-friendly streets in commercial areas • Safety of the residents with regard to road accidents and pollution.
GCDA	• Dedicated zoning for commercial activities • Inclusive and holistic planning for freight in land-use planning and development. • Strategic distribution of supply-chain activity centers, focusing on network connectivity and locations.
KMTA	• Reduce congestion on the roads • Proper management of freight and passenger movement. • Revenue generation through tolls and congestion pricing • Reduction in accidents • Decrease in emissions generated from the transport sector • Trip planning and optimization through dedicated control center • Projecting future demands and developing required transport infrastructure in co-ordination with state and national departments. • Promote multi-modal transportation centers and hubs • Allocate parking and unloading zones in the city with services and amenities catering to the needs of freight operators.

Stakeholder	Sub Goals
CSML	• Decongest commercial centers in the core city area • Pedestrian-friendly streets by promoting safer & cleaner streets • Reduce emissions from the transport sector • Promote commercial activities to improve economy • Route management depending on movement and road traffic from the command and control center • Control speed limit violations and rash driving
Town & Country Planning	• Dedicated zoning for commercial activities • Inclusive and holistic planning for freight in land-use planning and development • Strategic distribution of supply-chain activity centers, focusing on the network connectivity and locations. • Promote multi-modal transportation through various connectivity inter-linkages.
Pollution Control Board	• Reduction of pollution and emissions generated from the sector • Efficient transportation and movement of waste and garbage
KSINC	• Revival of past modes of water transportation • Shift of major mode of transportation from road to water • Develop multi-modal interchange centers and hubs • Promote use of state-owned storage facilities such as warehouses and godowns in the supply-chain process
CII	• Development of industrial and commercial zones as per development plans • Freight corridor with requisite facilities and services to attract more investors and promote commercial development in the industrial region • Promote multi-modal transportation for better efficiency • Parking zones and utilities for freight operators • More warehouse and godown arrangements
Cochin Port / ICTT	• Promote multi-modal transportation for better efficiency • Logistics hub to cater to bulk commodities • Revival of railway links to the area
Regional Transport Office	• Compliance with rules on age limit of road transport vehicles • Issuing of fines and fees for violation of regulations • Organising of Eco-driving training to freight vehicle drivers
Southern Railways	• Promotion of multi-modal transportation for better efficiency • Revival of railway links to various areas • Godowns and warehouse facilities to promote multi-modal interchange
Traffic Police	• Reduction in congestion on city roads • Issuing of fines and fees for violation of regulations • Pedestrian-friendly streets in commercial areas • Ensuring safety of people with regard to risk of road accidents and pollution.
Trade & Market Unions	• More efficiency in handling of goods • Improvement in total tonnage and cost efficiency • Better network connectivity for freight transportation • Dedicated warehousing spaces and zones for unloading of goods • Supply of manpower for unloading and packing activities

Stakeholder	Sub Goals
Distributors	• More efficiency in handling of goods • Improvement in total tonnage and cost efficiency • Better network connectivity for freight transportation • Dedicated warehousing facilities and unloading zones • Supply of manpower for unloading and packing activities • Fuel efficiency and increased lifespan of freight vehicles
Truck Association's	• Better road network connectivity • Improvement in freight facilities and services for truck drivers • Street signage and unloading bays for unloading of goods • Dedicated lanes for trucks for efficient transportation • Fuel efficiency and better lifespan of freight vehicles • Ro-Ro services for making cost-effective journeys • Trip optimization to reduce dead mileage

4. MAJOR ISSUES, BARRIERS AND OPPORTUNITIES

Several consultations were held with stakeholders from the public and private domains along with technical discussions with sectoral experts to assess the condition and functionality of freight transport in the city, issues that can cause network breakdowns, and ways of reducing emissions. The major issues and challenges that were identified are shown in the following graphic.



Challenges

Lack of information exchange and co-ordination between various agencies

Although national trends in freight movement are well documented, it is rare in the case of cities. There are several agencies functioning in the city for managing urban freight, but these organizations have different jurisdictions and duties. Therefore, they need to work in close co-ordination, including with freight operators and market associations in order to improve freight management in the city.

