

On behalf of:



Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection



giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



State Pollution Control Board, Odisha
ରାଜ୍ୟ ପ୍ରଦୂଷଣ ନିୟନ୍ତ୍ରଣ ବୋର୍ଡ଼, ଓଡ଼ିଶା



of the Federal Republic of Germany

Final Report

Establishing a Low Emission Zone, Ekamra Kshetra *Bhubaneshwar, Odisha*



Imprint Page

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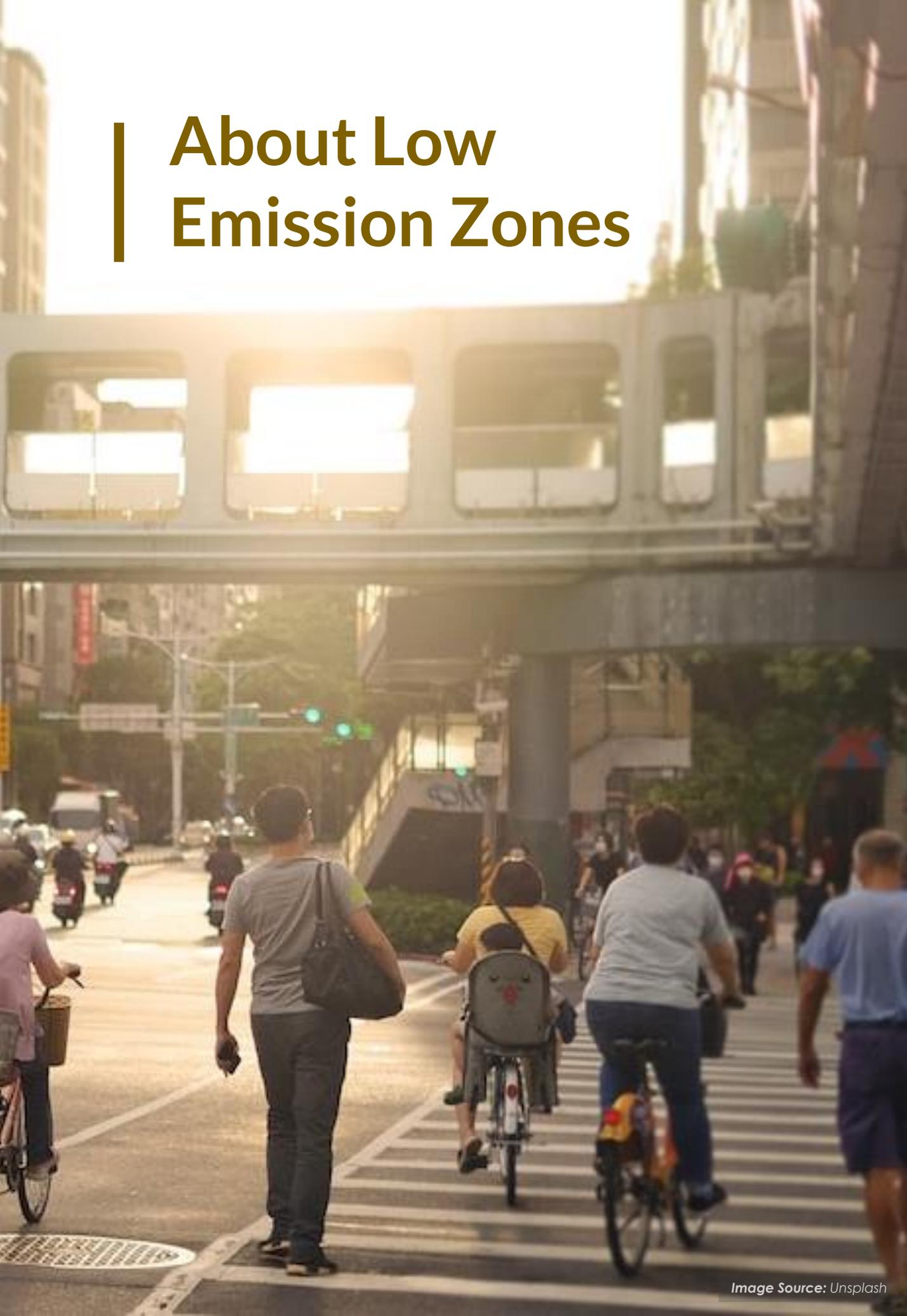
Various models adopted for the
implementation of proposals under
different sectors

REFERENCES

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About Low Emission Zones



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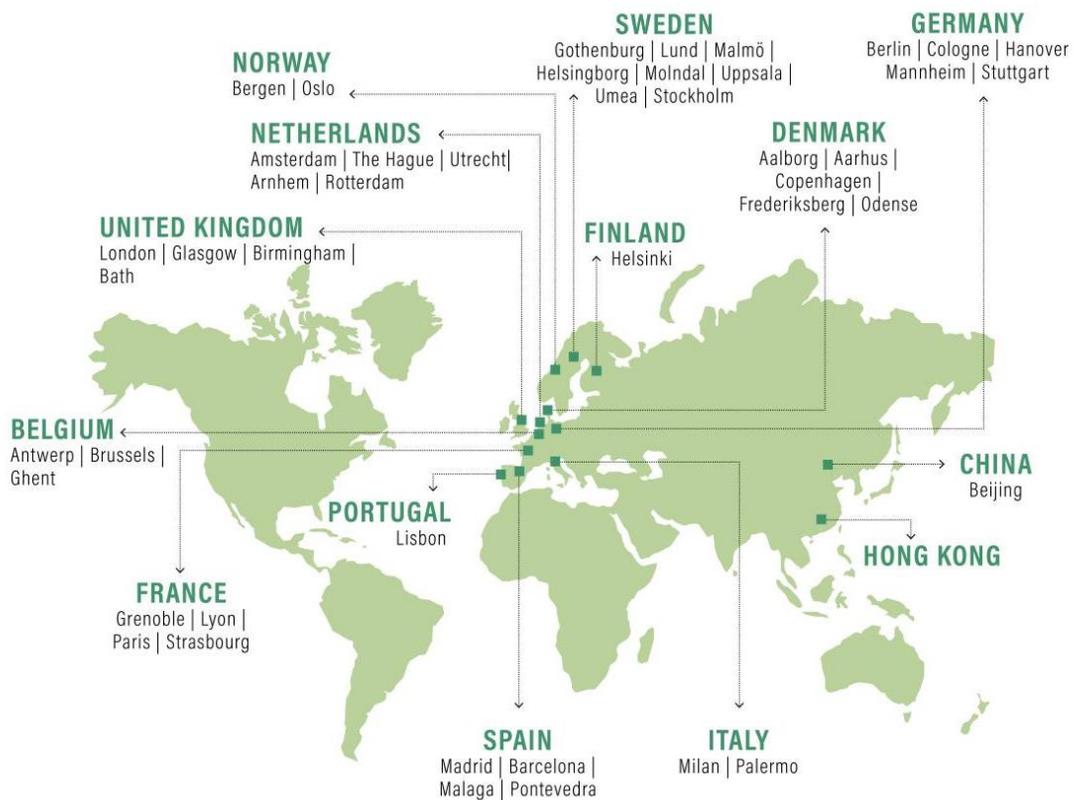
About Low Emission Zones

1.1. What are Low Emission Zones

Low Emission Zones (LEZs) have been used as a policy tool by several Global and Indian cities to improve air quality, reduce congestion and achieve climate goals. They are also known as environmental zones and are prevalent measures in European nations to improve urban vehicle fleet compositions and improve air quality. The concept emphasizes on delimiting an urban area with actions deterring highly polluting traffic. The actions are expected to lower emissions as a result, and encouraging individuals and businesses to go for cleaner vehicles.

Since 2000s, the number of LEZ initiatives in Europe has increased with leading cities in Sweden and Italy. In September 2017, there were 227 LEZs in 12 countries in Europe.

GLOBAL CITIES WITH LOW EMISSION ZONES



DISCLAIMER: This map is for illustrative purpose and does not imply the expression of any opinion on the part of WRI concerning the legal status of any country or territory or concerning the delimitation of frontiers or boundaries

Source: Compiled by WRI India from various global LEZ literature sources



Global Scenario

WHERE ARE LOW-EMISSION ZONES ?



drive
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city

BELGIUM Zone de Basses Emissions 24h	FRANCE Zone à Faibles Emissions (ZFE) time slots	GERMANY Umweltzone 24h
ITALY Zona Traffico Limitato (ZTL) time slots	NETHERLANDS Miljøzone 24h	PORTUGAL Zona de Emissões Reduzidas (ZER) 24h
SPAIN Zona de Bajas Emisiones (ZBE) time slots	SWEDEN Miljözon 24h	UNITED KINGDOM (Ultra) low emission zone (ULEZ) 24h

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Low Emission Zones in Europe (<https://drive2.city/low-emission-zones>, n.d.)

Introduction

London LEZ

Emissions in London had been seen to be decreasing in 2003, before the establishment of the LEZ. This was primarily due to better performing vehicles. However, the observed air quality values were still above the WHO standards.

Goal

To accelerate the decreasing air pollution trend and reach WHO's emissions standards by 2030

LEZ Established in 2008

City Population	Area under LEZ
 97 lakh	 1,569 sq km

Pollutants	PM2.5	PM10	NO2
WHO Standards ($\mu\text{g}/\text{m}^3$)	10	20	40
Emissions in London - 2008 ($\mu\text{g}/\text{m}^3$)	15.9	28.7	57.2
	<i>Annual mean concentration</i>		

Thus, the proposal of an LEZ arose from the Mayor's office in 2006 under the Transport Strategy.

The objectives of this LEZ were threefold-

- To reduce exposure at priority locations such as schools, hospitals etc.
- Compliance with UK and EW air quality limits.
- Reach WHO emission standards by 2030.

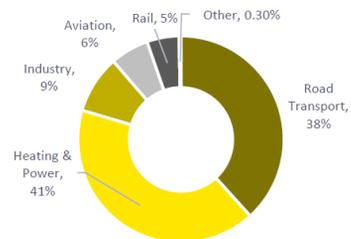


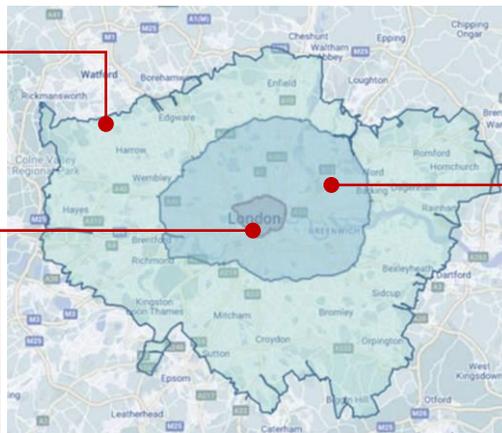
Figure 3: Estimated contributions of Road Traffic to PM10 emissions in London (Frank Kelly, November 2011)

Key Solutions:

The implemented LEZ covers all local roads in Greater London, Heathrow Airport, and parts of the M1 and M4 motorways. Only those vehicles that follow the Euro emission standards are allowed to enter the LEZ. Users who own vehicles non-compliant with Euro Standards can enter the LEZ by paying daily fees ranging from £100-200. Those entering the LEZ with non-complying vehicles without paying the daily fees are punished by a fine ranging from £500-1000.

The Ultra-Low Emission Zone (ULEZ)

To further curtail emissions in London, the ULEZ was launched in 2019 covering areas around Central London. To travel inside the zone, a vehicle must comply with the ULEZ emissions regulations or pay a daily fee of £12.50 for light vehicles and £100 for heavy vehicles. The ULEZ in London is the first such zone in the world.



LEGEND

- Congestion Zone
- Ultra Low-Emission Zone (ULEZ)
- Low-Emission Zone (LEZ)

Congestion Charge Zone

This zone was introduced in 2003 and covers the Central London Area. It operates on all days of the week, except on Christmas and New Year. Every vehicle except motorbikes, disabled drivers, EV and collective transport must pay a fee of £15 to drive in the zone.

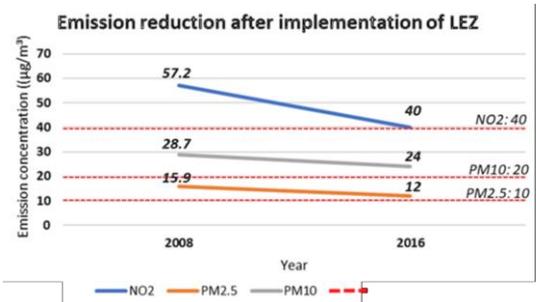
Surveillance System Inside the LEZ

TfL set up a reliable CCTV monitoring system to read license plates and compile a database of violators in order to regulate access to and prevent violations inside the LEZ.



Impact on air pollution:

A decrease in emission concentration has been observed but WHO standards have still not been met for certain pollutants such as PM 2.5 and PM 10.



- Air quality measurements for PM10 show that annual mean concentrations reduced between 2.46% and 3.07% within the LEZ compared to just over 1% for locations outside the LEZ.
- Air quality improvements were greater in areas with a larger share of heavy-duty vehicle traffic.
- PM10 readings above the EU air quality limits were substantially reduced and hourly mean concentrations were decreased by an average of 13% within the LEZ.

Berlin LEZ

Established in 2007	
City Population	Area under LEZ
 97 lakh	 88 sq km



Goal

To bring down air pollution levels to concentration levels defined by European Union

Key Solutions:

The concept is based on colour coded stickers placed on automobile windshields to classify vehicles based on their emission group.

This solution was introduced in a phased manner. In 2008, all vehicles with a red, yellow and green sticker were allowed. However, in 2010, these norms were modified to only allow vehicles with green stickers entry into the LEZ.

Results:

Air pollution: Since the introduction of the LEZ, ambient PM10 pollution has been reduced by 3%, accounting for 8% of anthropogenic PM10 pollution. The number of days when the PM10 level was exceeded was reduced by four.

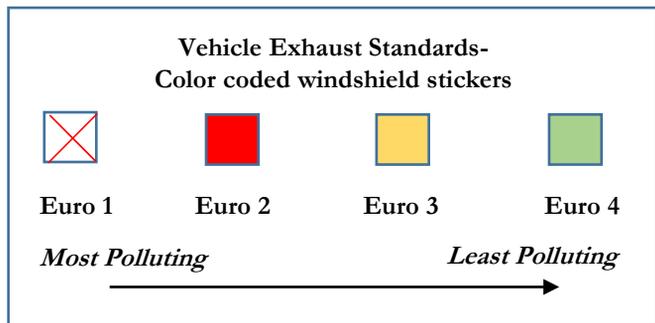
Retrofitting of vehicular fleet: To lower emissions, 124,000 automobiles (10% of the vehicle fleet) were upgraded. This was done by the public so as to be eligible for green stickers in order to enter the LEZ. The number of vehicles bearing a red label has dropped by 50-80 percent. By 2010, 25 percent of all diesel passenger cars and 18 percent of light and heavy-duty trucks had been modified to be eligible for green stickers.

Awareness raising: The introduction of LEZ has raised awareness of the population regarding air pollution and its consequent impacts on health and the economy.



This Berlin LEZ was established in 2008 based on a clean air action plan devised by the German Federal Environment Agency in 2007.

It is also called “Umweltzone” (environmental zone), and targets vehicular restrictions based on exhaust emission standards to curtail vehicular emissions.



Surveillance System Inside LEZ: The enforcement of the LEZ is manually ensured by the Berlin Police department. A fine of 40 Euros is levied on defaulters who enter the LEZ without an appropriate sticker.

Mexico LEZ

The vehicular fleet in Mexico differs from the European vehicular composition. The fleet has much older and comprises used vehicles. Moreover, passenger cars and light goods vehicles running on diesel are also very rare.

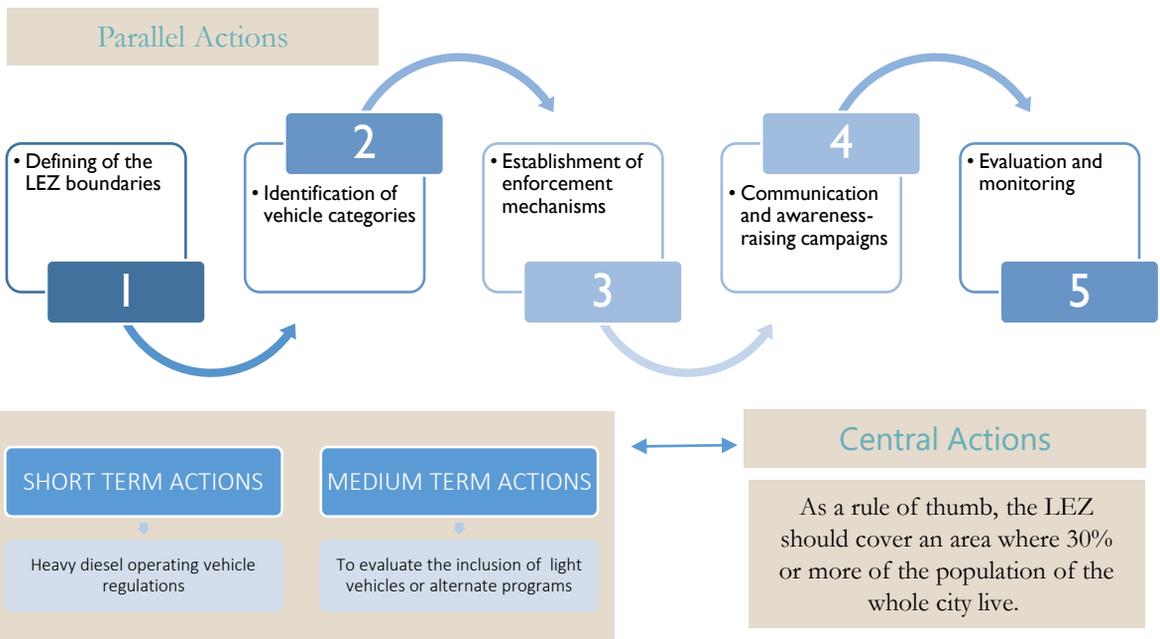
The regulatory framework for approval of vehicles is a mix of US and EU standards and hence presented difficulty in providing a cohesive basis for LEZ emission requirements.

Current sales of Zero Emission Vehicle, light duty vehicles (ZEV LDV)= 0.33%
 Goal= to produce 50% of the LDV fleet as ZEV's by 2030

Established in 2008	Target 2024
City Population 22 million	Area under LEZ 1056 sq km
Mexico is the 4th largest vehicle exporter in the world	

 **90% -Traffic**
 **50%-NOx Emissions** **Heavy Diesel Vehicles**

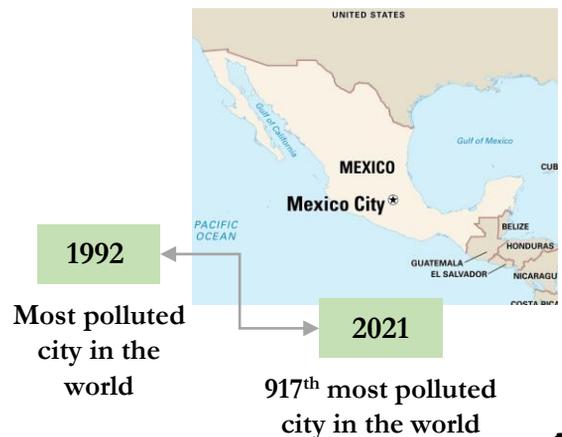
Low Emission Zone Implementation Framework



HOLOGRAM SCHEME

Hoy No Circula (today no circulation) program, which has been in place in Mexico City since the late 1980s.

Vehicles that meet specific emission standards are granted a hologram that allows them to move in the LEZ. The hologram scheme is divided into six categories, which are determined by the level of emissions from the vehicles. The categories range from zero emissions to vehicles that do not meet any emission standards.





Indian Scenario

Though the concept of Low Emission Zones has not yet been implemented within the Indian context, however some similar measures have been adopted towards implementing vehicle restriction zones or clean air zones in some cities.

Redevelopment of Central Vita of Chandni Chowk, Delhi

Year of implementation
2021

A 1.3 km stretch between the Red Fort and the Fatehpur Masjid was turned into a car-free zone and beautified keeping the Mughal-Era architectural style in mind.

Rs 650 million worth project involved the widening of roads, change of water supply lines, repair and replacement of existing sewerage system, construction of public amenities like washrooms, removal of encroachments and urban beautification.

Issues observed

- Compact built form
- Traffic congestion
- Narrow circulation space
- Low-rise high-density development



Vision

To facilitate the future development of the area as an important and lively regenerated urban center in connection with the historical and cultural character of the area.

Key Solutions

- Pedestrianization of the central street.
- Restricting motor vehicular access from 9 am to 9 pm.
- Decluttering of overhead electric and telephone wires.
- Regulation on building façade & material specifications.



Outcomes

- Improvement in the built environment of the neighborhood.
- Reduced traffic congestion
- Economic regeneration and improvement of tourism services.
- Overall urban renewal of the area.

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Taj Ganj, Agra

Year of implementation
2019

Agra, the City of Taj is also a city with PM2.5 that's twice the national standard.

Issues observed in Taj Ganj are-

- Absence of signage.
- Lack of parking facilities.
- Absence of community toilets in the precinct.
- Riverfront is subject to open defecation.



To connect disparate urban edges, such as parks, bazaars, and commercial areas, order to present a fresh perspective that corresponds to the historical and cultural aura of the city of Agra.

Key Solutions-

- Road development using traditional red cobbled stone.
- Addition of footpath and cycle tracks to promote NMT.
- Addition of public conveniences, seats, and kiosks.
- Erection of wayfinding signages.



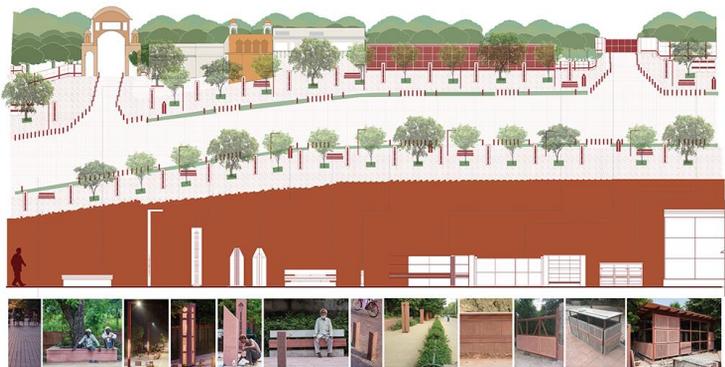
Outcome

Coherent urban design giving priority to NMT.

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Before

After



1.2. Characteristics of Low Emission Zones

Key Takeaways: Technical elements		Case studies
Vehicles must follow standard with daily fine for non-compliant vehicles	CRIT'Air classification	Paris, France
	Euro standards	London, UK Brussels, Belgium
Restriction on vehicular movement for limited period of a day		Chandni Chowk, Delhi Berlin, Germany Paris, France
Categorisation of vehicles	By fuel type	Seoul, South Korea
	By emissions (using colour coded stickers)	Berlin, Germany
Banning old diesel vehicles		Brussels, Belgium
Promotion of E-vehicles and NMTs		Seoul, South Korea London, UK
Congestion charges in congestion zone		London, UK
Pedestrianisation		Jagannath Temple, Puri Chandni Chowk, Delhi
Provision of cycle track and footpath		Taj Ganj, Agra, UP
Provision of public facilities and signage for tourists		Taj Ganj, Agra, UP Ujjain, MP Jagannath Temple, Puri
Restoration of waterbodies and conservation of heritage structures		Ujjain, MP Jagannath Temple, Puri
Raising awareness amongst citizens and introducing new LEZ rules to them		Berlin, Germany Brussels, Belgium
Regulation of building façade		Chandni Chowk, Delhi



Regulations limiting the ownership and use of private automobiles are becoming more prevalent to increase effectiveness and standard of transportation networks around the world. Rising levels of traffic congestion, regional air pollution, and greenhouse gas (GHG) emissions compel policymakers to implement smart traffic-control measures. Larger cities are seeing an increase in the use of license plate lotteries, driving bans, and peak-hour traffic restrictions.

Key highlights of LEZ area as per Global leading practices:

- The main aim of LEZs is to improve air quality in areas of higher pollution levels.
- LEZs usually operate 24 hours a day and 365 days of the year.
- Vehicles entering the zones need to meet prescribed emissions standards.
- LEZ restrictions generally apply to heavy diesel vehicles due to their relatively large contribution to air pollution. But the same can be extended to potentially all vehicles.
- Non-compliant vehicles entering LEZs are subjected to fines. These fines are usually large in amount to deter the repetitive behavior.
- Congestion charges are levied in some LEZs to allow non-compliant vehicles to enter the zone
- Zones that completely ban all vehicles running on an internal combustion engine and only allow electric-powered vehicles to enter are called Zero Emission Zones (ZEZ).



Special stickers placed on the dashboards of cars are used to verify whether it can drive in the zone.



Non-compliant vehicles entering the LEZ are subjected to heavy fines to deter repetitive behaviour.



Cameras linked to vehicle registration database are used to verify a vehicle's appropriate certification



Most LEZs operate 24 hours a day, 365 days a year.



Signs are used to designate the LEZ boundaries



Congestion charges are levied to allow non-conforming vehicles to enter the zone

Selection of a zone in a city for LEZ

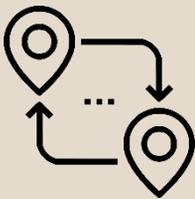
For selecting a zone in a city for establishing an effective LEZ, the following important aspects should be taken into consideration.



A significant portion of transit routes, commercial or institutional centres and public transportation hubs must be covered where air quality is observed to be poor. This site may have any cultural, commercial, historic, etc significance as this would ensure that it has a greater number of visitors and, thus, a higher chance of having and showcasing any impact at all than a site that is not an important part of the city's network.



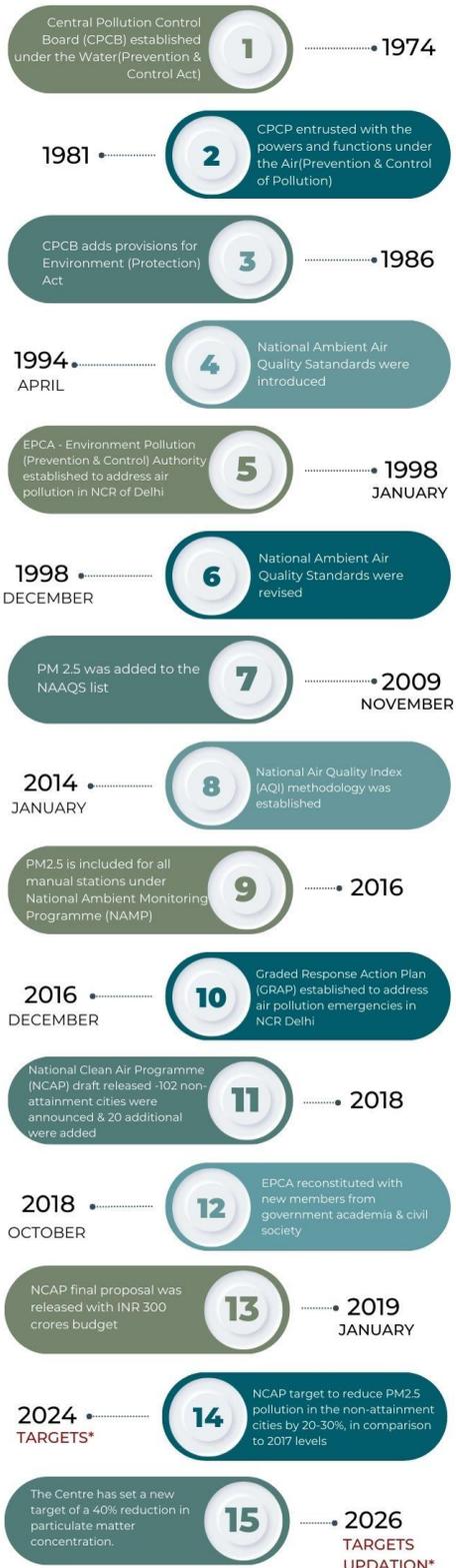
The selected site should also be home to 30% or more of the total population. Not only will this create a greater impact in terms of reduced pollution and consequent health benefits on the maximum number of people possible, but it will also ensure that the measures put in place are justified in their cost and effort.



The size of the LEZ should be large enough for the zone to not be easily bypassed or driven around. In the case of a relatively small LEZ site, commuters with non-compliant vehicles may choose to drive by the outskirts of the site which would inherently increase the pollution in these surrounding areas.

1.3. Relevance of Low Emission Zones to National Clean Air Programme

TIMELINE FOR TODAY'S NCAP AIR POLLUTION REGULATION IN INDIA



About NCAP

The Government of India launched the National Clean Air Programme (NCAP) through the Ministry of Environment, Forest and Climate Change to combat air pollution throughout the country. The NCAP programme aims to achieve a 20-30% reduction in Particulate Matter 2.5 levels of non-attainment cities by 2024, with baseline levels of 2019.

By 2024, the NCAP program aims to:

- Increase the CAAQMS to 1000 stations.
- Expand the monitoring network to 50 rural areas with at least one station.
- Revise the 2003 guidelines for ambient monitoring to enable alternative methods like low-cost sensors and emerging research grade monitoring equipment including a new certification system.
- Establish a 10-city super monitoring network (Venkataraman et al., 2020).
- Promote programs on indoor air pollution monitoring with special focus on managing household fuel combustion.
- Establish an air information centre.
- The awareness programs include dissemination of the monitoring data and short-term air quality forecasts.

As seen in the state-wise snapshot of share of actions under each sector given below, one can observe how most initiatives focus primarily on the traffic and transport sector. Through the LEZ, the aim is to provide an integrated solution focusing on all sectors and not just traffic and transport.

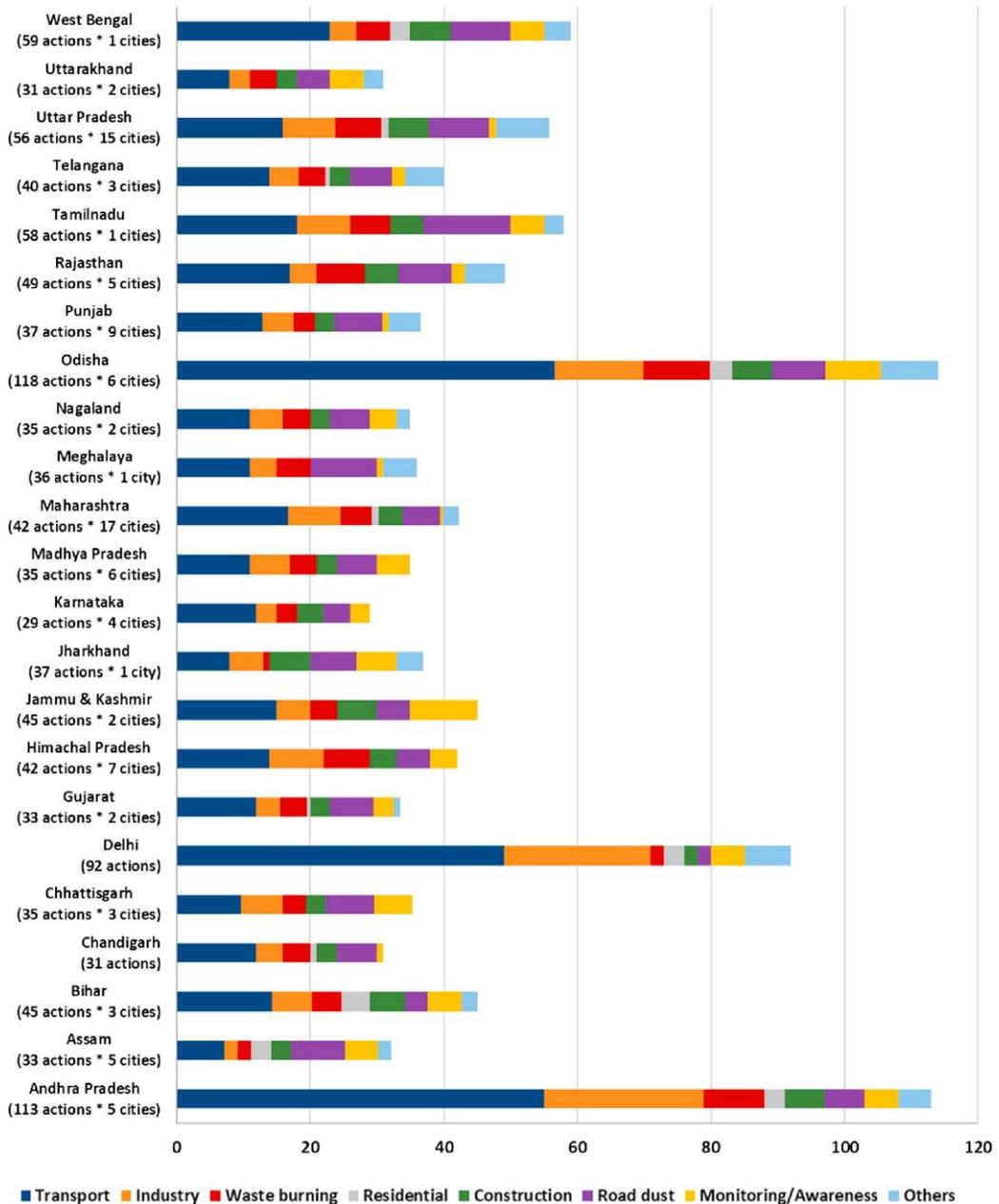
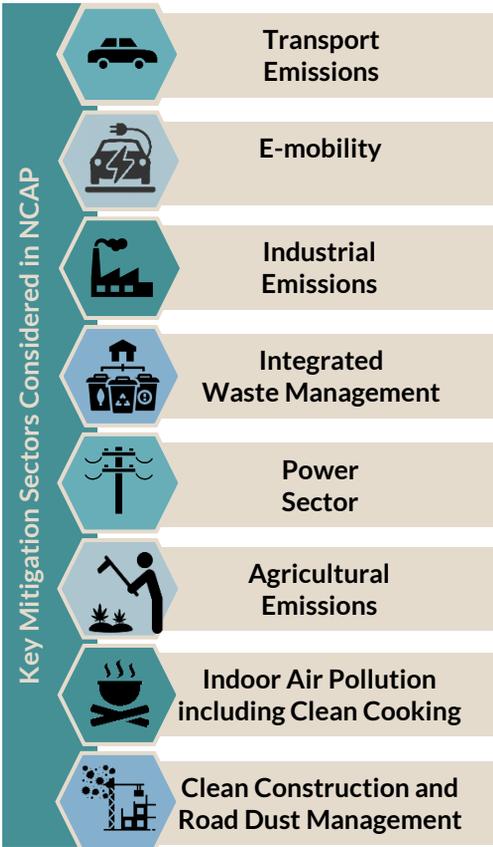
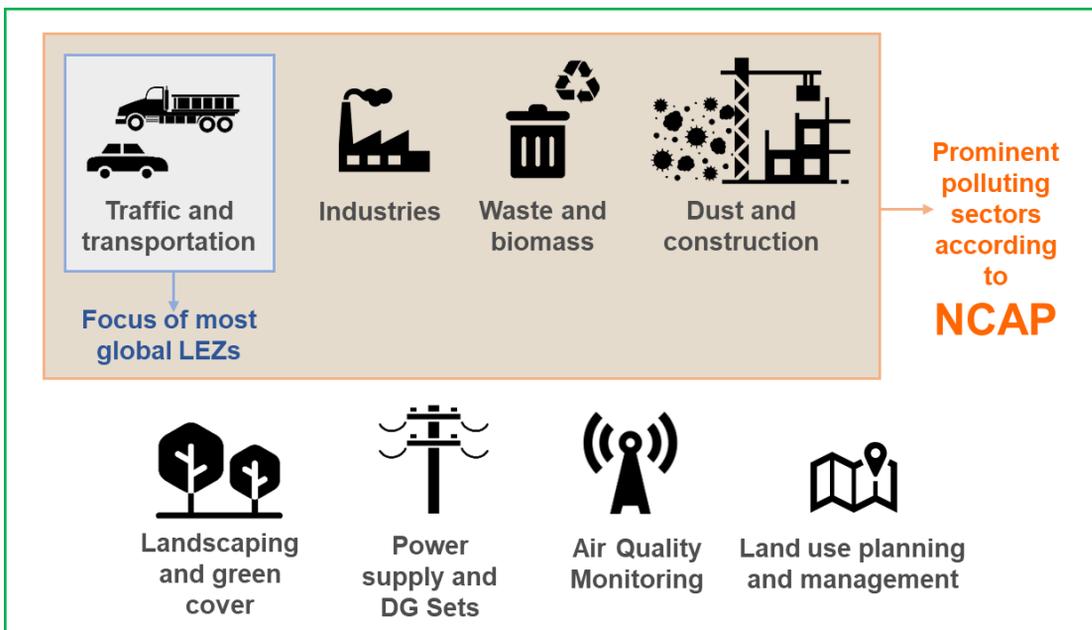


Figure 3-5: Average count of action points by sector mentioned in the NCAP clean air plans by state. (<https://www.sciencedirect.com/science/article/pii/S2590162120300368>, n.d.)

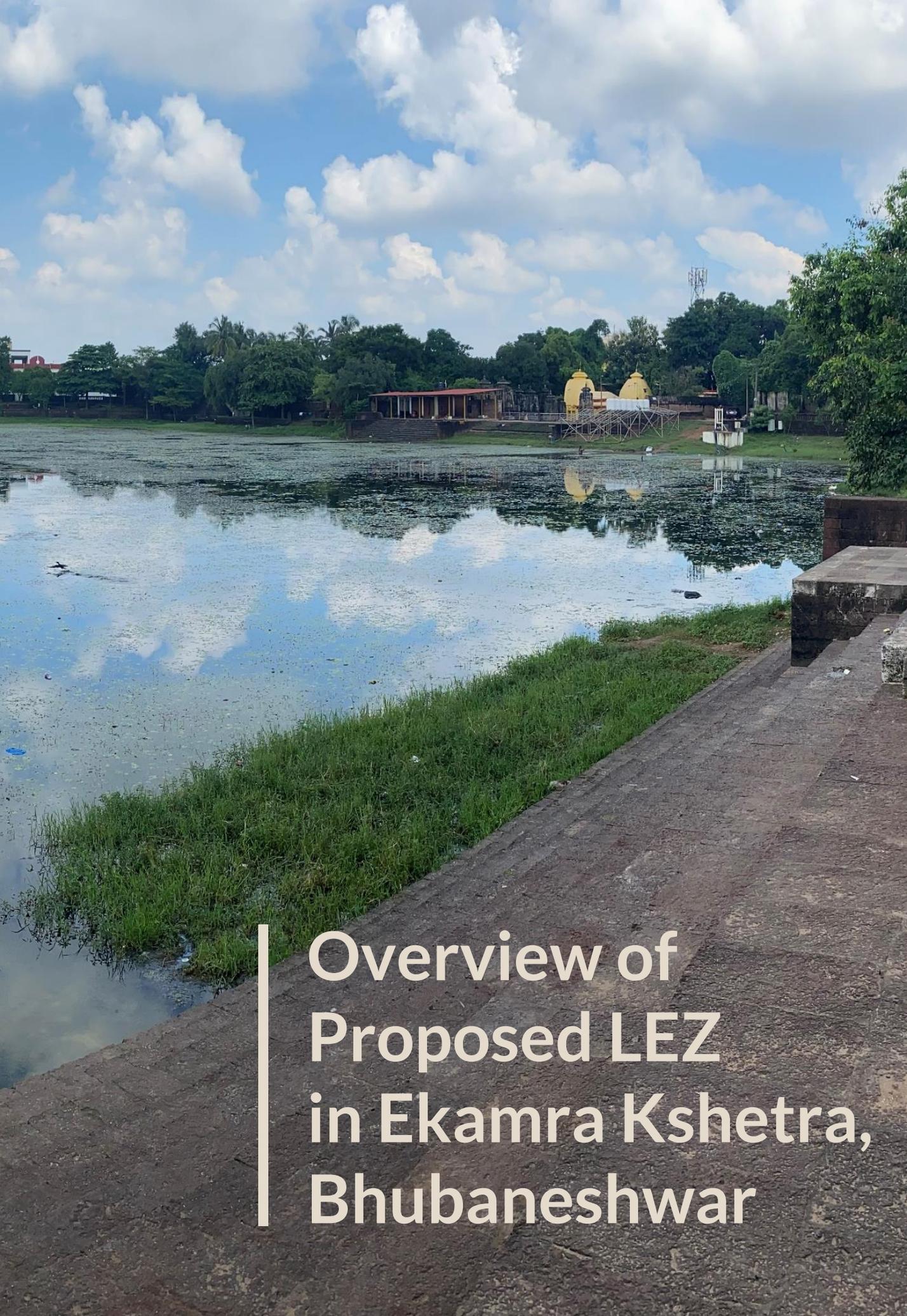


The main source of harmful pollutants in many urban areas, according to the European Environment Agency, is road traffic. Therefore, till today, global LEZs have mostly focused on tackling traffic pollution. The main source of harmful pollutants in many urban areas, according to the European Environment Agency, is road traffic. Therefore, till today LEZs have mostly focused on tackling traffic pollution. There is a potential to include in LEZs other sectors that address air quality issues such as those due to solid waste management, waste burning, land-use leading to congestion, industrial emissions etc.

The proposed LEZ in Bhubaneswar aims to provide an integrated solution within the selected zone in the city by addressing all key aspects such as land use planning and management, traffic and transportation solutions, waste management solutions to prevent burning and dumping, uninterrupted power supply and inclusion of renewable energy systems to prevent the use of diesel generators, plantations and landscaping etc.







Overview of
Proposed LEZ
in Ekamra Kshetra,
Bhubaneswar

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Overview of Proposed LEZ in Ekamra Kshetra, Bhubaneswar



2.1. Context

Odisha is one of the 24 States that included in NCAP, and it has seven non-attainment cities, namely Angul, Balasore, Bhubaneswar, Cuttack, Rourkela, Talcher, and Kalinga Nagar.

Bhubaneswar, the capital of Odisha is one of India's first planned cities. The city is an emerging hub for education and information technology. With increasing population, construction activity and transport, the Pollution Control Board in Odisha has reported that levels of suspended particulate matter are above the standard even in the summer months. The absence of systematic management of landfills and pollution from burning waste contributes to air pollution in the city.



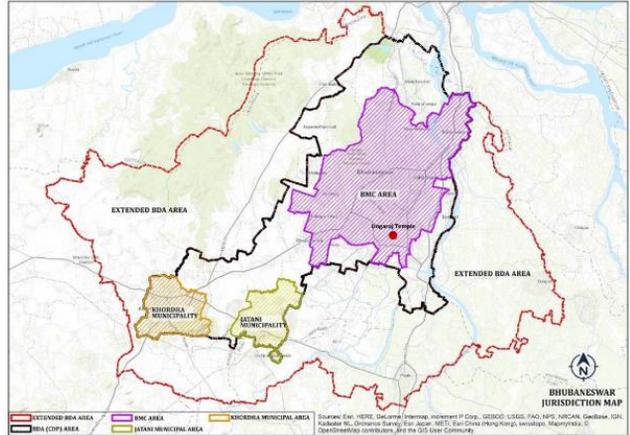
Bhubaneswar and its surroundings have several temples and associated heritage areas including the Lingaraj temple Ekamra Kshetra (Old Town). The old town area of the city surrounding the Lingaraj temple is a congested area significantly contributing to air pollution in the city.