Competition for on-street parking space

There is heavy passenger and freight traffic movement in the city and this volume is steadily increasing. Additionally, there is competition between passenger and freight vehicles for on-street parking space. Due to limited space for unloading of goods, these activities are conducted amidst heavy traffic, causing more congestion and road blocks.

Lack of basic amenities and services for freight drivers

There are no basic amenities such as toilets and resting facilities available for freight vehicle drivers during layovers or journeys. This issue could indirectly be the reason behind incidents of rash driving and road accidents in the city.

Unused warehousing infrastructure and facilities

The city has several abandoned godowns and warehouses that can be earmarked for goods storage. Some of these are in strategic locations that could facilitate multi-modal transportation and greatly reduce the number of freight trips being made on the road.

Deteriorating infrastructure for water and rail mode of goods movement

Kochi is well-connected by land, water and air transport. However, with greater shift to road transportation, the use railway and water transport reduced. There are canals and railway lines still, but a shift back to these modes of transport should be market driven, a move that can significantly reduce emissions caused by road transport.

Low load factor and dependence on fossil fuel operated vehicles

For local trips and last-mile deliveries, there is heavy use of LCVs and MCVs that run on fossil fuel. These trips are not managed efficiently as the vehicles might be only partially loaded with goods, and their return journeys in most cases are dead trips.

Poor driving behaviour

The city roads have a variety of vehicles running on them. Some of the roads don't have proper markings that indicate separate lanes for different vehicles. Even where there are clearly designated lanes, many drivers do not strictly follow traffic rules and tend to change lanes abruptly or even turn without using the indicator. Such bad driving behavior needs to be controlled and safety measures need to be imposed more proactively by the concerned transport authorities. Most of the freight vehicle drivers are unaware of driving techniques that will reduce fuel consumption and help increase the lifespan of the vehicle, thus saving expenditure on servicing and maintenance.

Empty running trips

There are no facilities that would help to plan trips more efficiently. Even though deliveries might be made by fully loaded or partly loaded vehicles, they often make dead kilometer trips on their return journey. IT-enabled infrastructure is needed for better management of freight trips.

Unplanned and unregulated warehousing activities

Even though the city has a Development Plan with a long-term vision until 2031, which clearly indicates the appropriate zoning for commercial and warehousing infrastructure, the plan has not been enforced strictly. This has led to haphazard construction of warehouses, shops and storage areas by private parties.

Lack of route management

There is a wide variety of roads, ranging from two-lane primary roads to narrow streets being used for freight transportation in the city. However, freight vehicles are restricted from using some of these roads. Such decisions that involve prioritizing of passenger movement are taken without considering their impact on the logistics and supply chains. This lack of awareness leads to several freight vehicles accessing restricted roads in order to make supplies to core areas. Instead, if properly designated routes are provided, then such activities could be better managed without the risk of any causalities.

4.1. Available Opportunities

The Action plan discusses reduction of the externalities in the city's urban freight sector. It intends to improve the logistics operations by using better technology and operations. Opportunities are assessed as per various visions and goals, which are as follows:

- What is the potential avenue to reduce emissions?
- How can efficiency be improved?
- How can the informalities in the sector be reduced, and integrated planning be included in the framework ?

Aspects of urban freight transport to consider for modification	Location
Lack of information exchange and coordination between authorities and freight operators	Kochi city
Heavy dependence on on-street parking	Market clusters, highways, ICTT and seaport- airport corridors
Lack of basic amenities such as toilets and resting facilities for freight drivers during layovers or onward journeys.	Highways, ICTT and seaport-airport corridors
Abandoned transport infrastructure and facilities left as non-performing assets	Kochi city
Unrestricted use of private two-wheelers for e-commerce delivery operations	Kochi city
Large numbers of fossil fuel-run LCVs and MCVs used for local or close-proximity deliveries	Core market and commercial areas
Poor road driving behavior and enforcement of safety measures by the concerned transport authorities	Kochi city
A large number of dead kilometer trips being made by freight vehicles	Kochi city
Entry of freight vehicles into restricted roads	Core market and commercial areas
Randomly located warehousing facilities in the city	Core market and commercial areas
Complicated procedures in cargo movement, involving different public and private agencies	Freight terminals
Lack of dedicated freight facilities (Staging areas, stops, lanes)	Kochi city