Under a Triangular Cooperation Project of Germany-India-Mexico on Clean Air under the German development Cooperation, the concept of Low Emission Zones was discussed and the Odisha State Pollution Control Board (OSPCB) selected the Ekamra Kshetra Heritage Zone in Bhubaneswar to be developed as a Low Emission Zone (LEZ). Besides having heritage, tourism and religious character, this zone has high levels of PM. LEZ offer an opportunity to improve air quality in this zone.

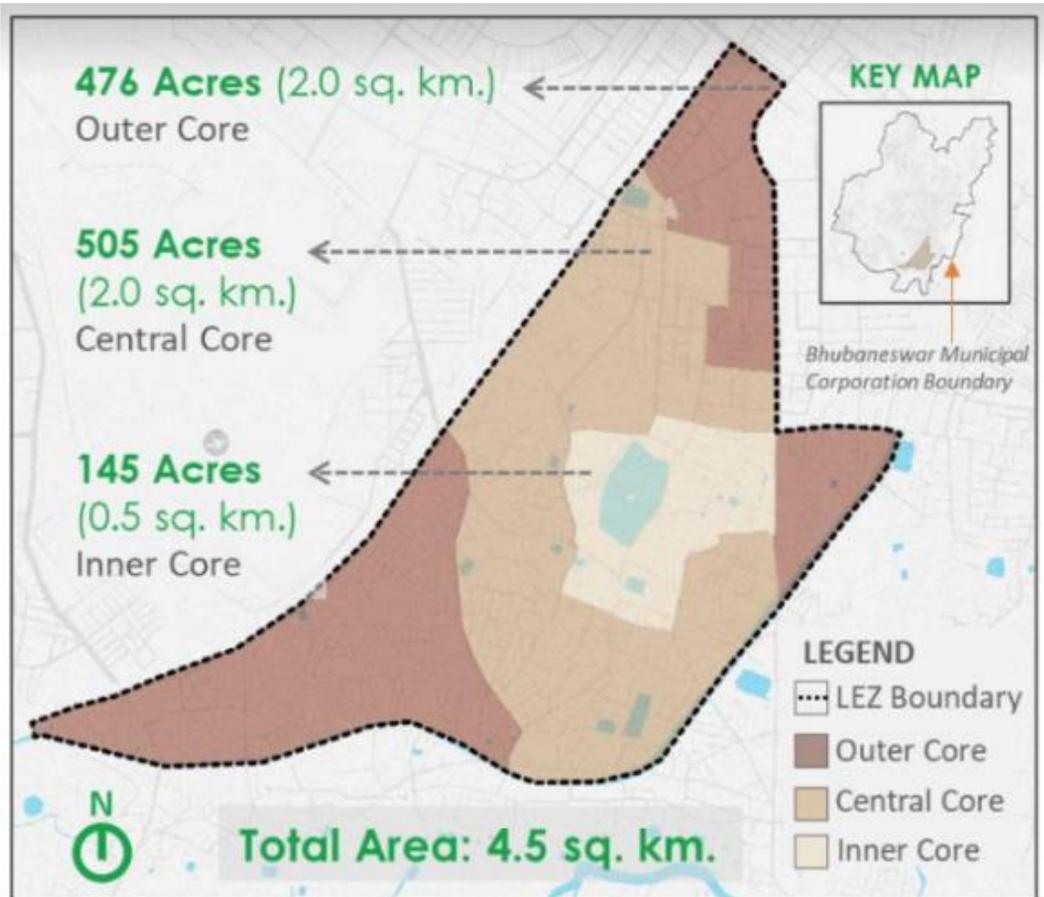


About Ekamra Kshetra

Ekamra Kshetra of Bhubaneswar is a series of ancient sandstone temples, heritage ponds and water tanks. Its wealth of monuments is testament to an ancient continuous architectural and historical heritage covering over 2,000 years from the 3rd century BC to the 15th century AD. It has been listed as a tentative site in UNESCO World Heritage list.



The boundary of the Ekamra Kshetra LEZ covers an area of 4.5 sq. km. The CDP for Bhubaneswar – 2030 further divides the Ekamra Kshetra heritage zone into three parts. The outer core which covers an area of 2 sq. km., central core which covers an area of 2 sq. km. and the inner core which covers an area of 0.5 sq. km. The famous Lingaraj Temple, which is the major tourist attraction of the Ekamra Kshetra is located inside the inner core of the heritage zone.



Cultural and historic significance

Shortlisted as a UNESCO World Heritage Site

High footfall throughout the year

Already conceptualized by state government

Mixed Land Use



Front and back entrance of temple



Temple Surroundings

Image Source: IPE GLOBAL - Reconnaissance Survey

2.2. Envisioning and Planning

<p>Vision</p> 	<p>To make the Ekamra Kshetra zone pollution free and an area showcasing heritage and cultural values with integrated urban planning and design, landscaping, and pollution prevention and control measures in all relevant sectors.</p>
<p>Objective</p> 	<p>To prepare a detailed plan for Ekamra Kshetra Low Emission Zones (LEZ) with integrated solutions for improving the air quality by incorporating socially/culturally relevant, technically sound and financially viable solutions with relevant measures so as to reduce air pollution and improve air quality in the selected area with a holistic effect.</p>
<p>Scope</p> 	<p>The Odisha State Pollution Control Board (OSPCB) has developed a concept for the development of this LEZ with the vision to provide the people of this city as well as the visitors to this city a unique experience of cleaner air for better health through eco-sensitive planning, without compromising employment growth, and ensuring preservation of diverse historical and cultural heritage.</p>
<p>Target</p> 	<p>By 2026, a 40% reduction in particulate matter concentration to be achieved in line with NCAP targets.</p>

Methodology

- 1 Desk review/ secondary research**

Data/reports available from secondary sources
- 2 Study area visit and primary data collection**

Reconnaissance survey and documents provided by government agencies
- 3 Data analysis and developing key sector-based interventions**

Primary and secondary analysis
- 4 Consultations with key stakeholders**

Discussing options with key stakeholders
- 5 Proposing solutions**

Providing short, medium and long term recommendations

Key Elements

<p>Proposed key elements identified by OSPCB for the reduction of emissions within the zone</p>	<p>Ambient air quality monitoring and communication</p>
	<p>Green – sticker system for the local resident’s private vehicles</p>
	<p>Intensive emission monitoring of resident’s emission and generator sets</p>
	<p>Promotion of EVs/ shared EVs for tourists</p>
	<p>Un-interrupted electricity supply</p>
	<p>Promotion of cycling and pedestrian passage</p>

Expected Results

- 

Reduction in PM10 & PM2.5 by 33% by 2030 and promote new jobs, investments and increase economic activity.
- 

Further providing support to state government and technical assistance to OSPCB for developing Ekamra Kshetra Heritage Zone as LEZ.
- 

Envisaging for creating Low Emission Zones for greater impact of Clean Air.

2.3. Stakeholder Mapping

Roles and Responsibilities of various stakeholders is identified. Consultations, meetings, and discussions were held with key stakeholders regarding to identify the proposed solutions and recommendations suggested for the LEZ.



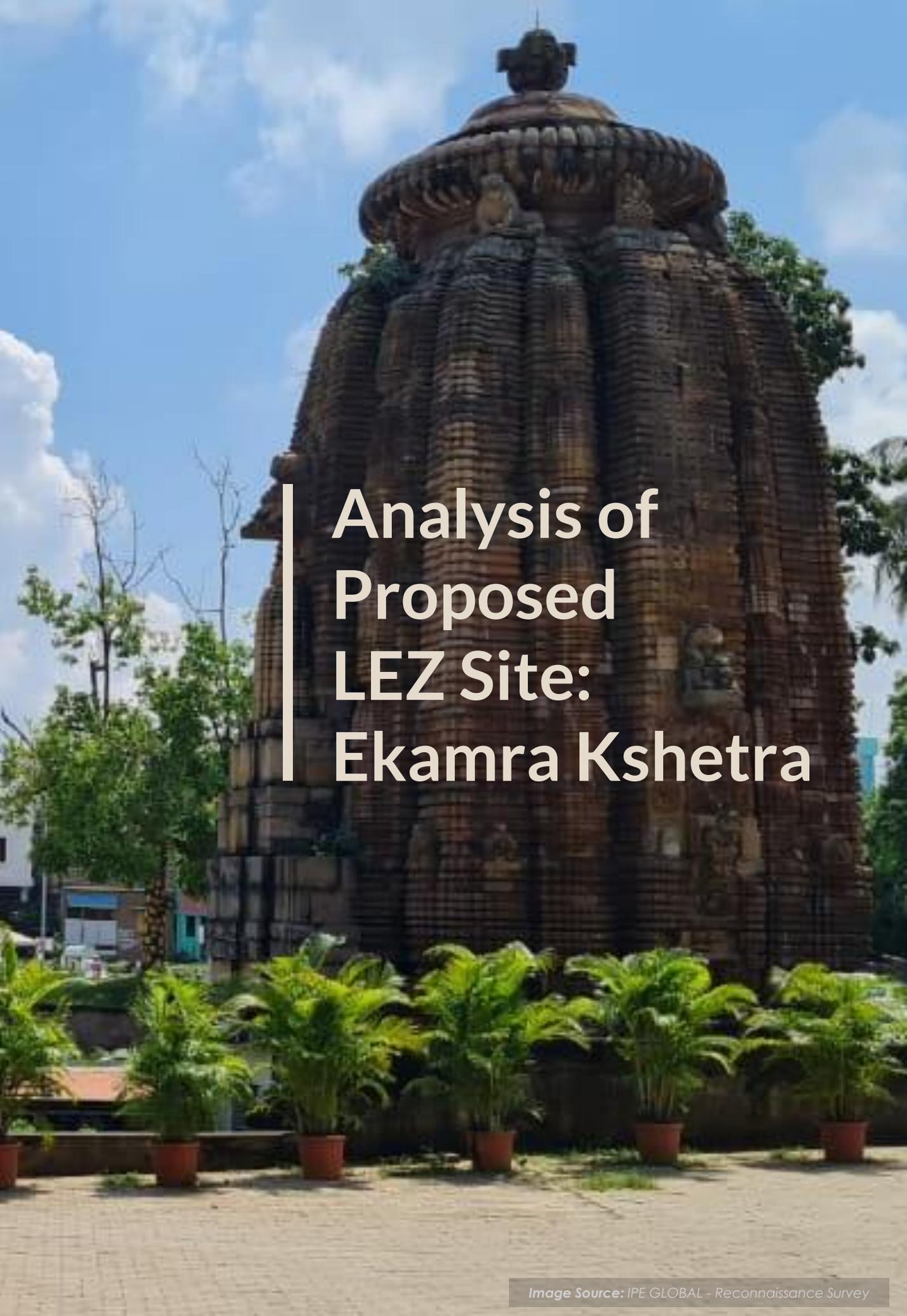
2.4. Existing Action Plan

As of August 2021, the status of implementation of Micro Action Plan for Non-Attainment City of Bhubaneswar is given below.

Action Point Code	Sector	Total Number of Actions	Number of Actions Completed	Number of Actions under progress
CB	Capacity Building, Monitoring Network and source Apportionment	09	04	05
PO	Public Outreach	07	03	04
RD/C D	Road Dust and Construction & Demolition	33	12	21
VE	Vehicles	32	13	19
IP	Industries	29	13	16
BB/DF	Waste and Biomass- Burning and Dumping	13	08	05
AQ	Air Quality Data	01	01	00

<https://cpcb.nic.in/Actionplan/Bhubaneswar.pdf>



A tall, ancient stone tower with a tiered, conical top, surrounded by green plants in a courtyard. The tower is made of dark, weathered stone and has a complex, multi-tiered structure. The top is a large, rounded dome with a small finial on top. The tower is set in a courtyard with several potted plants in the foreground. The sky is blue with some clouds.

Analysis of Proposed LEZ Site: Ekamra Kshetra

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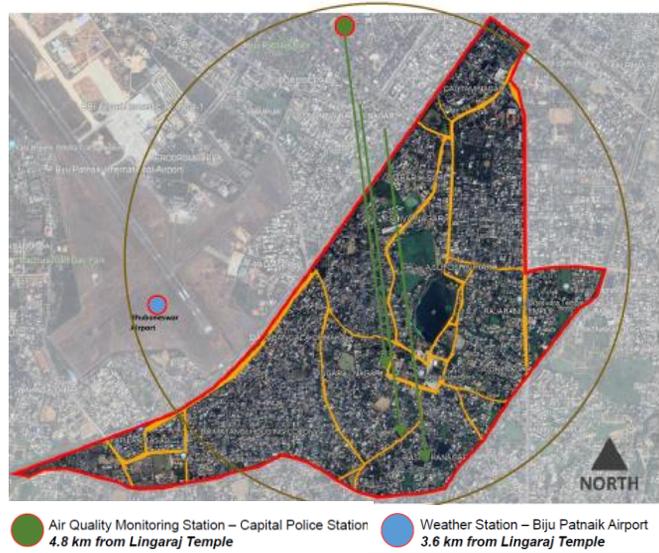
Analysis of Proposed LEZ Site: Ekamra Kshetra

3.1. Air Quality

The proposed Low Emission Zone has no Air Quality Monitoring Station within the site. The nearest station is Capital Police Station, located 4.8 km from Lingaraj Temple which lies at the centre of the LEZ.

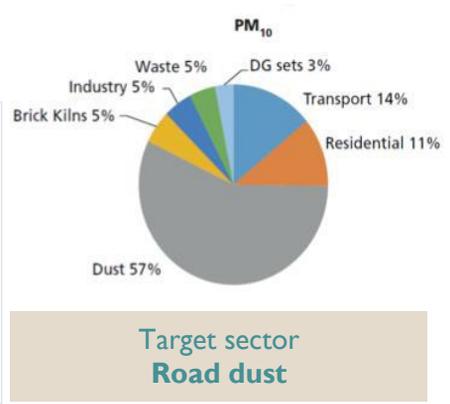
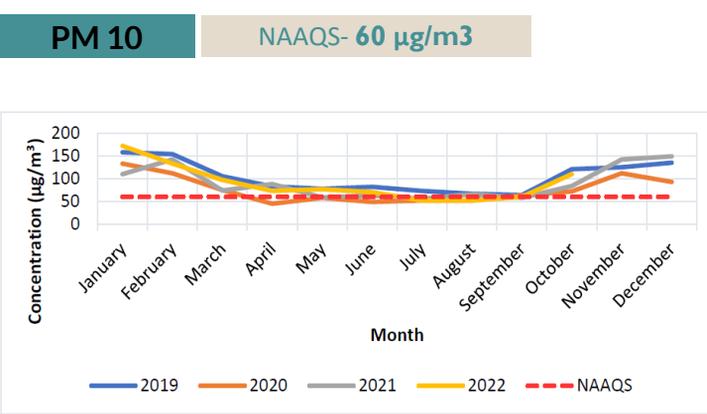
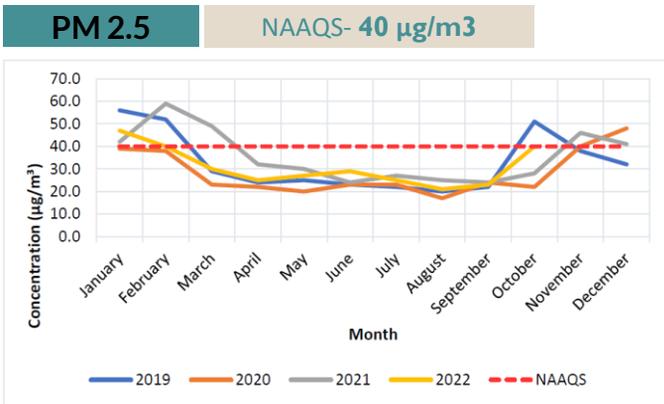
For Bhubaneswar, the average PM2.5 concentration was 47.7 µg/m³. This is marginally higher than the national standard (40 µg/m³), but more than 4 times the WHO guideline (10 µg/m³).

Numerous analyses identify open waste burning, residential cooking and transportation, road dust, etc as the main contributors to air pollution in the city.



AIR QUALITY TARGETS

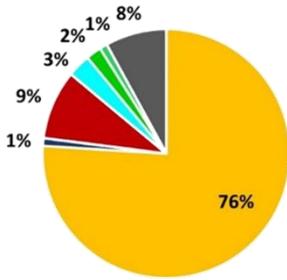
NCAP targets for 40% of particulate matter reduction by 2026.



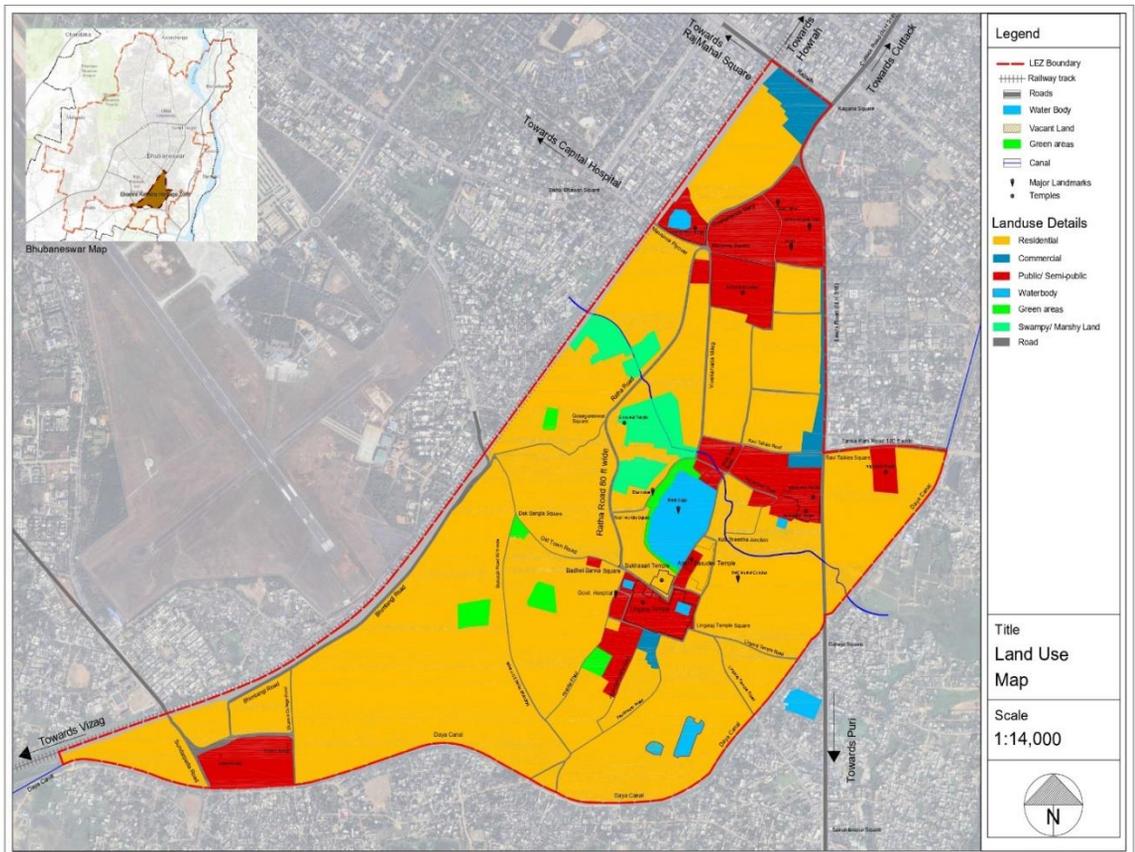
3.2. Master Plan and Land Use



As per the Comprehensive Development Plan (CDP) for the Bhubaneswar Development Plan Area (BDPA) 2030, the Ekamra Kshetra is identified as Heritage Zone A – Old Town Area. The predominant land use in the study area is Residential within Special Heritage Zone with other land use including public semi-public, commercial, protected monuments, precincts, ponds, lakes, and lagoons.



The existing land use pattern in the LEZ is a mix with residential land use being the predominant and covering 76% of the site. Public/Semi-public land use covers 9% of the LEZ. These areas mainly consist of various temples and religious buildings. Water bodies cover 3% of the LEZ and mainly consists of the Bindu Sagar and other ponds.



Existing Land Use

Land use	Existing land use 2022	Proposed land use 2030	Deviations observed
Residential	76%	75%	Existing is greater than the proposed
Commercial	1%	1%	No change
Public-Semi public (PSP)	9%	5%	Existing is almost twice the proposed.
Waterbodies	3%	4%	Existing is lesser than the proposed
Green areas	2%	4%	Existing is lesser than the proposed
Swampy/marshy areas	1%	-	-
Road	8%	11%	Existing is lesser than the proposed



Proposed Land Use by CDP 2030

3.3. Vehicular Emissions



According to the source apportionment studies, traffic & transportation is the major contributor from vehicular emissions.

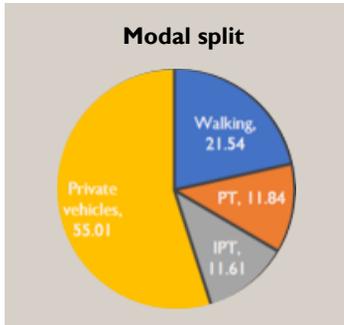
Contribution at city level



PM 2.5 = 27%



PM 10 = 14%

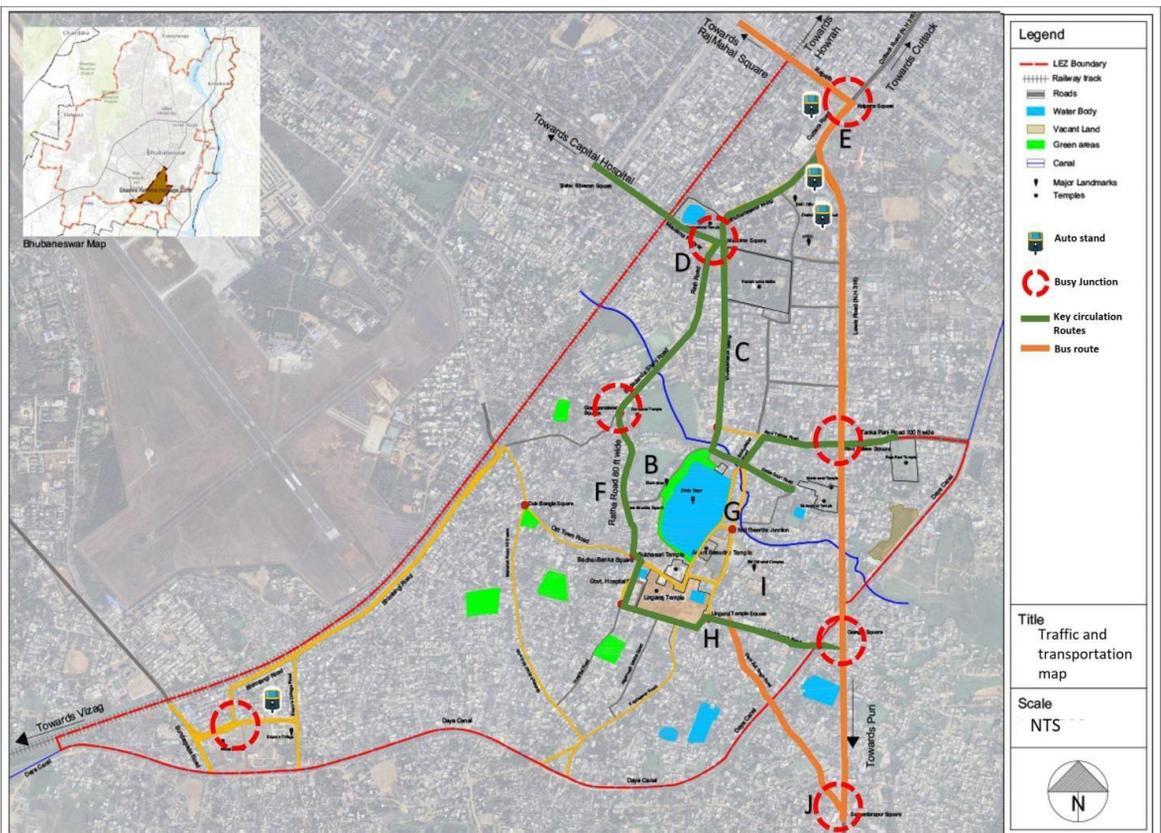


Source: CDP - Bhubaneswar 2030

The Ekamra Kshetra heritage zone lies in the old city area. It is characterized by narrow lanes and traffic congestion is a common issue. The heritage zone's narrow and congested roadways cause slow-moving traffic, which adds to the pollution levels.

As per the Comprehensive Development Plan for Bhubaneswar Development Plan Area 2030, private vehicles constitute very high percentage (55.1%) of mode share and walking comes second constituting to 21.5% share.

Road Infrastructure



Condition of entry points in the proposed LEZ-

Entrance 1- Sitalasathi road

- Through this entry point, not much of the traffic is contributing towards the temple. So, diversion towards this road will be helpful in monitoring of the vehicles.
- The ROW of this road is narrow and there is no footpath on this road.

Entrance 2- Rath Road

- This road is the leading point for Lingaraj temple, so high traffic volume can be experienced on this road.
- Entry to rath road is form the Badhei banka chowk.

Entrance 3 - Ravi talkies road to Taleshwar chowk.

Entrance 4 - Sanitorium chowk towards Bindu Sagar road.

Entrance 5 – Lingaraj temple Road.

Entrance 6 – Giani Zail Singh Road.

All these entrances have a fairly good volume of traffic that enters through these points.



Internal Roads



Internal Roads



Bindu Sagar Road



Ratha Road



Bindu Sagar Road



Ananta Basudev Road



Vivekananda Marg



Main Gate to Temple



Mausima Square



BMC New Market Complex



Kalpana Square



Ravi Talkies Square

Inferences-

- Road surface is in good condition however there are no footpaths.
- Arterial, sub arterial and collector roads have shoulder space. This shoulder space is contributing to dust along the roads.
- Only 26% roads in the city are covered with footpaths.
- Lack of road infrastructure to walk and cycle leads to safety concerns for vulnerable road users and discourages walking and cycling leading to increase in use of motorized private vehicles thus, increasing dependence on motorized vehicles.

Public Transportation

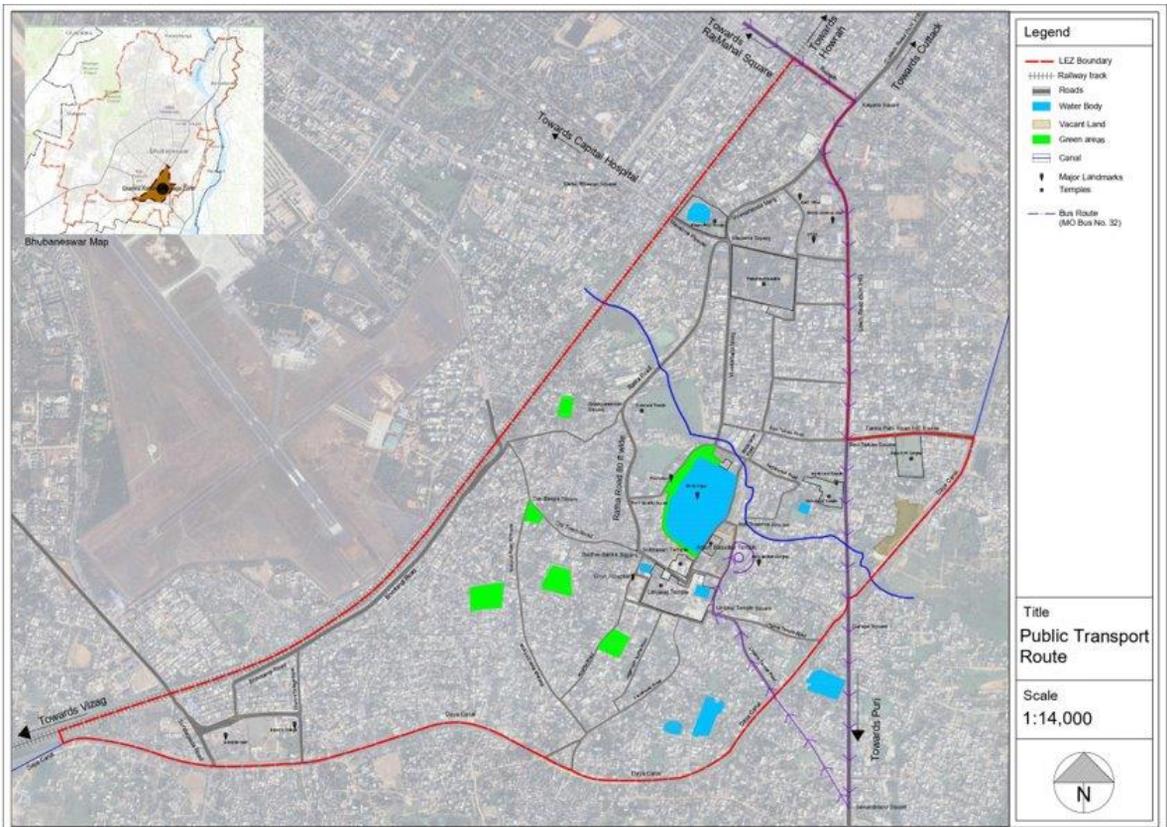
The Ekamra Kshetra LEZ experiences a very high tourist footfall throughout the year. Tourists and devotees use various transport modes for visiting temples inside the LEZ, viz. private vehicles, public transport like busses and auto. However, amidst all the traffic, it is startling to note that public transport is least preferred by tourists and visitors.



Issues Observed

There is only one e-bus route that passes through the LEZ because of which people either use auto rickshaws or private vehicles. The auto rickshaws and private taxis mainly comprise of vehicles using petrol or diesel as energy source. This shows the lack of low-carbon mobility options for transportation inside the LEZ.

EXISTING SCENARIO



NMT and Pedestrian Infrastructure

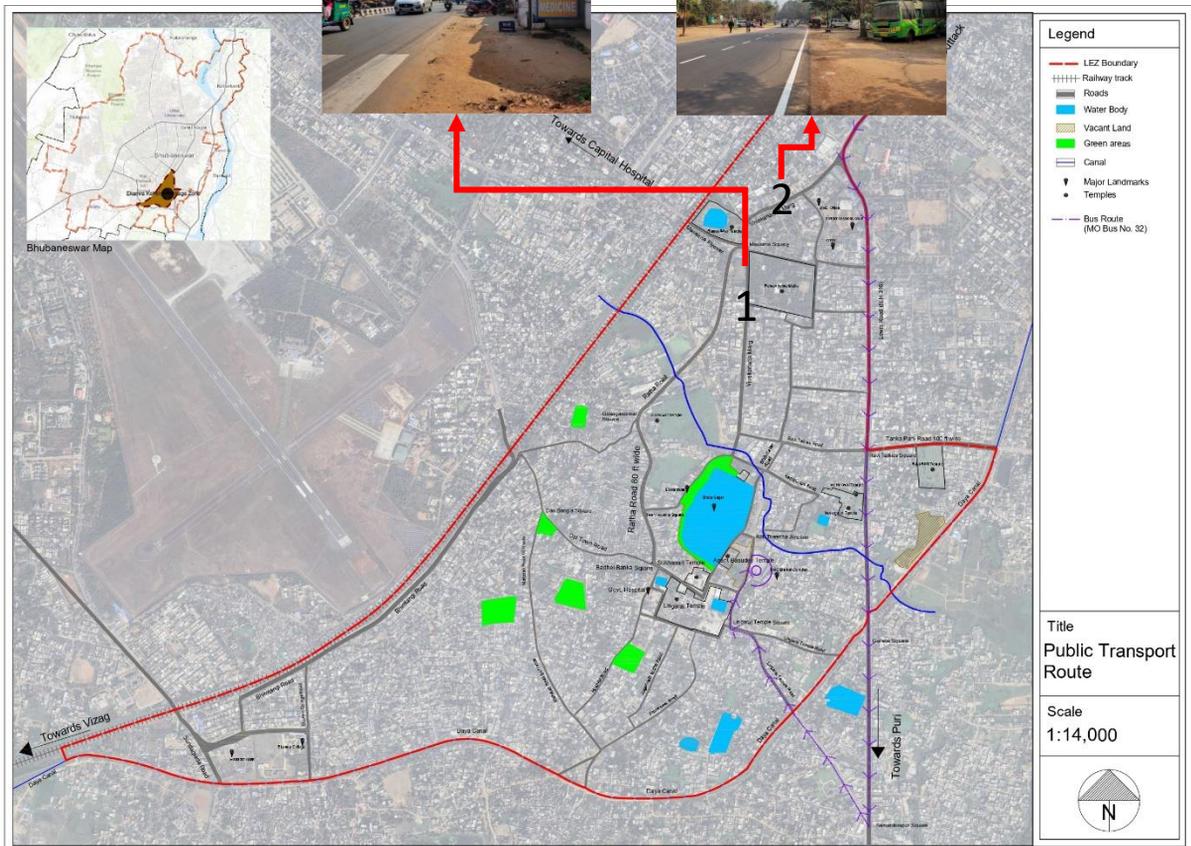
Usage of non-motorised transport (NMT) modes not only has positive impact on environment but also has health benefits. Poor infrastructure leads to decline in use of NMT. During reconnaissance surveys it has been noted that apart from arterial roads, most of the roads lack walking and cycling infrastructure.

The footpaths in the heritage zone are often encroached upon by vendors and parked vehicles, which forces pedestrians to walk on the road. Accumulation of dust on and beside roads is a major issue inside the Ekamra Kshetra. Construction activities in the heritage zone, including laying of underground pipes often involve the use of heavy machinery and materials that contribute to dust pollution in the area. The dust ultimately settles down on and around the roads for vehicles to disseminate it into the air again.

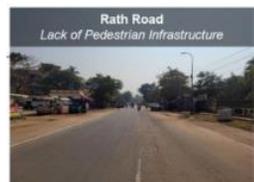
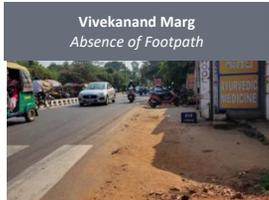
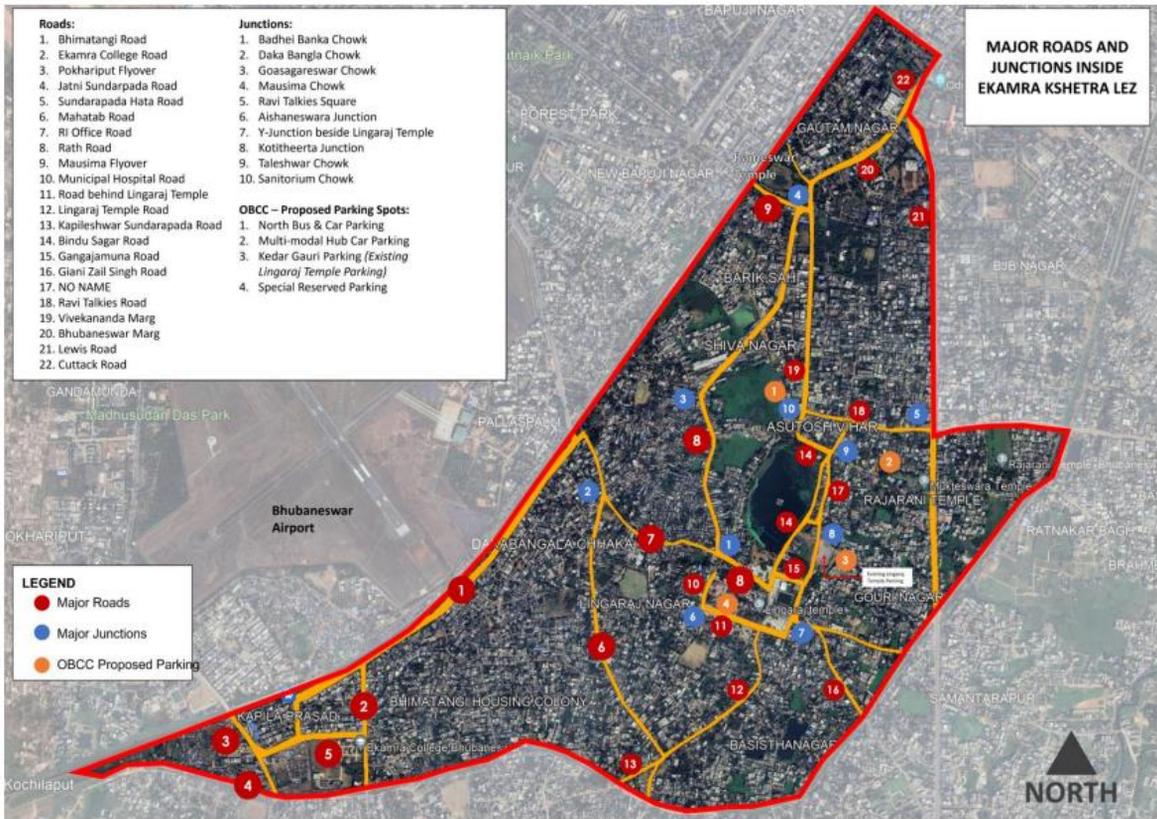
1 Absence of footpaths on Vivekanand Marg road



2 Absence of footpaths on Bhubaneswar road



Identified Issues



EXISTING CONDITION & IDENTIFIED ISSUES

-  **Dust accumulation**
-  **Unauthorized parking**
-  **Waste Dumping**
-  **Traffic Congestion**
-  **Absence of footpaths**
-  **Construction Debris**

- Only 26% roads are covered with footpaths (Smart City)
- Almost all roads in study area including arterial, sub arterial and collector roads lack footpaths
- Shoulder space is available on almost all roads and contributing to dust along the roads



3.4. Power Supply

DG sets emit particulate matter and nitrogen oxides, which are harmful air pollutants. DG sets that are not properly maintained can emit higher levels of pollutants. Hence, it is important to promote energy-efficient alternatives such as rooftop solar panels inside the LEZ, especially for commercial establishments and temples which use DG sets as a backup energy source.

Contribution at city level



PM 2.5 = 6%



PM 10 = 3%

For residences: Inverters used

For commercial set-ups: Shops use personal inverters; no provision for DG sets in the BMC New Market Complex, or for buildings with multiple shops

For Temple premises:

- a. Lingaraj Temple: Has DG Set/Inverter within the temple premises
- b. Other temples in the vicinity: Either inverters installed in the Garbagriha of the temple, or no alternate provisions
- c. For Raja Rani Temple, Mukteswar Temple, Mausima Mandir: Inverters only for the guard house

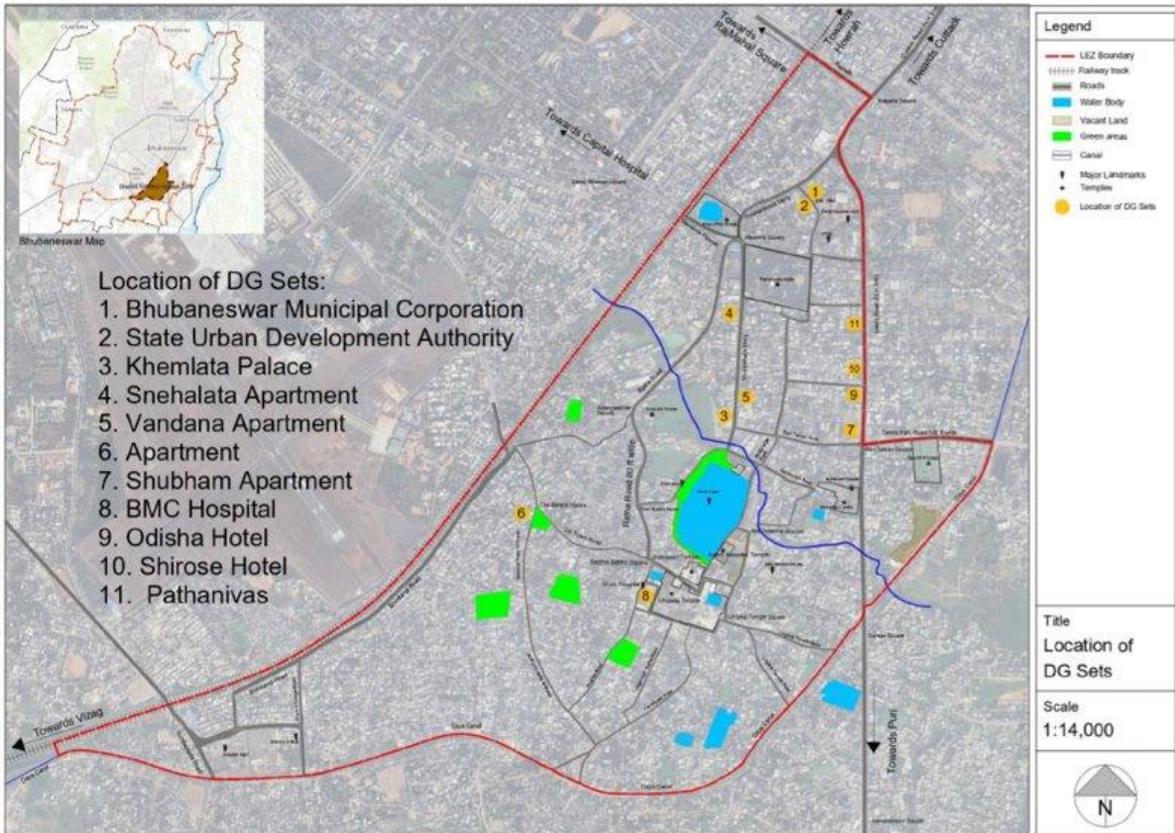
For institutional buildings, like schools and colleges:

No DG set, only inverters/ UPS installed in selected rooms



DG Sets used in commercial, public and semi-public establishments inside the LEZ
Source: Site Visit, January, 2023

Map showing the location of DG Sets in Ekamra Kshetra, LEZ



3.5. Waste Management



Contribution at city level



PM 2.5 = 8%



PM 10 = 5%

The roads beside the Lingaraj Temple are covered with organic waste (food waste from temple), in contrast to the cultural characteristic of the temple premise. The inadequate waste disposal procedures, such as disposal of waste in open areas or water bodies, also contribute to air pollution. This is due to the fact that decaying trash emits methane and other pollutants that contributes to air pollution. Apart from the emission of methane due to its decay, the waste creates unhygienic conditions, pollutes water bodies which further deteriorate the environment inside the area. The team observed that organic waste from temples, household waste from households and construction waste from various construction activities were dumped on the roads.



Total Waste Generation-approx. 15/20 Tons Per Day



Issues Observed

Haphazard disposal of waste in open spaces and beside roads.