4.1.1. Promote urban freight management concepts as part of urban planning

- Provide exclusive lanes for mass transport and container movement wherever possible; and develop goods and passenger terminals with adequate infrastructure.
- Encourage reliable and efficient multi-modal mass transport system by providing additional stations, park and ride facilities, introduction of multi-modal single ticketing system , and utilize the potential of water bodies in the integrated transport system.
- The potential of water bodies and canals in the planning area shall be fully utilized for transportation of goods and people.

4.1.2. Develop freight terminals to promote multimodal integration

Truck terminals are being planned in various cities in the country for reducing problems caused by heavy traffic during peak hours. Truck terminals have become a reality in many cities like Visakhapatnam, Kolkata, Mumbai and Pondicherry. The setting up of freight terminals in Kochi city

has been proposed to provide integrated facilities for highway vehicles such as for parking, transit and transshipment of goods and trucks, communication and networking, amenities, transport agency offices, and vehicle repair and maintenance activities. It should also act as a logistics center for warehousing, inter-modal transport, container transport and freight forwarding services, among others.

Considering the heavy flow of goods vehicles at the entry/exit points of Kochi City, the following locations have been proposed for setting up the truck terminals:

- Kalamasserry
- Thiruvankulam
- Kumbalam
- Cheranallur
- Eloor
- Vallarpadam

The terminals will have facilities like offices and godowns of transport companies, easy loading and unloading facilities, weigh bridges, large parking areas for trucks, in addition to banks, restaurants, dormitories for essential staff, dispensaries, motor spare part shops, petrol / HSD pumps, garages and workshops.

4.1.3. Low carbon urban freight policy

Freight has largely remained as an unnoticed transportation subject. The green freight policy will have the overarching aim of enabling efficient and reliable handling and distribution of goods and services. Freight policies that need to be adopted for the Greater Kochi region are:

- Managing the heavy demands placed on the regional infrastructure, by balancing the needs of freight and passenger traffic
- Improving the array of transportation options available to the regional freight user
- Restricting the entry of heavy vehicles into the city during day time. However, the International Container Terminal Road can be made available for heavy vehicles
- Developing truck terminals near cordon points and distribution of goods in LCV/sustainable vehicles
- Helping freight traffic to bypass the city.
- Developing a Freight Operator Recognition Scheme. A tiered set of membership levels can be given to frequent operators coming to the city.
- Developing a freight information portal, i.e., a single interface to be made available for information on freight movement.
- Promoting the freight aggregation model with ICT
- Promoting the use of low-carbon modes for last-mile delivery e.g. E-Loaders.

It is estimated that the small commercial vehicle (3W) segment is likely to grow at a CAGR 12% between 2021 and 2031.

The majority of the LCVs run on petrol, followed by gasoline. However, rising diesel prices and the lower cost of e3Ws are turning the situation rapidly in favor of EV variants.

The share of BS-IV LCVs is low, indicating a wider use of inefficient vehicles.

Higher EV penetration can lead to 14% reduction in CO2 emissions in the small commercial vehicle segment.

Vehicle performance is one of the key concerns of drivers, including its range, speed and payload carrying capacity

4.1.4. Promote water-based freight transport

Freight movement thorough the inner Kochi city can be avoided if it is shifted to water transport. To avoid double handling charges, Ro-Ro terminals would help to ease traffic congestion caused by freight movement in the city. The CMP proposes two new Ro-Ro terminals that could be easily integrated with the surface transport.

1. The existing Ro-Ro terminals at Bolgatty and Kochi Port can be redeveloped along with terminals at Kottapuram – North of the city, part of National water way. This could considerably reduce traffic on NH 17, along which densely populated areas are located and where the roads are narrow.
2. South Kerala-bound trucks can easily bypass Kochi traffic, via Aroor, which is located to the south of the city.