Insights from stakeholder Consultation

Need to establish a compost plant to utilize organic waste (vegetables, flowers and other biodegradable waste) from temples, vegetable market, and public places

LOCATION OF OPEN AND WASTE DUMPING SITES

EXISTING CONDITION



3.6. Landscaping and Green Cover



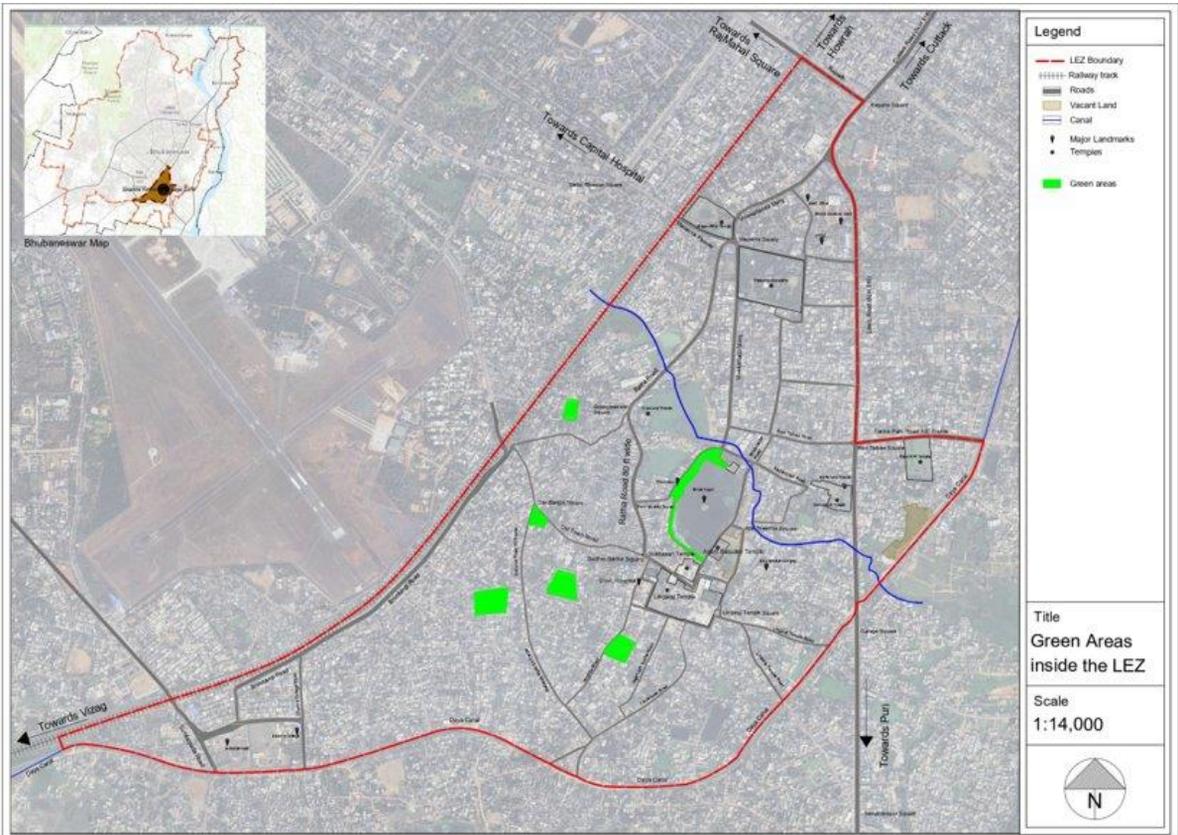
Green Cover

Green Space per person is suggested to be 10-12 Sq.mts as per URDPFI(2014) Guidelines. According to population projection of LEZ, green cover per person will be 0.83 sq. m. per person in 2030 even after proposing increase of green cover from 2% to 5%. Increase in green space required based on projected population of 2030: 0.35 sq. km.

Comparison from CDP & present condition



Map showing the Green Areas inside the LEZ



Analysis | Existing Scenario

Water Bodies

From field visits to various water bodies like Bindu Sagar lake and Papanasini pond, it was understood that water bodies inside LEZ are highly polluted and are dumping grounds for garbage.

Relevance to Air Pollution

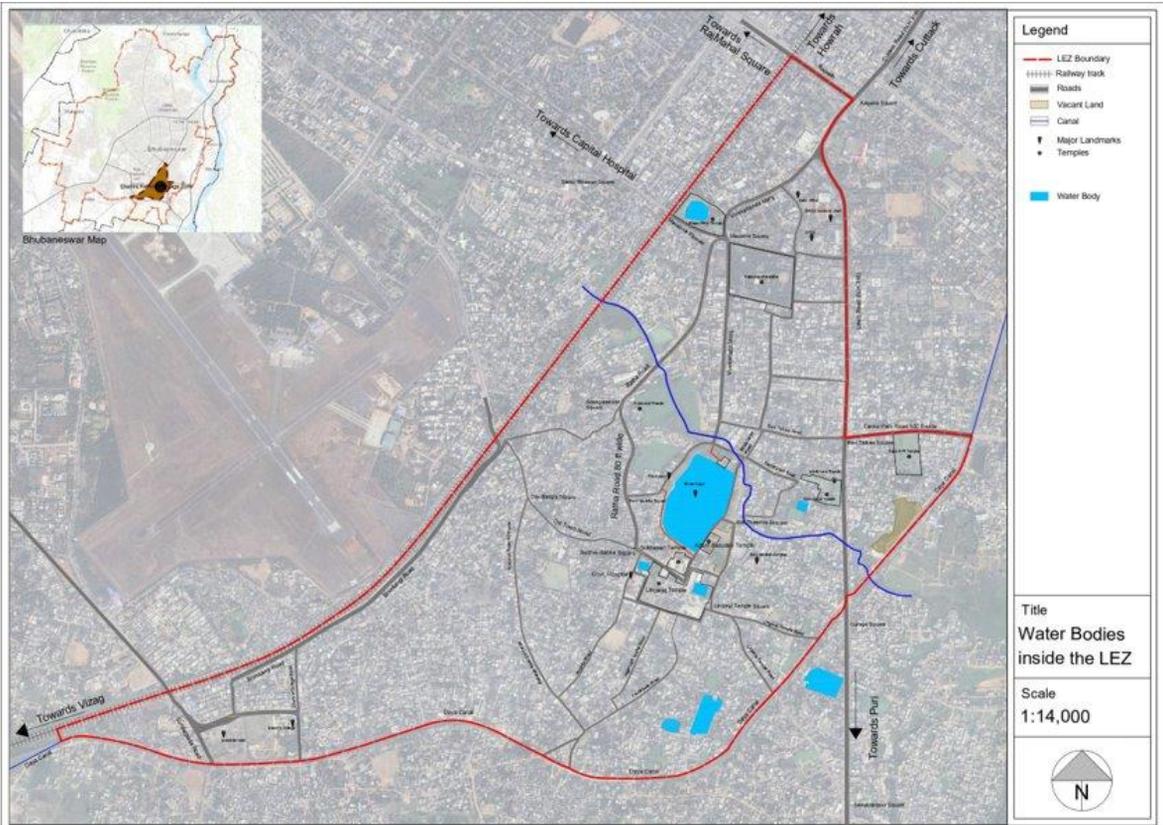
- Organic matter produced by algal blooms are released into the air above the water body, hence polluting it.
- High levels of nutrition in the water like nitrogen and phosphorus can cause eutrophication where the water body is starved of oxygen.
- This can result in the release of methane and other greenhouse gases, contributing to air pollution.

In addition to causing air pollution, unclean water bodies become breeding grounds for mosquitos which can cause diseases like dengue and malaria and can become a nuisance to the people living in the area.

Existing Condition of Papanasini And Bindu Sagar Lake



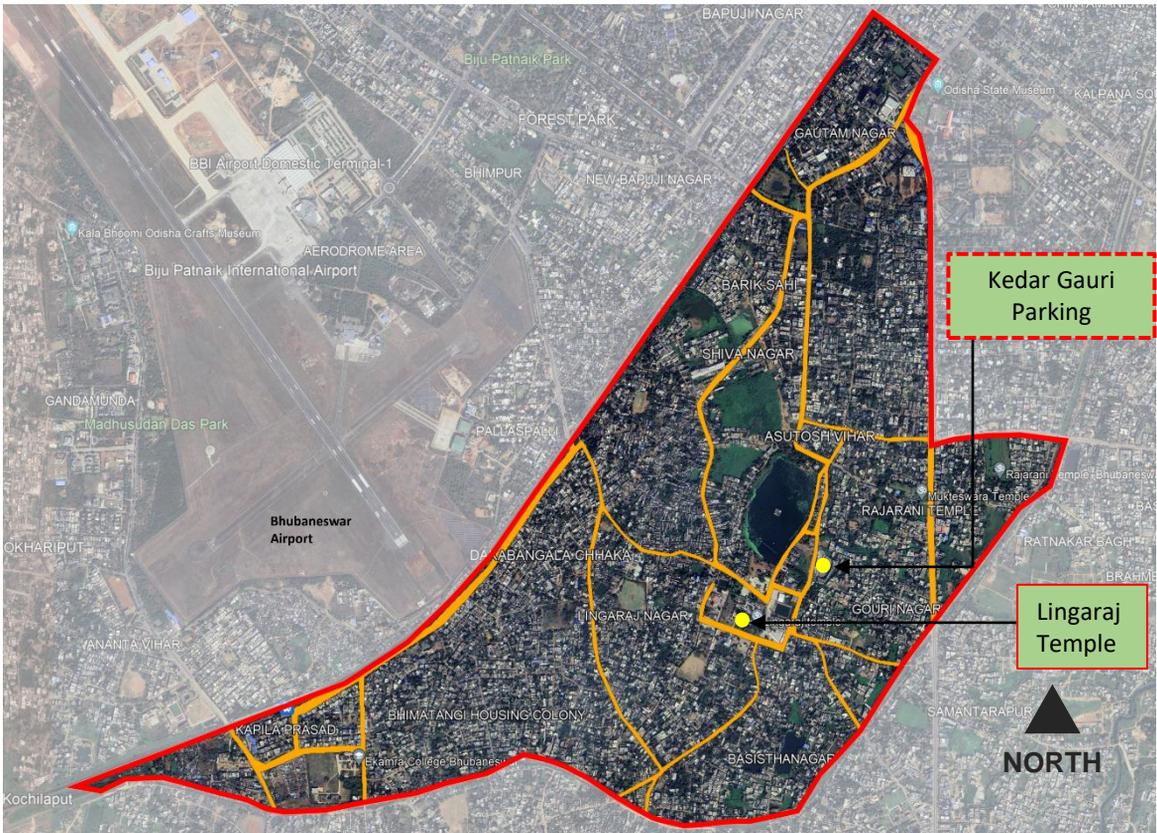
Map showing the Waterbodies inside the LEZ



3.7. Sanitation

The lack of adequate toilet facilities in the heritage zone is leading to open defecation or usage of unhygienic facilities, causing foul odours and release of harmful gases. The tourists are brought to the parking lots through buses, and these parking areas do not have toilet facilities. The Kedar Gauri Bus Parking, which is located 500 meters away from the LEZ is one of the problem areas identified. Being the main bus parking area near the Lingaraj Temple, it sees a high volume of tourists for which its current sanitation facilities are inadequate.

LOCATION OF OPEN AND WASTE DUMPING SITES



EXISTING CONDITION



Kedar Gauri Parking

- ✓ Main Bus Parking Area near Lingaraj Temple, 500 meters from Lingaraj Temple.
- ✓ Average 10-15 tourist buses per day, Peak Season – 30-50 tourist busses per day Sanitation Facilities Present
- ✓ **Existing Facilities:-** 2 Toilets & 4 Bathing Rooms – Inadequate for high volume of tourists



Issues Observed

1. Tourists use nearby open spaces for defecation and to take baths
2. Limited toilet facilities for Temple Pujaris inside temple complexes



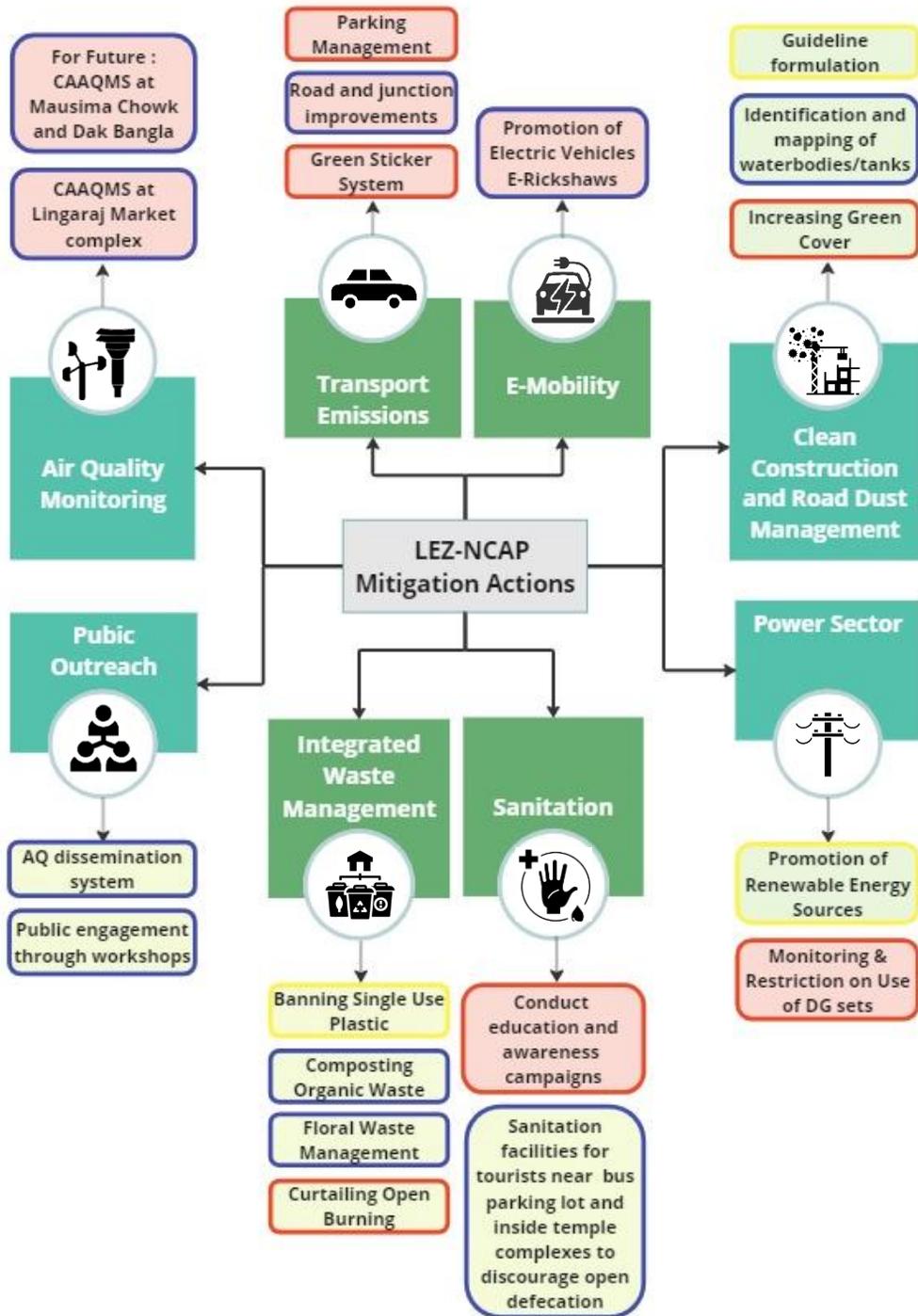


Recommendations and Proposals



4

Recommendations and Proposals



MEASURES



Technical



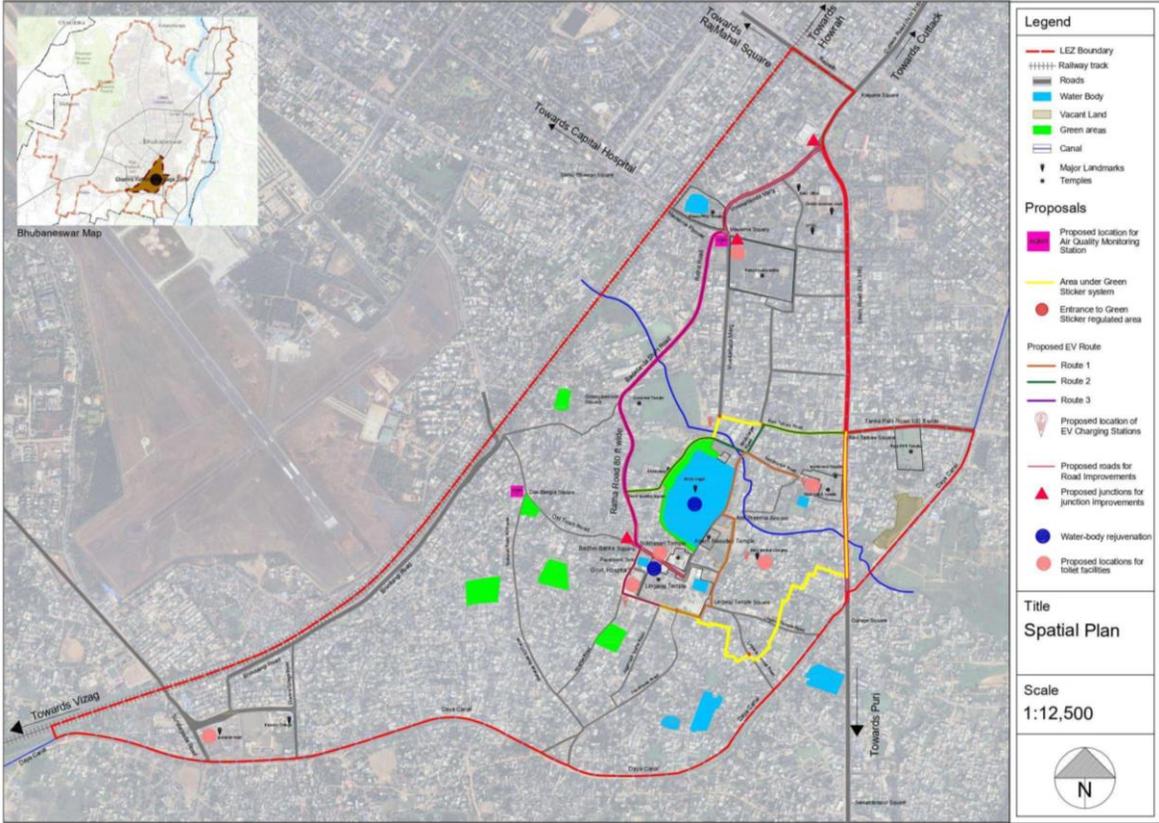
Regulatory



Policy

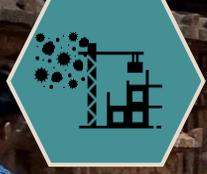
- OSPCB's Proposals – Concept report on LEZ in Bhubaneswar
- Proposals envisaged under Ekamra Kshetra LEZ project

OVERALL SPATIAL PLAN FOR PROPOSED INTERVENTIONS IN EKAMRA KSHETRA - LEZ



EXPECTED AIR POLLUTION REDUCTION (2022 TO 2030)

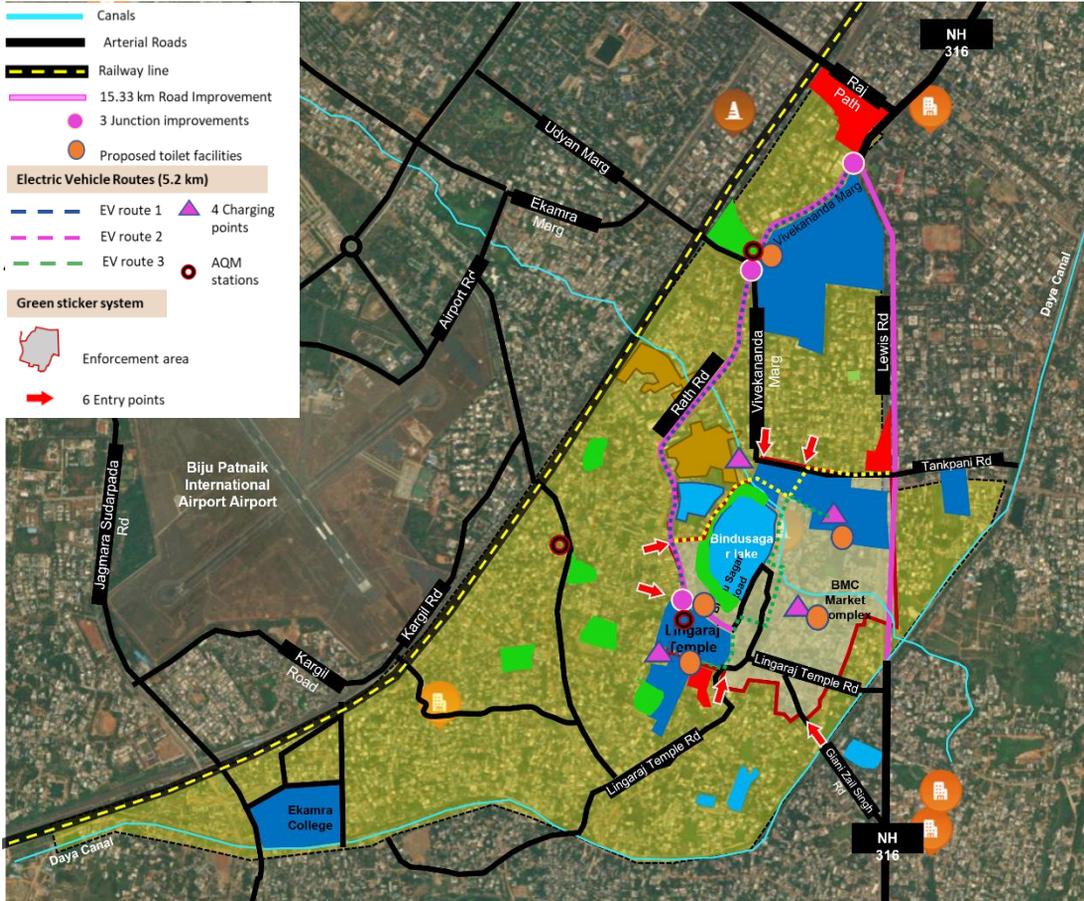




4.1 | Integrated Urban Planning

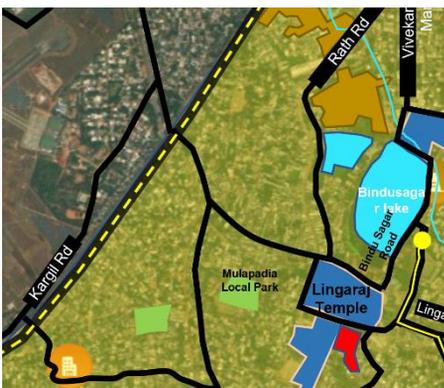
PROPOSED LANDUSE ZONING WITH INTERVENTIONS

Integrated urban planning for low emission zones involves a comprehensive and coordinated approach to address air pollution and promote sustainable transportation in urban areas.