4.2. Synergy of Action Plan with City Goals

The action plan has been formulated in closed collaboration with public as well as private stakeholders associated with the urban freight ecosystem in Kochi. Therefore, along with the larger goal of reducing the externalities and emissions, the action plan has developed synergy with various sub-goals of the city as well as of private stakeholders:

"To provide 'world-class' mobility experience to the citizens of Kochi by establishing planned urban transport system that is safe, reliable, universal, accessible and sustainable"

– Comprehensive Mobility Plan ,2015-35

'An economically productive, effective and egalitarian metropolis which will provide to all sections of society the desired level of services and attract worldwide attention as a preferred destination for Health care, Heritage, Tourism, IT and Port based services'

– City Development Plan, 2011-31

The Vision is 'to transform Kochi into an inclusive, vibrant city of opportunities with efficient urban services sustainable growth and ease of living'

– Cochin Smart City Mission Limited's Vision

5. LOW CARBON STRATEGIES AND ACTIONS FOR URBAN FREIGHT IN KOCHI

5.1. Proposed Low Carbon Strategies for Kochi

Freight movement in a city is an inevitable process of trade and economy. The action plan has been prepared in consultation with stakeholders to help the city meet the LCAP's emission reduction targets. This section describes a set of specific objectives and related actions related to the implementation of 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.

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
Stakeholder engagement	A joint committee comprising KMTA and all major stakeholders from public and private sectors to interact as and when required for addressing freight management issues.	Holistic approach to freight management	Low investment requirement and short- term execution period.		Develop co-operation of the private sector which will greatly improve the framing of policies and strategies.	Initial waiting period for KMTA to become fully operational and bring the potential stakeholders on-board.
Regulatory measures	Policy framework for regulating E-commerce sector. Zone wise capping of number of two- wheeler vehicles by providing tokens or passes by KMC or Traffic Police.	Controlling the spontaneous increase of private two- wheeler vehicles used for home deliveries	Low investment requirement and long- term execution period.		Capping of two-wheeler vehicles being used for goods delivery. Revenue from fines and applicable taxes. Shift to NMT modes for deliveries	Amendments to central motor vehicle rules is required. However, the city authorities in co-ordination with RTO and traffic police can consider imposing restrictions on the total number of delivery vehicles in future.

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
	Regularize freight vehicles entering Kochi Municipal Area Entry and exit of trucks and MAVs should be restricted within the KMC area between 7 am and 9 pm. Restrictions of entry and exit of LCVs within the KMC area during peak hours, i.e. between 9am and 12 noon, and from 5pm to 8pm.	Reduce congestion and pollution during the day	Low investment requirement and long- term execution period.			Coordination and cooperation between various stakeholders required.
	Regularizing the time during which freight enters GCDA Restricting the entry and exit of trucks and MAVs within the, GCDA area during peak hours, i.e., between 9 am and 12 noon and from 5 pm to 8 pm. (need access to reach the truck terminals)	Reduce congestion and pollution during the day	Low investment requirement and long- term execution period.			Approval from the government body for time restrictions Communication among all links in the supply chain required -including all government-run organizations

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
	Develop a traffic and transport plan for Kalamaserry railway station and surrounding area Identify the impact of traffic and integrate the railway station's internal mobility plan with external mobility plan	Improve transport network around station and reduce delays for goods vehicles in reaching the station. Shorter delays, and lesser fuel consumption will reduce emissions.	Low investment requirement and medium- term execution period.			
	Create a representative body for freight under UMTA (Unified Metropolitan Transport Authority) This body should include representatives from organizations related to freight in Kochi, such as ports, railway stations, important industries like BPCL, Infopark, market associations, Supplyco, customs department, etc.	This will improve data generation related to freight entering and moving through the city, thereby leading to addressal of issues in a holistic way.	Low investment requirement and medium- term execution period.			
Market- based measures	Curb Management Strategy- For Ernakulam and Fort Kochi Market	Reduce congestion in the narrow streets	Moderate investment requirement and medium- term execution period.		Pedestrian-friendly streets for increasing the footfall in commercial hub of the city	It is one of the oldest markets, hence KMC will need to take a lot of effort to implement it properly.

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
	App-based delivery operations - for Ernakulam and Maradu Market	To optimize trip frequencies and freight load.	Moderate investment requirement and medium- term execution period.		Will reduce empty running trips and road congestion.	Involves getting several individuals from informal sector to share information.
	Formalize on-street parking in Ernakulam and Broadway Market Identify and categorise streets in terms of paid on-street parking, no-parking zones, restricted parking, and parking permitted on the left side of the road	Improve easy movement for people in the market and restrict haphazard vehicle parking	Moderate investment requirement and long- term execution period.			
	Regularize goods autos - prominent in and around market area Develop an association for regulation. Convert fossil fuel-run goods auto to e- autos (Light Electric Vehicles)	Representation of goods auto owners through association. E-autos will reduce emissions in city center	Low investment requirement and long- term execution period.			

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
Infrastructure-based measures	Develop truck terminals with adequate facilities Identify locations for truck terminals based on need and provide adequate storage facility, parking and halting areas.	This will enable heavy goods vehicles to reach GCDA area and unload the goods here. Light goods vehicles like LCVS and goods autos can load the goods at the terminal during off-peak hour. This reduces congestion on city roads and facilitates fast movement	Moderate investment requirement and medium- term execution period.			
	Upgrade the Kalamaserry Railway Station Improve access to station, construct paved roads and build storage space for goods. Redevelop railway station and office with better technology.	Easing and improvement of loading/ unloading process. This will prevent delays caused by manual loading/ unloading of goods and reduce turnaround time of vehicles	Moderate investment requirement and medium- term execution period.			

Parameters	Proposal	Nature of problem addressed	Investment required & Implementation time	Impact (GHG Reduction Potential)	Strength on Intervention	Weakness
Rolling stock-based measures	Scrutinize the goods vehicles for pollution levels Good vehicles that are more than eight years old should not be allowed to enter and should be fined. Ensure that the vehicles are not overloaded or damaged as reduced efficiency leads to more fuel consumption and higher emissions	Reduce emissions and initiate transition of fuel-based good vehicles to electric vehicles	Moderate investment requirement and long- term execution period.			

5.2. Stakeholder Involved in Action Plan - Making it Happen

Recommendation	Action	Timeframe	Public sector	Private sector
Regularize freight vehicles entering Kochi Municipal Area	Entry and exit of trucks and MAVs should be restricted within the KMC area between 7 am and 9 pm. Restrictions of entry and exit of LCVs within the KMC area during peak hours, i.e., between 9am and 12 noon, and from 5pm to 8pm.	One-time operational solution to be implemented in 2021 and managed henceforth	Approval from government body for time restrictions Communicate to all links in the supply chain including all government organizations	Have an informed approach about the restrictions. Set delivery time considering the restriction. They should pursue delivery of goods should be made during the allowed and recommended time frame range only
Formalize on-street parking in Ernakulam and Broadway Market	Identify and categorize the streets in the market with paid on-street parking and in no-parking areas Permit parking on the left side of the street on even days, and on the right side on odd days Restrict parking in area adjacent to the proposed multistory market establishment (as adequate parking space is available) Restrict on-street parking on Fridays (market day) after 7am Restrict on-street parking on Sunday-car-free streets This enables easy movement for people in the market and restricts haphazard vehicle parking	One-time operational solution to be implemented in 2021 and managed henceforth	Include and update the list of shops in Ernakulam Market Association Formalize the association for the implementation of the action and collection of revenues on behalf of KMC	Comply with permitted parking rules