GREEN AREAS

Existing designated green spaces



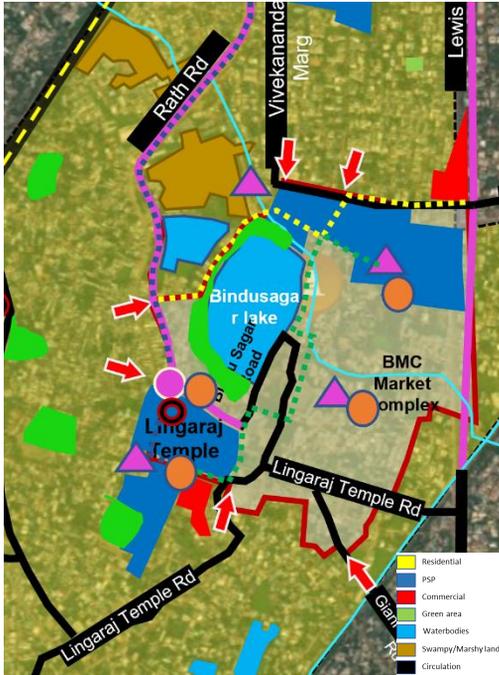
Proposed as per the Master plan



- Residential
- PSP
- Commercial
- Green area
- Waterbodies
- Swampy/Marshy land
- Circulation

REVITALISATION OF HERITAGE ZONE

Proposed Land Use of Lingaraj Temple Area



Existing situation in temple premises



Proposed Urban Design in temple complex



Reviving a heritage zone through urban design requires a careful balance between preserving the past and embracing the future. Here are some key considerations and strategies taken reviving a Lingaraj heritage zone through urban design are Context-sensitive design, Pedestrian-friendly design, Green spaces and landscaping, Public amenities and facilities & Wayfinding and signage.

Existing condition of road outside temple complex



Proposed Urban design of the street and walls.



Proposed Interventions in the Heritage Zone	
Transport: <ul style="list-style-type: none"> Road improvements Junction improvements Green Sticker system (<i>parking lot at periphery of enforcement area</i>) 	Air Quality Monitoring: <ul style="list-style-type: none"> Proposed locations for Air Quality Monitoring Stations Public display boards for dissemination of Air Quality information
Promotion of electric vehicles: <ul style="list-style-type: none"> EV routes EV charging points 	Urban Design: <ul style="list-style-type: none"> Boundary wall improvements Permeable pavers on footpaths and parking lots Fountains and grass plantations Pedestrian infrastructure (<i>sidewalks, signages etc</i>) Street furniture
Power: <ul style="list-style-type: none"> Solar energy powered street lights 	
Waste: <ul style="list-style-type: none"> Organic waste composting in temple complex 	

Rejuvenation of Papanasini Tank

Existing condition



Proposed Urban Design elements



Residential + Commercial Land use



Proposed interventions for Residential + Commercial Land Use	
Promotion of electric vehicles: <ul style="list-style-type: none"> EV routes EV charging points 	Urban Design: <ul style="list-style-type: none"> Boundary wall improvements Permeable pavers on footpaths and parking lots Fountains and grass plantations
Power: <ul style="list-style-type: none"> Solar energy powered street lights 	
Waste: <ul style="list-style-type: none"> In-vessel composting Mobi-truck food waste 	Road dust: <ul style="list-style-type: none"> Vertical gardening

Existing condition of Commercial Spaces



Proposed street with context sensitive design



Informal Market-Creating Opportunities for Social spaces

Existing condition towards BMC hospital area



Proposed Urban Design elements

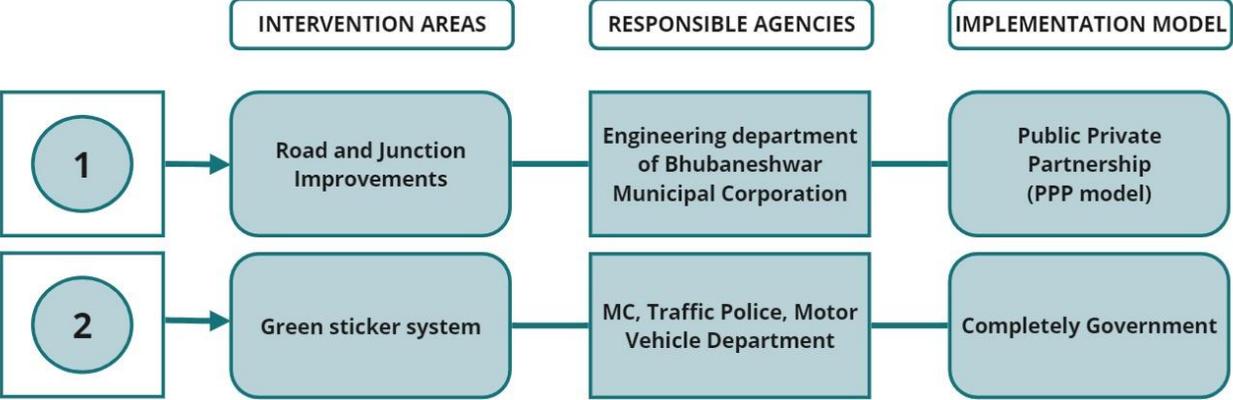


The major objective is to Re-activate the informal market spaces by bridging the gap between conceived space and lived space by updating the perception of the space. The proposal is to transform a Market-Street into Adaptive Street with Quality Public Space while enhancing the celebratory nature. Streetscape design and revitalization are crucial to resolving more significant city economic vitality, livability, and physical and social mobility.



Image Source: IPE GLOBAL - Reconnaissance Survey

4.2 | Transport Emissions





Various aspects included to achieve sustainable mobility



Footpaths
Safety to pedestrians



Cycle lanes
Along the main carriageway to encourage safe cycling



Dedicated vending zones
Proposed to not encroach on walking space while making the street vibrant and safe



Universal, barrier free design
To provide dignity, independence and accessibility to all ages, sex and genders



Green buffers/landscaping
To make the space vibrant, provide shade and reduce dust along the street

The broader goal of introducing proposals within the transportation sector is to promote sustainable mobility by focusing on non-motorized transport and pedestrianization.

This is along the lines of the National Urban Transport Policy (NUTP) 2006, which intended to transform the current urban transport system into a safe, convenient, and efficient transportation system in urban areas. It suggests designing roads for people and not vehicles.

To achieve these objectives, the NUTP suggests some measures that the cities could take:

- a) Equitable allocation of road space: “The Central Government would, therefore, encourage measures that allocate road space on a more equitable basis, with people as its focus. This can be achieved by reserving lanes and corridors exclusively for public transport and non-motorized modes of travel.”
- b) Priority to the use of public transport
- c) Priority to non-motorized transport (walking and cycling)

By improving accessibility through improving non-motorised infrastructure and facilities, the goal is to reduce the need to use personal vehicles, thereby helping curb air pollution.

Accessible

To improve the accessibility for all by creating complete street network and multi modal system.

Safe

To make sure streets are safe for all. For this the pedestrians should be given the priority.

Inclusive

The street designing should be done considering all genders, age, or condition.

Liveable and Vibrant

By introducing elements such as landscape, furniture for pedestrians, vending zones will make the foot paths more lively, interactive and vibrant.

Approach towards sustainable mobility

Source: Street Design Guidelines (2011), UTTIPEC



4.2.1. Road and Junction Improvement

The road and junction improvements are proposed following a thorough survey and assessment of the existing road infrastructure considering factors such as traffic flow, road width, pedestrian footfall and the presence of cycling infrastructure.

Total length of roads proposed for improvement **15.33 km**

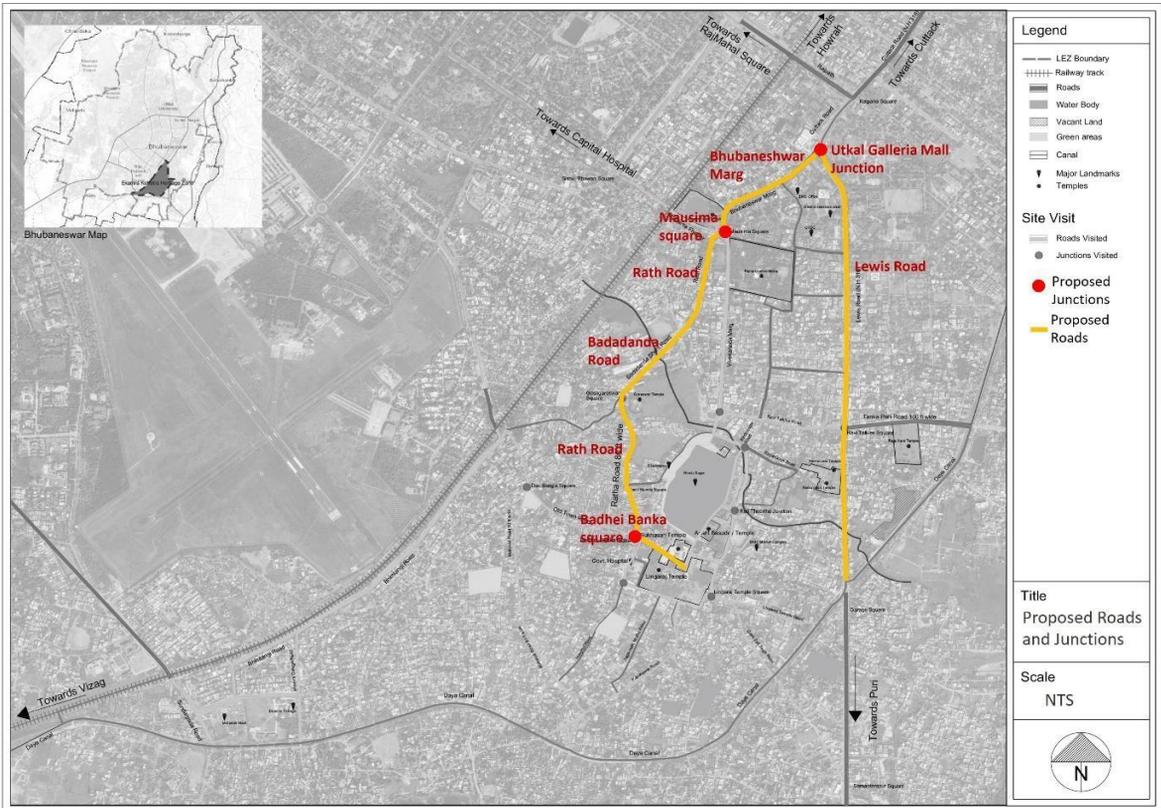
Total proposed cost **₹ 105 Cr**

Phase I- target roads that need intervention on high priority and available budget
Phase II- target roads with moderate necessity

Intervention details
NCAP Key Sector: Vehicles
Action Point: VE 5, VE 7, VE 12, RD 1
Type: Technical solution

Nodal Agency
Engineering Department of Bhubaneswar Municipal Corporation

Map showing the location of proposed roads and junctions

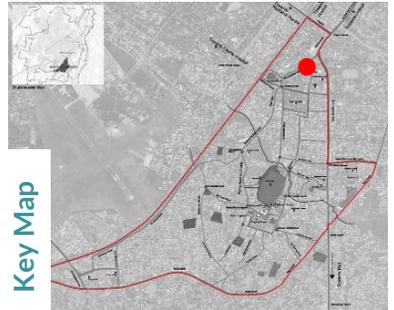




Utkal Galleria Mall



Utkal Galleria mall is on the extreme North of LEZ area. The traffic on the road flows in a haphazard manner. The traffic flow is towards Cuttack road, Lewis road and Bhubaneswar Marg.



EXISTING

Source- Google maps

- Lack of alignment in the traffic flow.
- Absence of signages
- Lack of organised parking space
- Non-uniform Footpaths

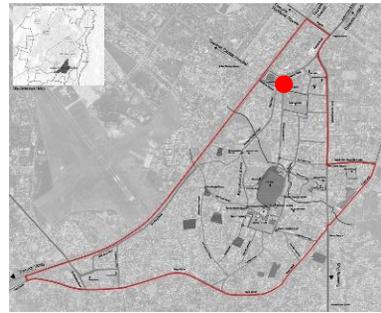
PROPOSED

- Proposal for round-about for uniform of traffic flow.
- Expansion of existing island for geometry correction and addition of placemaking elements
- Uniform Footpaths of width 1.8-2.5m as per the RoW (as per Bhubaneswar street design guideline).
- Provision of pedestrian crossings for safe pedestrian crossing



Mausima Mandir Chowk

Mausima Mandir chowk connects Bhubaneswar Marg and Rath road and is also the starting point of Mausima flyover. Heavy traffic can be seen on this chowk as it is the leading towards Lingaraj temple.



EXISTING



-  Informal parking of vehicles in open spaces
-  Absence of signages
-  Accumulation of dust due to lack of plantation

PROPOSED



-  Specific type of planters/ shrubs (Sansevieria trifasciata Prain, Sansevieria trifasciata Prain) that will help in improving the air quality
-  Creation of footpaths to promote walkability as per Universal design guidelines with honeycomb pavers
-  Beautification of junction through wall art and placemaking with the use of Mankada stone.



Honeycomb pavers help water permeation

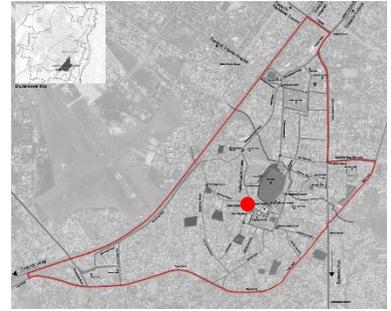


Water flows through planters



Badhei Bank Chowk

This is the main chowk leading to the Lingaraj temple and is one of the busiest junctions of LEZ area. The traffic volume is high on this road because of the Hospital as well as the Lingaraj temple.



EXISTING



-  Lack of barrier-free design
-  Decaying road condition
-  Lack of pedestrian infrastructure
-  Lack of recreational spaces

PROPOSED

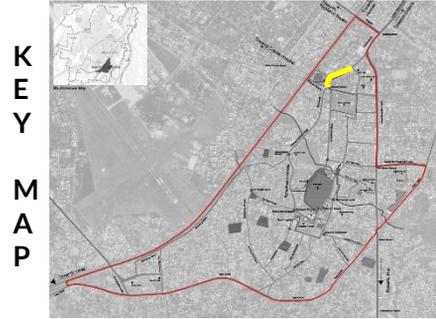


-  Provision for public seating & recreational spaces
-  Creation of footpaths to promote walkability
-  Clear road markings and barrier-free urban design



Bhubaneshwar Road

This is the identified major approach road leading to the **inner core of the Ekamra Kshetra**. The traffic flow is high throughout the day and is **towards Mausima Chowk and Kalpana Square**.



EXISTING

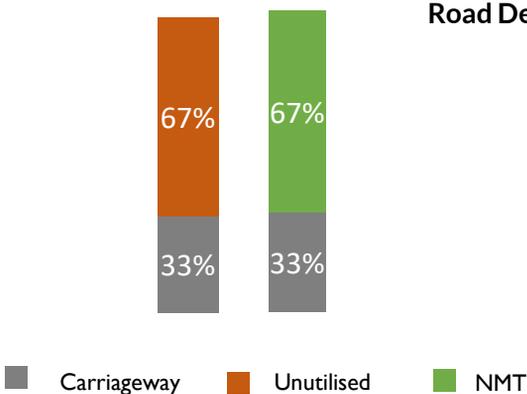


-  **No footpaths** for pedestrian movement
-  **Dust-laden shoulders**
-  **Lack of green spaces** to control dust
-  **Lack of signage** to guide pedestrians
-  **No designated vending zones**

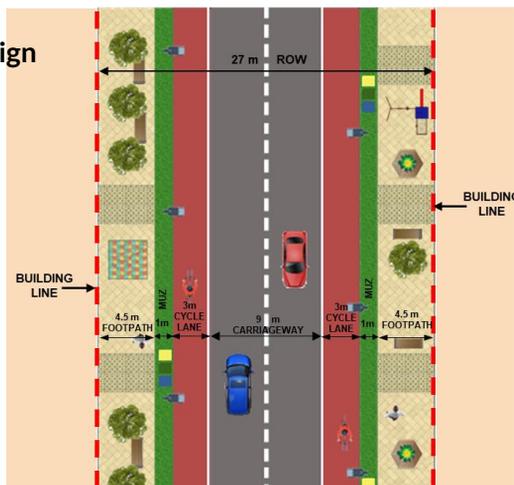
PROPOSED



-  **Cycle lane** to promote non-motorized transport
-  **Clear walking zone.** Use of permeable block paving to reduce surface runoff
-  **Dedicated Multi Utility Zone (MUZ)**
-  **Ground Level Landscaping and street furniture** as part of the placemaking to be provided in the MUZ.



Road Design



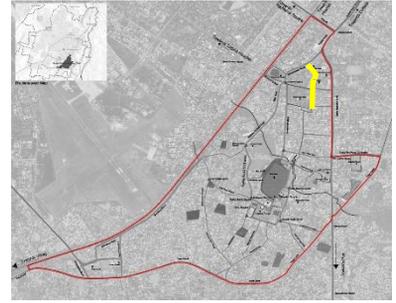


Lewis Road

Starting from the Utkal Galleria mall, Lewis road goes up to Ravi Talkies road and takes the traffic of Cuttack road to the Lingaraj temple.

K
E
Y

M
A
P



EXISTING



Source- Google maps

-  Lack of organised parking facility
-  Lack of pedestrian infrastructure
-  Accumulation of dust due to lack of plantation



PROPOSED



-  Proposal of organised parking lay-byes
-  Creation of footpaths to promote walkability.
-  Clear road markings and barrier-free urban design





Implementation

List of Actions/Measures for Implementation in LEZ for Road and Junction improvements

Responsibilities	Roles
Engineering Department	Operation and maintenance-
Agencies to be appointed for various projects	Preparation of Detailed Project Reports
Contractors	Construction works- (tender floated) in consultation with engineering department

Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
1.	Promotion of Cycling and Pedestrianization	BMC, BDA			
1.1	Finalization of pilot roads and junctions identified for improvement		P		
1.2	DPR preparation including surveys, detailed cost estimate: 4 selected roads and junctions		P		
	RFP preparation, bid process management and selection of the agency		P		
1.3	Redevelopment and improvement of identified roads (including permissions, and approvals from departments, if applicable)		P		
1.4	DPR preparation including surveys, detailed cost estimate: other roads and junctions in LEZ			P	
1.5	RFP preparation, bid process management and selection of the implementing agency			P	
1.6	Redevelopment and improvement of identified roads (including permissions, and approvals from departments, if applicable)			P	
1.7	RFP preparation, bid process management and selection of the implementing agency			P	
1.8	Statutory clearances	BMC/BDA/	R	R	
1.9	Improvement of green areas along other roads			P	

P- Physical Interventions; R- Regulatory Interventions



Cost Estimates – Road Improvements

Road Number	Road Name	Length (Km)	Cost of Proposed improvements (INR)				Total (INR)
			Carriageway Improvement	Footpath Improvement	Cycle Lane Addition	Landscaping & Beautification	
Road 1	Bhimtangi Road	1.61	1,55,40,195.00	5,00,64,129.00	95,88,516.00	24,69,740.00	7,76,62,580.00
Road 2	Ekamra College Road	0.52	50,19,193.00	1,61,69,781.00	30,96,912.00	7,97,680.00	2,50,83,566.00
Road 6	Mahatab Road	1.68	1,62,15,856.00	5,22,40,830.00	1,00,05,408.00	25,77,120.00	8,10,39,214.00
Road 7	RI Office Road/ Old Town Road	0.54	52,12,239.00	1,67,91,695.00	32,16,024.00	8,28,360.00	2,60,48,318.00
Road 8	Rath Road	1.88	1,81,46,315.00	5,84,59,976.00	1,11,96,528.00	28,83,920.00	9,06,86,739.00
Road 10	Municipal Hospital Road	0.53	51,15,716.00	1,64,80,738.00	31,56,468.00	8,13,020.00	2,55,65,942.00
Road 11	Road behind Lingaraj Temple	0.24	23,16,551.00	74,62,976.00	14,29,344.00	3,68,160.00	1,15,77,031.00
Road 12	Lingaraj Temple Road	1.67	1,61,19,333.00	5,19,29,872.00	99,45,852.00	25,61,780.00	8,05,56,837.00
Road 14	Bindu Sagar Road	1.18	1,13,89,708.00	3,66,92,964.00	70,27,608.00	18,10,120.00	5,69,20,400.00
Road 15	Ganga Jamuna Road	0.37	35,71,349.00	1,15,05,421.00	22,03,572.00	5,67,580.00	1,78,47,922.00
Road 16	Giani Zail Singh Road	0.96	92,66,203.00	2,98,51,903.00	57,17,376.00	14,72,640.00	4,63,08,122.00
Road 18	Ravi Talkies Road	0.54	52,12,239.00	1,67,91,695.00	32,16,024.00	8,28,360.00	2,60,48,318.00
Road 19	Vivekananda Marg	0.92	88,80,111.00	2,86,08,073.00	54,79,152.00	14,11,280.00	4,43,78,616.00
Road 20	Bhubaneswar Marg	0.61	58,87,900.00	1,89,68,397.00	36,32,916.00	9,35,740.00	2,94,24,953.00
Road 21	Lewis Road	2.08	2,00,76,774.00	6,46,79,123.00	1,23,87,648.00	31,90,720.00	10,03,34,265.00
	Total						73,94,82,823.00

Expected Air Pollution Reduction

It is expected that through these interventions, 33% of PM reduction through unpaved surface and 9% through paved surface.



4.2.2. Green Sticker System

Intervention details

NCAP Key Sector: Vehicles
 Action Point: VE 2
 Type: Regulatory solution



Nodal Agency

BMC, Traffic Police, Motor Vehicle Department

A green sticker system involves the use of colour coded stickers or labels that will indicate the level of emissions based produced by a vehicle. This categorization will be based on the vehicles Bharat Stage (BS) emission standards which have been established by the Government of India to limit emissions from new vehicles.

This will involve the use of 3 or 4 different coloured stickers indicating a different level of emissions.

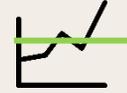
Vehicles that do not meet the minimum emission requirements for the Low Emission Zone will either not be permitted entry into it or else will have to pay a fine should they wish to enter.



All vehicles
>15 years



Diesel models
>10 years



BS standards
< BS III

Non-compliance- Highest fine will be levied



All vehicles
>10 years



Diesel models
<10 years



BS standards
BS IV

Non-compliance- Mid level fine will be levied



CNG fueled
vehicles



BS standards
BS VI

Vehicles allowed to
enter freely



All EV
models

Vehicles allowed to
enter freely





ENTRANCE 1 - SITALASATHI ROAD

- Not much traffic enters the core area via this
 - Narrow ROW
 - No footpath



Boundary of Core Area Entry to Rath Road

ENTRANCE 2 - RATH ROAD

High traffic volume entering the core area via this entry.



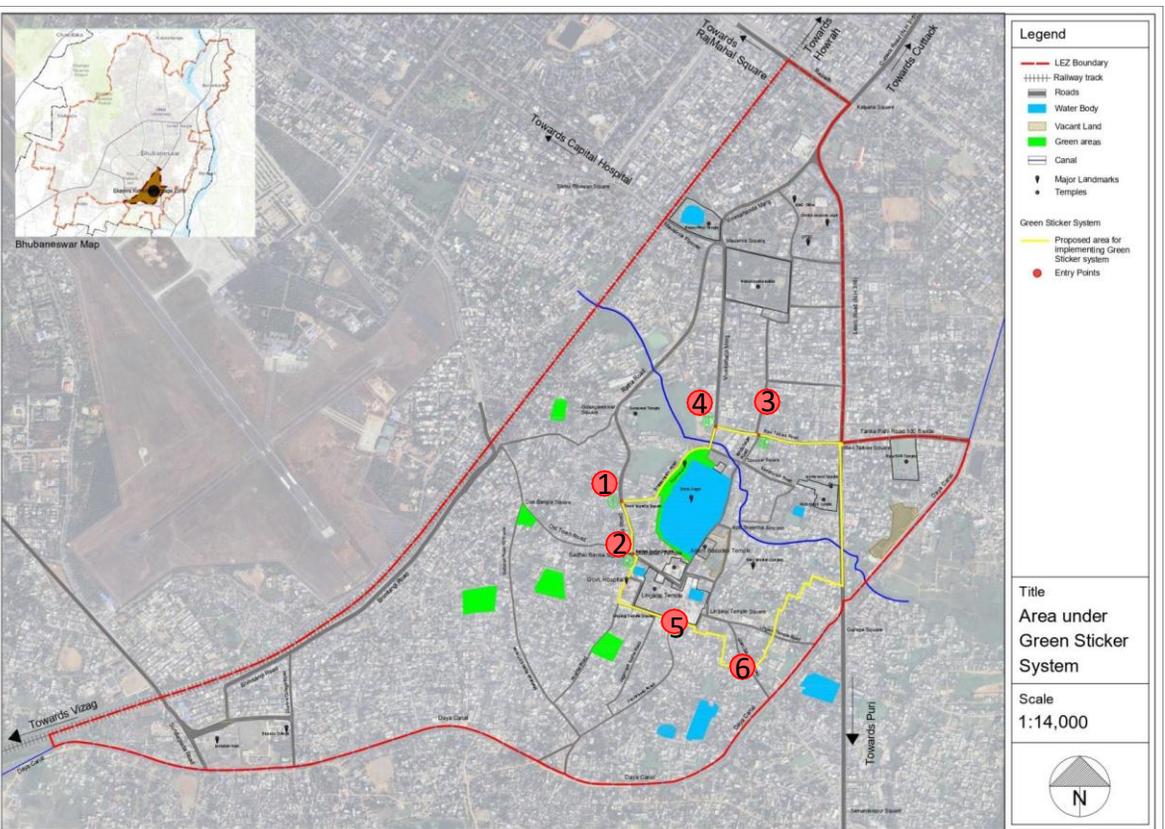
ENTRANCE 3 - RAVI TALKIES ROAD TO TALESHWAR CHOWK

- Moderately high volume of traffic enters from this point.



ENTRANCE 4 - SANITORIUM CHOWK TOWARDS BINDU SAGAR ROAD

- Moderately high volume of traffic enters from this point.





Implementation



License plate video recognition

License Plate video recognition- Through this system data collection will be better and it is the most effective system of all and further simplifies the tracking process.



Remote Sensing Technology

Remote sensing technology- Along with camera enforcement, remote sensing technology can be used to measure and collect the data for pollution and noise levels in real time. As the vehicles will move, it will be easier for the authority to track that which area has the maximum number of polluting vehicles.



Manual enforcement

Manual enforcement- This system is in use in most of the cities but it often lacks consistency and has had issues in providing quality data. For LEZ area this enforcement will be manual, it can also be combined with parking regulation enforcement, which also has been in the case of Berlin.

Phasing

The system would be run as a pilot project. A grace/trial period would be provided first for people to get accustomed to the system.
 Phase I: Manual enforcement
 Phase II: CCTV surveillance

Implementation agency
 For implementation of this system, the agency that will work on the forefront will be BMC and traffic police of Bhubaneswar.

Agencies: BMC and Traffic Police of Bhubaneswar

Issuance agency
 As far as issuance of stickers is concerned, the issue of these stickers will be done through the online portal of BMC and in person in BMC office. Implementation approach
 The implementation of the sticker system needs to be monitored very closely as it will be first of its kind in the country and people to adopt it can be one of the challenges.



Proposed needs for implementation

Area	Vehicles	Enforcement System	Implementation agency	Fine	Monitoring agency
<ul style="list-style-type: none"> Land use characteristics Already identified zone Access control possible Regulation implementation Public acceptance 	<ul style="list-style-type: none"> As per Odisha Scrappage Policy, Vehicles more than 15 years of age will be banned from movement 	<p>3 systems for enforcement are-</p> <ul style="list-style-type: none"> Licence plate video recognition Remote System Technology Manual enforcement <p>For the Pilot Phase, we will be using the Manual enforcement in which stickers on the basis of vehicle age and type will be provided.</p> 	<p>BMC/Traffic Police Process for Issuance-</p> <ul style="list-style-type: none"> Property list from BMC Information letter to be sent to the people residing in LEZ area <p style="background-color: #92d050; color: #0070c0; padding: 2px;">Issuance agency</p> <ul style="list-style-type: none"> Issue of sticker through online portal <p>*To be discussed after consulting the stakeholder</p>	<p>As per the Green Tax rules proposed by the state</p> <p>Transport vehicles of age more than 15 Years- Rs. 4000/-</p> <p>Non-transport vehicle aged 15 year- Rs. 1000/-</p> <p>*Note- To make it stricter, fines will be decided at implementation stage</p>	<p>Phase 1-Traffic Police/NGO/Other Government authority</p> <p>Phase 2- CCTV Surveillance will be installed and linked to ICCC</p> <p>As the enforcement is Manual, the officials will be allocated on all the selected Entry points.</p>

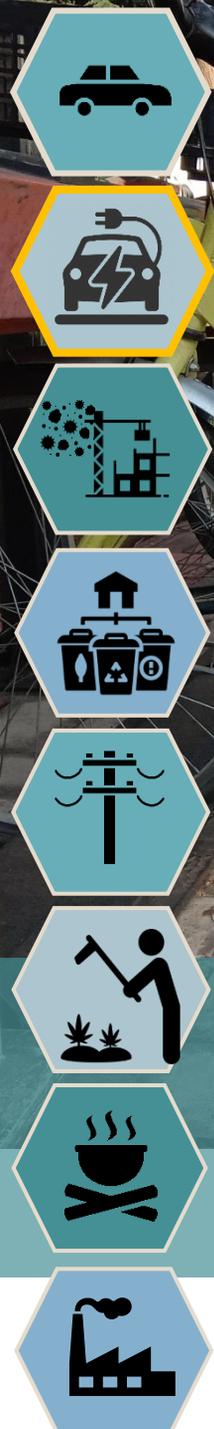
*Note- The above proposals needs to be discussed after consulting the stakeholder

Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
1	Introduction of Green sticker system for vehicles				
1.1	Selection and finalization of area (within LEZ)	BMC/Traffic Police/MVD	R		
1.2	Finalization of the Implementation Agency	BMC		R	
1.3	Vehicle category (in consultation with stakeholders)	BMC/MVD		R	
1.4	Enforcement system (including collection of fines)	MVD/Traffic Police		R	



Image Source: GIZ



4.3 | E-Mobility

INTERVENTION AREAS

RESPONSIBLE AGENCIES

IMPLEMENTATION MODEL

1

Promotion of Electric Vehicles and shared E-Vehicles for tourists

CRUT, Bhubaneswar Municipal Corporation, BDA

Completely Government



4.3.1. Promotion of Electric Vehicles

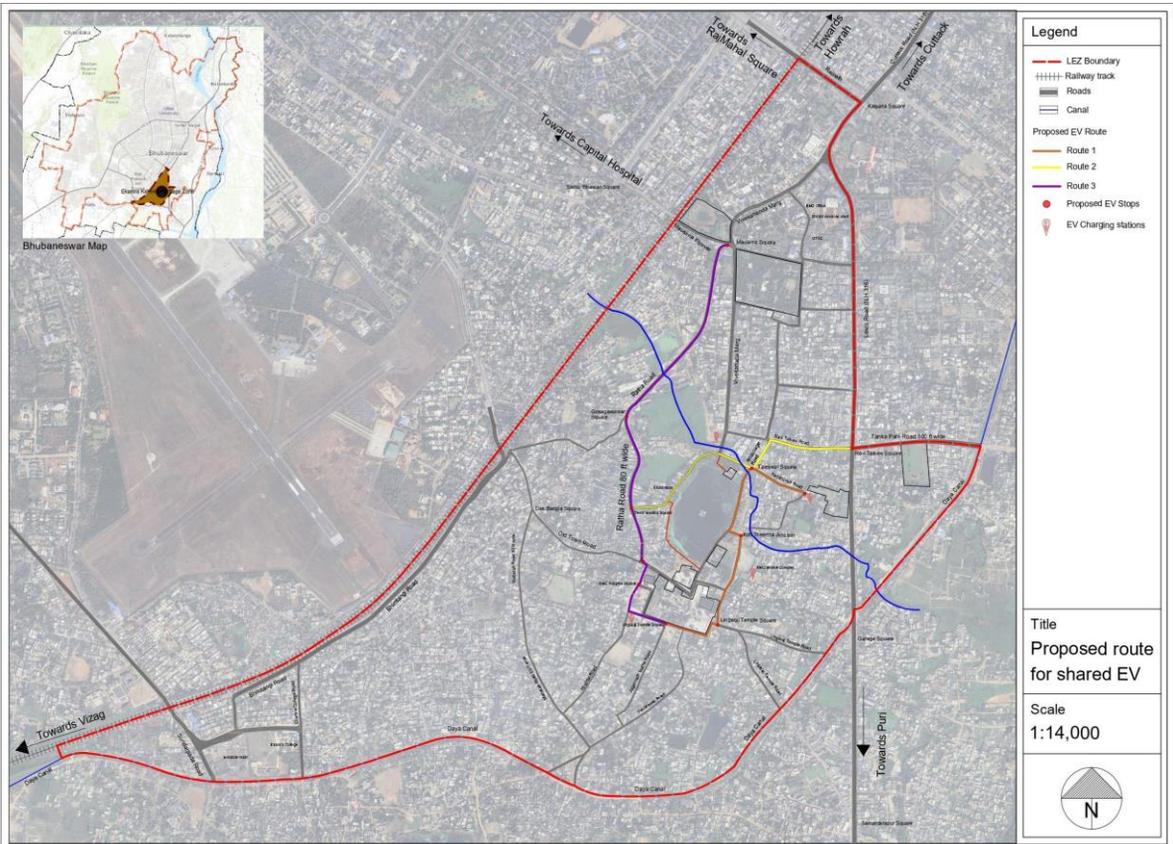
- 3 feeder routes
- **Pick up points-** From the parking / public transport stops
- **Drop off points-** two entrances of the temple
- These routes are main entry routes leading towards the temple and have mixed use along the road.
- **EV feeders Charging points-** proposed to be provided at the existing and proposed parking locations.

Intervention details
NCAP Key Sector: E-mobility
Action Point: VE 6
Type: Technical solution

For initial phase three feeder routes are proposed in the study area where the electric feeders will pick up passengers from the parking / public transport stops and take up to the temple premises. These routes are main entry routes leading towards the temple and have mixed use along the road. EV feeders drop off point will be at the two entrances for the temple. Charging points are proposed to be provided at the existing and proposed parking locations.

Proposed 3 EV Routes are

- Route 1 -1.2 Km**
 Starting point-Kedar gaon proposed parking
 Via- Dwarabasini temple- Multimodal hub- Y-junction (Giani Zail singh road)
 Destination- Lingraj temple
- Route 2 -1.9 Km**
 Starting point-Ravi Talkies square
 Via- Taleshwar Chakk- Bhubaneswar Road- Teenimundia square- Badhei Banka square- BMC Hospital
 Destination- Lingraj temple
- Route 3 -2.1 Km**
 Starting point-Mausima square
 Via- Ratha Road-Gosagareswar square-Teeni mundia square- Badhei Banka square- BMC Hospital
 Destination- Lingraj temple





Implementation

Identification of stakeholders

Capital Region Urban Transport (CRUT), BMC, traffic police / Electricity board

Consultations

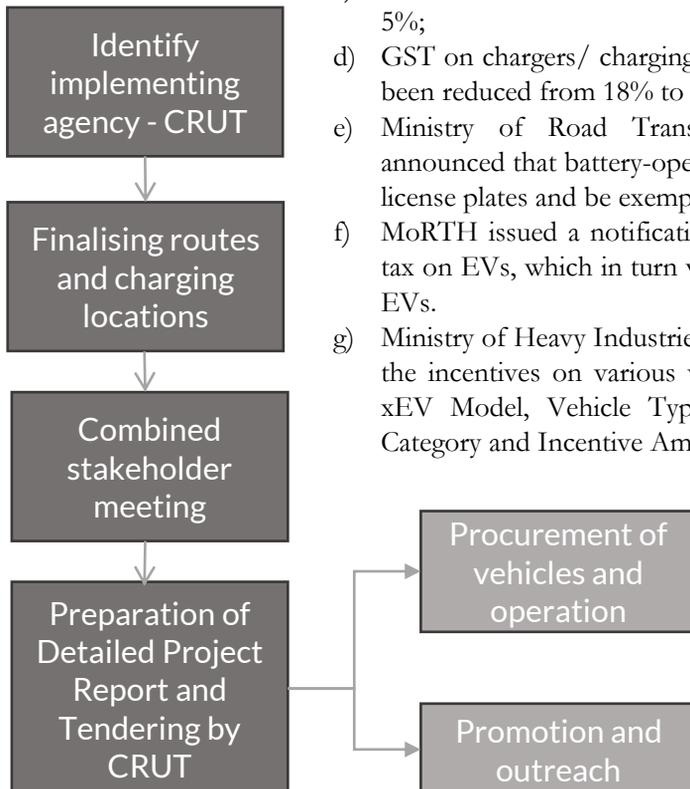
All the agencies will be required to discuss and agree on the E-rickshaw routes, no. of E-rickshaws required on the basis of tourist influx data, details of infrastructure requirement (charging station/repair etc). Migration plan for diesel autos to e-autos must also be looked at.

Existing schemes and plans

Faster Adopting and Manufacturing of Hybrid and Electric Vehicles in India (FAME-India)- II
National Electric Mobility Mission Plan 2020

Incentives and grants

- a) Production Linked Incentive (PLI) scheme for manufacturing of Advanced Chemistry Cell (ACC) in the country in order to bring down prices of battery in the country. Drop in battery price will result in cost reduction of electric vehicles.
- b) Electric Vehicles are covered under Production Linked Incentive (PLI) scheme for Automobile and Auto Components, which was approved on 15th September, 2021 with a budgetary outlay of Rs. 25,938 crore for a period of five years.
- c) GST on electric vehicles has been reduced from 12% to 5%;
- d) GST on chargers/ charging stations for electric vehicles has been reduced from 18% to 5%.
- e) Ministry of Road Transport & Highways (MoRTH) announced that battery-operated vehicles will be given green license plates and be exempted from permit requirements.
- f) MoRTH issued a notification advising states to waive road tax on EVs, which in turn will help reduce the initial cost of EVs.
- g) Ministry of Heavy Industries, Government of India also lists the incentives on various vehicles segments¹⁸. It provides xEV Model, Vehicle Type & Segment, Vehicle CMVR Category and Incentive Amount (In INR).





EV – At a Glance

Charging infrastructure	At existing and proposed parking
EV routes designed around	Bus stops Existing and proposed parking IPT stands Tourist/religious attractions
Frequency	Every 5 minutes
Agency	CRUT

Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
1.	Promotion of E- vehicles and shared E-vehicles for tourists	CRUT/BMC/BDA			
1.1	Feasibility study		P		
1.2	Preparation of a detailed implementation plan: finalization of routes, charging infrastructure and associated infrastructure		P		
1.3	Finalisation of routes and charging points		P		
1.4	Preparation of DPR		P		
1.5	Preparation of RFP for procurement and enhancing charging infrastructure		P		
1.6	Selection of the agency			P	
1.7	Procurement of E-vehicles (government scheme for subsidy, etc.)			P	
1.8	Promotion and public outreach			P	
1.9	Operations				P

Estimated Air Pollution Reduction

Due to Vehicular Restrictions & incorporation of EVs



35% ↓



34% ↓





Image Source: OSPCB, AERIAL VIEW

4.4 Clean Construction & Road Dust Management





4.4.1 Urban Greening

1. Greening of Vacant and Open Spaces:

In 2020, the Housing and Urban Development Department, Govt. of Odisha had officially announced and released Planning and Building standards which included standards for greening of open areas, gardens, community places, schools, and housing societies.

2. Use of Pollution Absorbing Trees and Shrubs:

Pollution-absorbing trees locally available near Bhubaneswar include Neem tree, Mango tree, Banyan tree and Ashoka Tree.