Recommendation	Action	Timeframe	Public sector	Private sector
Regularize the time during which freight vehicles can enter GCDA	Restrict entry and exit of trucks and MAVs within the GCDA area during peak hours, i.e. between 9 am and 12 noon, and from 5 pm to 8 pm. (need access to reach the truck terminals)	One-time operational solution to be implemented by 2025 and managed henceforth	Approval from the government body for time restrictions Communicate to all links in the supply chain- including all government-run organizations	Have an informed approach about the restriction. Set delivery time considering the restriction Pursue delivery of goods during allowed and recommended time range only
Develop truck terminals with adequate facilities	Identify locations for developing truck terminals- The Comprehensive mobility plan (CMP) identifies potential land under government for the terminals The locations for truck terminals may be prioritized as per requirement. CMP should include provision of adequate parking facilities for the vehicles and other facilities for driver halting facilities along with adequate storage facilities with bays for goods vehicles for loading and unloading goods vehicles This will enable heavy goods vehicles to reach the GCDA area and unload the goods here. Light goods vehicles like LCVS and goods autos can pick up the goods from the terminal during off-peak hours. This reduces congestion on city roads and facilitates fast movement.	Develop the terminals based on demand and location over five years	Approval for developing terminals on government land • Develop the terminal on a PPP model	Participate in development of truck terminal project on a PPP model

Recommendation	Action	Timeframe	Public sector	Private sector
Develop a traffic and transport plan for Kalamaserry railway station and surrounding areas.	Identify the traffic impact area with the railway station as the boundary Carry out a detailed study based on different vehicular movements Integrate the railway station's internal mobility plan along with the external mobility plan This will help in improving the transport network around the station and reduce delays for goods vehicles in reaching the station. Shorter delays and lesser fuel combustion will reduce emissions	Develop a bid document, finalize the project and prepare a master plan within two years	Appoint a consultant to develop a transport plan	Carry out the project considering all stakeholders and future growth
Upgrade the Kalamaserry Railway station	Improve the access to the railway station Sufficient space available to design an appropriate paved road to improve access the station Redevelop the railway station and its office with better technology Identify a multi-level storage space (space available on site) where goods can be stored. Based on the space availability, goods can be pick up or delivered Upgrading the infrastructure will make the loading and unloading process easier, quicker and more reliable. This will prevent delays caused by manual loading/ unloading of goods and decrease the turnaround time of vehicles.	Redevelopment starts after formulating the traffic and transportation plan. Station to be operational by 2025	Approval for redeveloping the railway station from center Prepare tenders and adopting a PPP model approach for redevelopment Assist in getting approvals and clearances for the project	Participate in redevelopment of the railway station on a PPP model. Suggest best practices and help to select the technology to be used for development of the station. Continue to encourage transport of goods over long distances via railways

Recommendation	Action	Timeframe	Public sector	Private sector
Regularize the goods autos - prominent in and around market area	Identify and formalize goods auto owners. Develop an association to regularize their movement Convert the fuel-run goods autos into e-autos (Light Electric Vehicles), similar to introduction of e-passenger autos in Kochi	Begin the process in the coming year and form the body by 2022	Formalize the body. Provide subsidy for goods auto owners to help them buy electric goods vehicles from EV Mission promotion fund. Provide incentives for switching like concessions in road tax, toll fees, parking fee, etc.	Invest in environment-friendly modes of transport, looking at the larger benefits for the system
	This step brings a combined representation from goods auto owners. The conversion to e-autos will reduce emissions in the city center, i.e. KMC area. With a unified body, it will be easy to implement it	Complete shift to electric goods autos by 2025		
Scrutinize the goods vehicles based on how polluting they are	Check the vehicle certificates to find its age. Any goods vehicle that is more than eight years old should not be allowed to enter the city, or should be fined. All goods vehicles must produce a 'pollution under control' certificate and a fitness certificate (as per the Motor Vehicle Act) at check points Ensure that the vehicles are not overloaded. Overloading reduces the efficiency of vehicles and causes more wear and tear, leading to burning of more fuel and higher emissions. Initiate transition from fuel-based goods vehicles to electric vehicles	Checks for scrutinizing vehicle papers should be initiated by 2022. Initiatives to promote electric goods vehicles should begin after e-auto for carrying goods start plying on roads (post-2025)	Develop a system for scrutinizing the vehicles. For example, create an online dashboard for the vehicle owners to upload required data about their vehicles Identify more check points along the GCDA boundary for screening the goods vehicles	Facilitate the creation of an online dashboard. Comply with all norms identified for vehicles entering the city

Recommendation	Action	Timeframe	Public sector	Private sector
Create a representative body for freight sector under UMTA	Identify representatives from organizations related to the freight sector in Kochi, such as ports, railway stations, important industries like BPCL and Infopark, market associations, Supplyco and customs department to be part of the body. This will provide access to information regarding freight vehicles entering the city and an overall perspective of the movement pattern. This will help to address the issues holistically.	Initiate the process to identify stakeholders by end of 2021, followed by formation of the body by 2023, and approval for it to be part of UMTA by 2025	Actively lead the formation of the body. Approval for the body to be a part of UMTA	Contribute to the formation of the body Actively participate and contribute in the stakeholder discussions. Provide access to data for identification of gaps and to recommend appropriate solutions

Sl. No.	Category	Details and location
Institutional/ stakeholders		
1	Designate a freight person at key agencies	
2	Create a Freight Advisory Committee (FAC)	It is envisaged that the designated committee for freight is formed in Kochi. The committee can be either anchored at the KMC or KMTA. It will comprise different freight stakeholders and serve as a forum where best practices and problems are discussed and feedback is given. A dedicated freight expert (with an understanding of the freight sector) should be appointed at the agency to act as a focal point of communication between stakeholders (public and private sectors).
Regulatory/ Policy related		
3	Low emission zones (LEZs)	Kochi should take efforts to control vehicular movement in environmentally sensitive areas as well as areas with tourism potential (e.g. Fort Kochi). In zones with low carbon emissions, vehicles are required to meet specific environmental standards. Electric freight vehicles shall be promoted in areas such as Ernakulam market.
4	Integrating freight into land-use planning	Kochi can integrate freight in its land-use planning,
5	Time-based access restrictions	Kochi can notify the time windows for freight vehicles, so that the peak hours of passenger and freight movement do not co-incide.
6	Peak hour clearways	The parking of freight vehicles should be prohibited during peak hours. The roads should have clearway signs at each end where parking and standing of freight vehicles is prohibited during peak hours.
7	Emission standards	Enforcement of emission standards through programs. This may also involve the use of electric or low-emission vehicles for making deliveries
8	Land reserved for multimodal logistics	In Kalamaserry, the land use master plan can reserve land for multimodal logistics , both on the periphery and inside the city to integrate alternate modal options
9	Ecodriving- driver training Initiative	Ecodriving trainings, Intelligent transportation systems (ITS), such as ETC, GPS, and traffic information system I, Safe and Fuel Efficient Driving (SAFED) can be introduced
Operational		
10	Urban freight information and maps with information of routes, restrictions and other operational information which can be used by the drivers of freight vehicles.	Kochi can deploy ITS for real time route optimization. It uses ITS for route optimization and real time congestion
11	Using capacity of public transport (Freight on Transit FOT)	Public transport can be used for freight transport in Kochi. Eg., Dabbawalas in Mumbai

Sl. No.	Category	Details and location
12	Use of ITS in freight movement and real time information systems	Advanced Traffic Management Systems (ATMS), Electronic Toll Collection (ETC) Systems, Commercial Vehicle Operations (CVO) Systems, Dynamic routing as a part of decision making.
13	Parking pricing	Differential parking to reduce demand during peak congestion hours. It includes: Charging for the use of curb space; some based on fixed rates, while others involve variable or differentiated pricing
14	Time sharing of parking spaces	Kochi can promote same parking spaces are used for different carriers. It includes coordinating the timings of pickups and deliveries with operators.
Infrastructural		
15	Freight parks	Distribution centers, manufacturers, truck terminals, and inter-modal facilities are constructed in a single location, typically on the urban fringe.
16	Freight centers and consolidated delivery	Common areas where all the goods to be delivered are consolidated in an area and segregated according to the delivery areas, i.e. which work on joint delivery systems .
17	Freight parking and loading zones	Truck stops/ parking areas are planned with a focus on designating and enforcing various parking requirements and freight-related restrictions.
18	Improved staging areas-	This initiative fosters the development and/or requirement of on-site off-street areas at businesses or other facilities to con-duct loading, unloading, or other freight-related activities.
19	Exclusive truck lane	Allocation of restricted right-of-way exclusively to trucks.
Miscellaneous		
20	Non-motorized freight distri-bution	Non-motorized vehicles are used for freight delivery.
21	Vehicle size and weight restrictions	Model for weight and dimensions of heavy commercial vehicles.
22	Cleaner goods vehicles	EVs/cleaner fuel vehicles are used for deliveries.
23	Anti-idling program	Programs to reduce pollution caused by idling truck engines. The most popular anti-idling technologies are fuel- operated coolant heaters, auxiliary power units, and truck stop electrification.
23	Certification/ Recognition	Platforms implemented to encourage and reward sustainable practices throughout the supply chain.
	Programs/ Incentives	Platforms implemented to encourage and reward sustainable practices throughout the supply chain.

5.3. Emission Reduction Potential

The table below summarizes the approximate reduction potential of CO2e emissions intensity from the freight sector in Kochi.

	Technology				Policy/ Management/ Enforcement			Infrastructure		
Vehicle Categories	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)	60% reduction (New electric bikes - needs subsidy and tax exemption)	45% reduction	25 to 30% reduction (Application can be created to optimize the route to reduce distance and save fuel costs)	100% reduction	NA	25% reduction	NA	25% reduction	30% reduction	35% reduction
LCV	25% reduction	35% reduction	Two ways - internal and for total trip length.	45% reduction	25% reduction	12% reduction	15% reduction	30% reduction	20% reduction	12% reduction
HCV	15% reduction	11% reduction	40% reduction	35% reduction	20% reduction	11% reduction	20% reduction	17% reduction	12% reduction	23% reduction
4W Rick(goods rickshaw)	50% reduction (saving fuel cost)	30% reduction	20% reduction	Possible only for specific deliveries	30% reduction by reducing idling time	17% reduction	25% reduction	20% reduction	20% reduction	32% reduction
3 W	12% reduction	25% reduction	15% reduction	31% reduction	10% reduction	15% reduction	30% reduction	15% reduction	25% reduction	27% reduction
Van/Pickup	28% reduction	28% reduction	20% reduction	25% reduction	15% reduction	30% reduction	25% reduction	27% reduction	15% reduction	19% reduction

5.4. Key Performance Indicators

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_2e/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

5.5. Demonstration Projects

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

The demonstration projects by themselves may not yield large reductions in GHG emissions due to their limited scale. However, they will introduce innovative concepts, raise awareness, create justifications and opportunities and 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 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' recommendations 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 Kochi to develop potential project 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.

Potential project that could be undertaken on a pilot basis: Promoting low-emission three-wheeler freight vehicles for last-mile deliveries in Ernakulam Market

The Government of Kerala envisages achieving a target of 1,000 electric three-wheeler (3-W) freight vehicles. However, there has been limited application of this policy due to various concerns related to the workability, suitability, performance, and operating costs of these vehicles amongst private sector actors. Moreover, there is limited evidence of real-time operations, financial viability and performance of electric 3-W freight vehicles in Kerala.

In this context, the city should undertake a demonstration project to operationalize electric 3-W freight vehicles to validate the workability and financial viability and to demonstrate the benefits of low-emission freight vehicles for last-mile goods delivery. The demonstration project should validate different variants (the vehicles shall differ in the form factor of loading space, i.e., pickup and delivery van) of electric 3 -W freight vehicles available in the market, as the capital cost of electric freight vehicles is substantially higher than internal combustion engine counterparts.

6. WAY AHEAD

This action plan sets out the existing situation of Kochi and outlines the key actions it needs to take in the short, medium and long term to overcome the barriers to developing clean, safe and efficient freight. The actions will help the city achieve a 20% reduction in emission intensity by 2041 and improve the way deliveries are carried out across the city. However, this is only our first step towards achieving the vision of sustainable urban freight transport in Kochi. Over time, the city needs to continue monitoring 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. KMC and KMTA need to take a leading role in coordinating action and partnership with many parties involved, such as boroughs, suppliers, operators, servicing companies, businesses, informal sector organizations, customers and others, to ensure Kochi remains at the forefront of providing clean, safe and efficient freight transport.

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

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