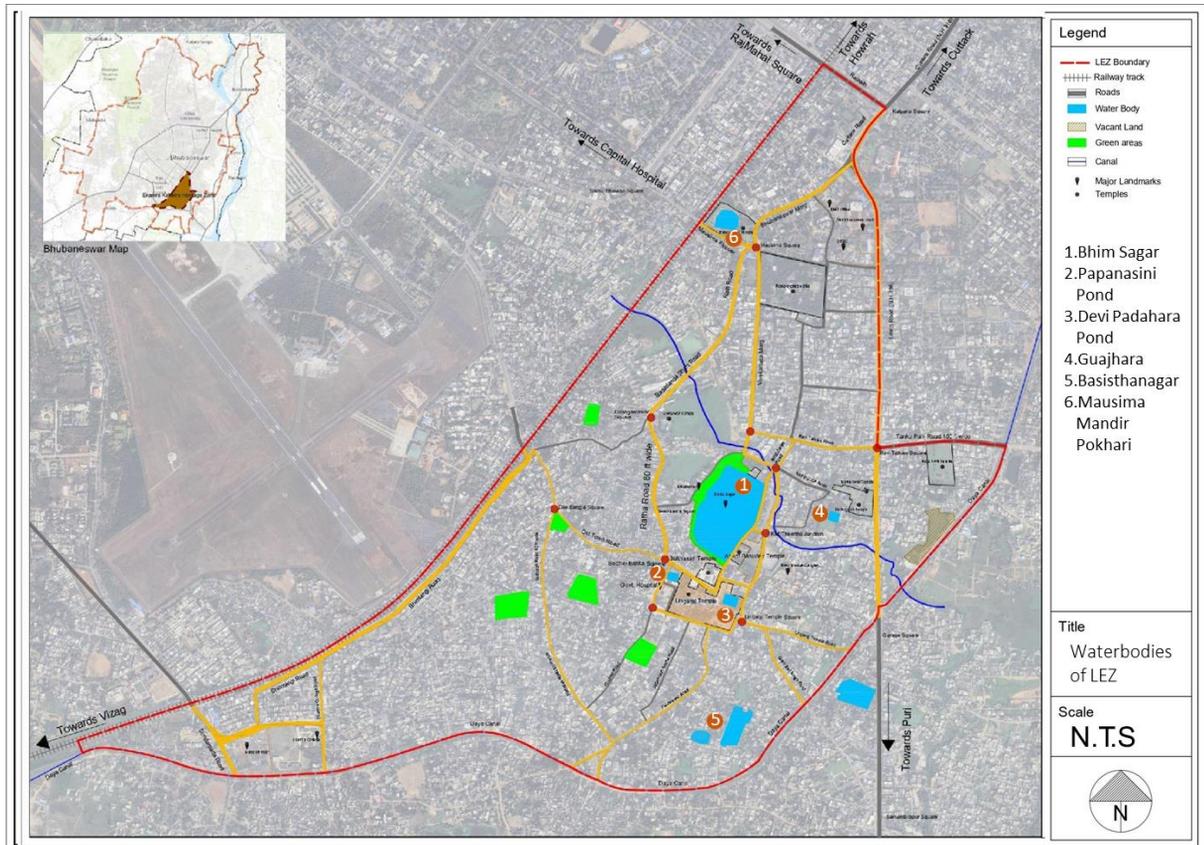
Pollution absorbing shrubs include Agave, Snake Plant, Bougainvillea and Crepe Jasmine.

Intervention details

NCAP Key Sector: Construction and Road Dust

Action Point: RD 2

Type: Regulatory solution





According to population projection of LEZ, green space per person will be 0.83 sq. m. per person in 2030 even after proposing increase of green cover from 2% to 5%.

Required increase in green space required based on projected population of 2030: 0.35 sq. km. can be aimed to achieve.

POLLUTION CONTROL FOR CONSTRUCTION SITES

Construction sites inside the LEZ (construction of buildings, construction and maintenance of infrastructure services) need to function as per CPCBs guidelines for construction activities.

- These guidelines involve use of covers, green screens, side covering of digging sites, etc. wherever applicable.
- Storage of construction materials along the roads should also be prohibited to mitigate dust pollution.
- BMC should strictly follow Air Pollution Emergency Response Plan prepared by the SPCB, Odisha to prohibit construction activities in case of high pollution levels.

Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
1	Increasing green cover	BMC, BDA, Environment department			
i)	Identification of vacant and open spaces in LEZ			P	
ii)	Greening of Vacant and Open Spaces			P	
iii)	RFP for procurement of Sweeping machine Road sweeper and selection of the agency		P		
iv)	Operations		P		





4.4.2. Waterbody Restoration

The following recommendations are suggested for the restoration of water bodies/tanks in the LEZ -

Intervention details

Type: Regulatory solution

TECHNICAL

Identification and mapping of water bodies/tanks (Bindusagar and Papanasini in the first phase) in the LEZ

It is important to ensure that these water bodies should be notified in the municipal land use records as municipal assets (mentioning their area, location).

Bindusagar



Papanasini tank



TECHNICAL

Demarcation of waterbody boundaries

BMC and/or temple trusts

It is important to set up a boundary around the water bodies. The task can be taken up by the BMC, as well as temple trusts where water bodies lie inside temple complexes. For water bodies with heritage importance, boundaries should be erected using sustainable materials which do not require any sort of concretized construction. The process is called bio-fencing, where shrubs and plants are planted alongside lakes and ponds. The planters act as a boundary, hence maintaining their desired functionality while being sustainable for local conditions.



REGULATORY

Monitoring of inlet and outlet

OSPCB

The inlet and outlet of the water bodies should be identified and need to be monitored at frequent intervals. Any outfall of domestic sewage into the water bodies should be prevented and only treated effluent, as per the effluent standard of the Odisha State Pollution Control Board, may be allowed.

REGULATORY

Assessment of present condition

Water quality of the water bodies needs to be monitored by the OSPCB, BMC/BDA, concerned authority

Assessment of water quality to assess the present condition of water bodies. Post assessment, perform de-siltation of waterbodies and remove algal blooms through scientific techniques and as per the applicable guidelines for the ASI-protected monuments. This will clean the water in the ponds and lakes and ensure optimal water quality.

If any parameters are found to be beyond the limit of designated use, proper action should be taken up to maintain the quality of lake water. It is also important to maintain water levels throughout the year. Float valves can be used to indicate water levels at all times for authorities to take appropriate action.

TECHNICAL

Cleaning and desilting

BMC/BDA, concerned authority

The water bodies inside the Ekamra Kshetra LEZ including the Bindusagar Lake and Papanasini Pond should be cleaned and cleared of algae and silt to control associated air pollution. Restoration and cleaning of dirty, algae-filled water bodies can have a significant impact on reducing air pollution in the surrounding areas by reducing odour, decreasing the risk of harmful algal blooms, and improving the overall biodiversity. The successfully tested and technologically suitable to the local condition may be taken up.

TECHNICAL

Beautification of waterfront development

May be taken up, conforming to prevalent environmental legislation and maintaining the social and cultural sanctity of the place.

POLICY

Formulation of guidelines for restoration

Keeping in view

- (i) to make pollution-free water bodies and to meet the desired water quality criteria;
- (ii) to restore and augment storage capacities of water bodies;
- (iii) to serve and enhance groundwater recharge; etc





Implementation

Identification of stakeholders

OSPCB, BMC/BDA,

Existing schemes and plans

Restoration of water bodies is envisaged through the Jal Shakti Abhiyan, and other missions in the cities.

Business models

Various CSR, PPP options can also be explored.

Proposal Cycle

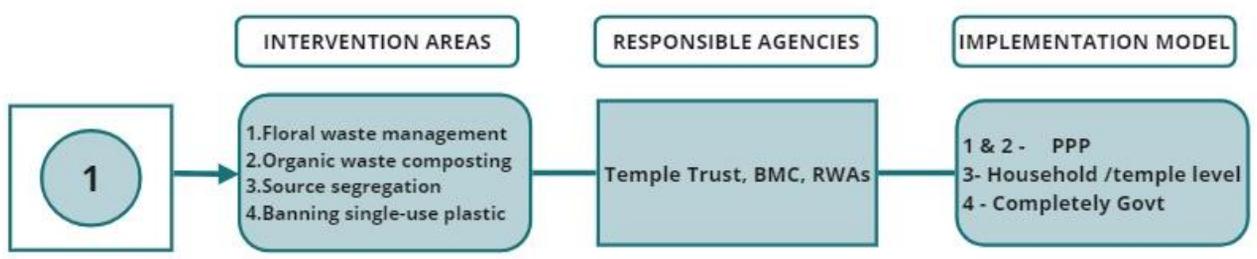
S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
1	Restoration of water bodies				
i)	Identification and mapping of water bodies/tanks (Bindusagar and Papanasini in the first phase) in the LEZ.		P		
ii)	Formulation of guidelines for restoration of water bodies		R		
iii)	Beautification and waterfront development may be taken up, conforming to prevalent environmental legislation and maintaining the social and cultural sanctity of the place			P	
iv)	Enforcement of strict measures for dumping of solid waste near/ into the water bodies		R		
2	Bio-treatment techniques (NEERI, IITs, ICAR)			P	
i)	Stakeholder engagement in the management of the water bodies		R		
ii)	Restoration of Bindusagar lake, Papanasini tank		P		
3	Cleaning and landscaping around water bodies		P		
i)	Pollution Control for Construction Sites	BMC, BDA			
ii)	Strict enforcement of CPCBs guidelines for construction activities		R		



Image Source: GIZ, India

4.5

Integrated Waste Management





4.5.1. Waste Management

Intervention details
NCAP Key Sector:
 Integrated Waste Management
Action Point: BB1 , BB2, BB3, BB4
Type: Regulatory solution

Nodal Agency

**Bhubaneswar
 Municipal
 Corporation**

Bhubaneswar has already made various initiatives towards managing its solid waste in an efficient manner. In line with the Bhubaneswar Municipal Corporation (BMC) Solid Waste Management Bye-Law 208, the city has adopted a decentralized waste management system

The door-to-door collection of waste is also started area. BMC is the responsible and nodal agency for solid waste management services through private agencies in the city including the LEZ area. During the survey, it was observed that the temple waste from Lingaraj Temple is often seen lying on the roads and sometimes there are issues with waste collection, disposal, and transportation. To deal with this issue stringent decentralized solid waste management needs to be implemented with active support from the Temple Trust, RWAs, citizen groups etc.

Already proposed by BMC

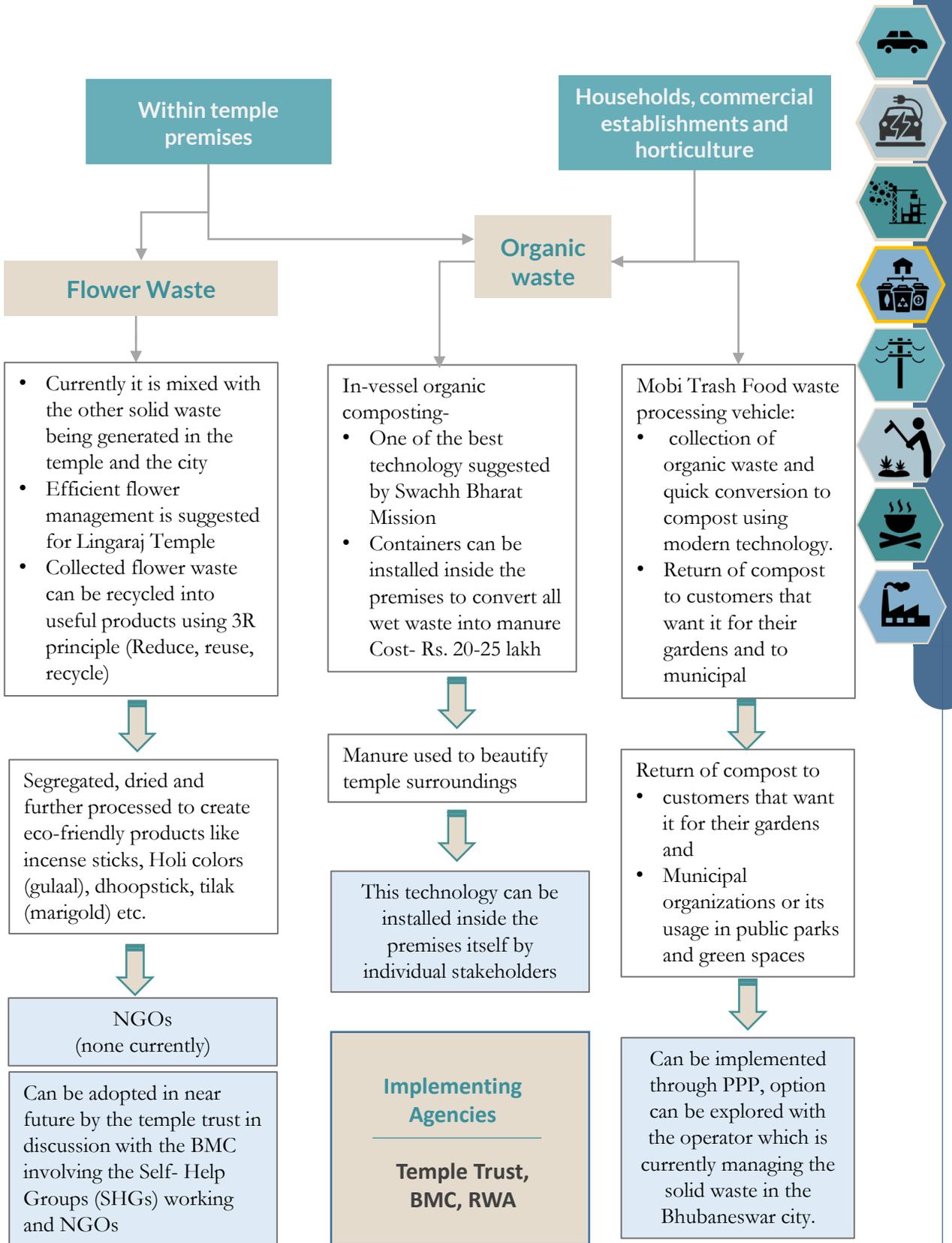
Micro Composting Centers (MCC- 5 TPD each)	41
Material Recovery Facilities (MRF-5 TPD each)	2

INTERVENTIONS

Banning the use of plastic:

As of 2021, a total of 1529 commercial establishments including hotels, restaurants, educational institutions, and offices, and 211538 households in Bhubaneswar practiced source segregation of waste before disposal. It is therefore important for the practice to achieve 100 percent coverage inside the LEZ. The





*BMC can avail the services of new age service delivery





Open burning of waste:

OSPCB had issued Public Notice on August 2017 and H&UD Dept. Govt. of Odisha had instructed the ULBs in January 2021 to enforce ban on open burning of waste. During stakeholder engagements with the RWAs and Temple Trust of Ekamra Kshetra heritage zone, it was found that open burning of waste is not practiced inside the area. But it is important for the BMC to conduct regular checking and monitoring to ensure that the situation remains the same. Along with regular checking, it is also important to impose fine on defaulters so that the practice of open burning of waste is not encouraged.

Implementation

Identification of stakeholders

BMC, Temple Trust, RWAs

Existing schemes and plans

Swachh Bharat Mission
Source segregation is already being done as per the Comprehensive Action Plan for Bhubaneshwar under NCAP

Business models

PPP models for mobi trash food waste processing
BMC may work with NGOs to manage floral waste

Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
7.1	Solid waste management	BMC, Temple Trust			
i)	RFP for procurement of Organic In-vessel composting		R		
ii)	Installation of organic in-vessel composting		P		
iii)	Flower waste composting				P
iv)	Strict Enforcement to Curtail Open Burning of Waste	BMC	R		

P- Physical Interventions; R- Regulatory Interventions
RFP= request for proposal

Cost Estimates

S.No.	Proposed projects	Nodal Agency	Quantity	Unit	Rate per unit (INR)	Amount (INR)
	Solid Waste Management	BMC, Temple Trust				
i)	In- vessel organic composting		1	1TPD	25,00,000	25,00,000

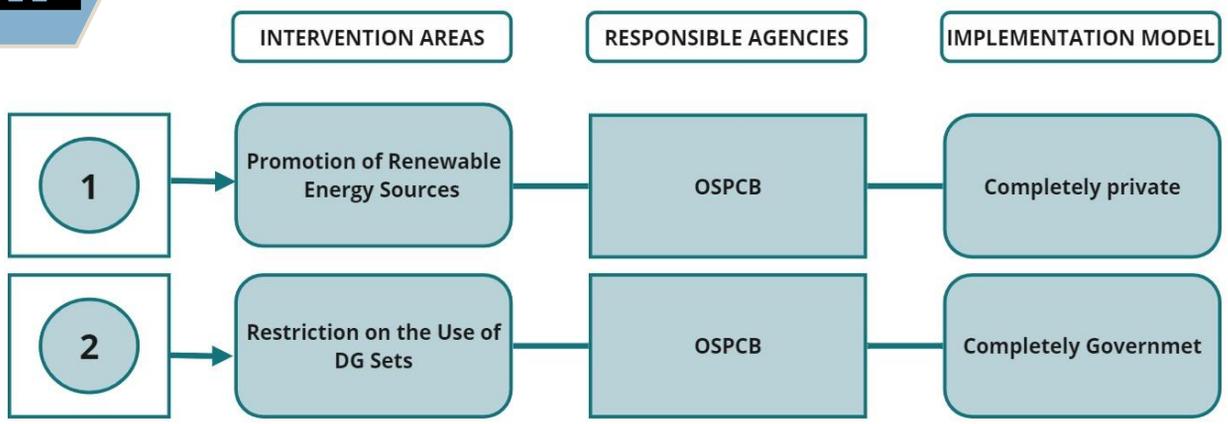




Image Source: GIZ



4.6 | Power





4.6.1. Promotion of Renewable Energy Sources

Energy requirements need to be calculated based on current electric supply, rooftop capacity and existing demand for more energy. Based on the demands calculated commercial establishments can be identified for installation of rooftop solar power plants based on the demand of that particular establishment.

Intervention details

NCAP Key Sector: Industries
Action Point: IP 11, IP 13, BB3, BB4
Type: Technical solution

Implementation

Identification of stakeholders

Solar power related businesses and consultancies

Existing schemes and plans

The micro plan for air pollution control in Bhubaneswar is prepared as part of the NCAP envisages the widespread adaptation of renewable energy sources like solar energy.

Incentives and grants

Grants offered by the Odisha Renewable Energy Development Agency under sustainable development schemes.

Business models

Solar power related businesses and consultancies may provide consultation services from calculation of energy to implementation of solar panels on rooftops. The services can also be used by the BMC for setting up solar powered lamps and streetlights on roads and other public places like parks, etc.

Proposal Cycle

Intervention	Nodal Agency	Short term	Medium term	Long term
Solar panels on government buildings, temple complexes, streetlights and other public buildings	OSPCB		P	



4.6.2. Restriction on the Use of DG Sets

The Micro Plan for Air Pollution Control in Bhubaneswar has already established the fact that only those DG sets meeting emission standards and design standards (design of chimneys, exhaust and enclosures) issued by the CPCB may be used. Users of old DG sets can retrofit their machines to meet the emission and design standards. The guidelines should be made a mandatory practice inside the LEZ to mitigate emissions from DG sets.

Intervention details

NCAP Key Sector: Industries
Action Point: IP 11, IP 13, BB3, BB4
Type: Regulatory solution

Implementation

Identification of stakeholders

OSPCB, BMC, RWA's & BDA

Business models

For its implementation, SPCB, Odisha and BMC should issue guidance advisory on the norms for usage of DG sets and make the public aware of the emission and design standards set by the CPCB.

The public should be given ample time for retrofitting existing DG sets and buying of latest DG sets that meet standards before intensive checking exercise begins.

Proposal Cycle

Intervention	Nodal Agency	Short term	Medium term	Long term
Preparation of guidelines for monitoring of emissions	OSPCB		R	
Monirtoing of DG sets	BMC, RWAs, BDA, OSPCB		R	
Restriction on the usage of DG sets			R	



Image Source: IPE GLOBAL - Reconnaissance Survey



4.7 | Other Proposed Interventions

4.7.1. Air Quality Monitoring

Technical Solution

Installation of Air Quality Monitoring Sensor (AQMS)

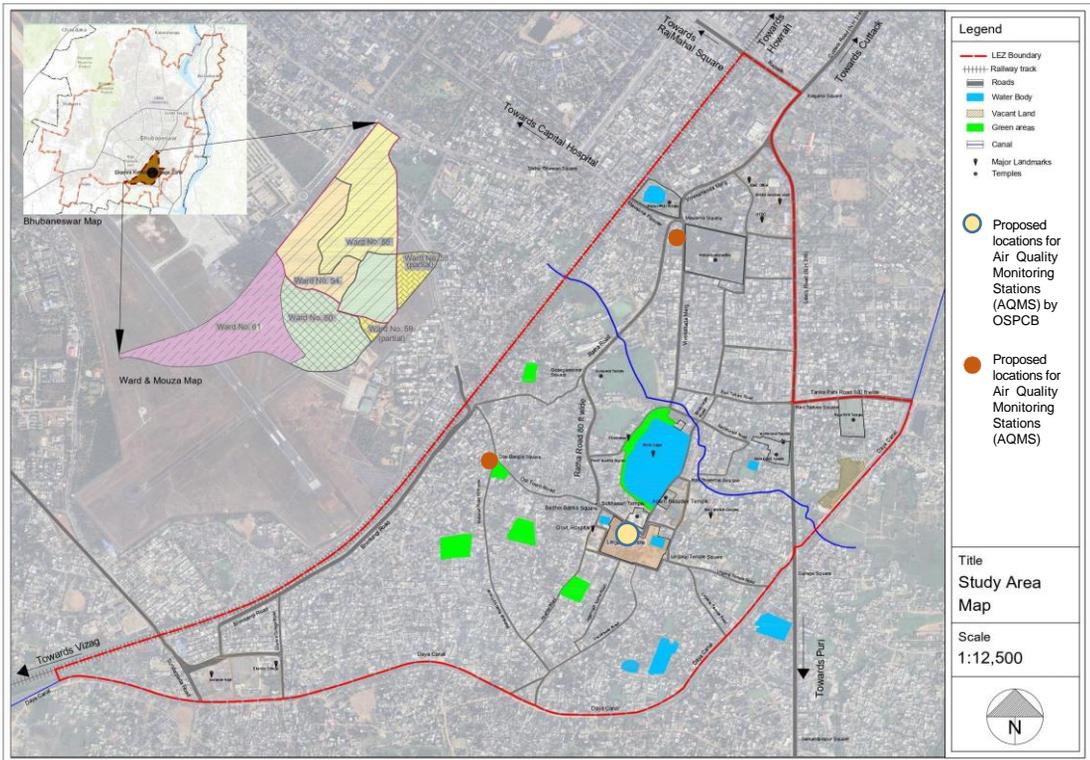
Need to establish 1 Air Quality Monitoring Sensor (AQMS) to monitor changes in pollution levels and assess the impacts of pollution mitigation strategies in the future



Odisha State Pollution Control Board has already planned to establish an ambient AQMS within the LEZ. Hence there is no need to propose the establishment of another AQMS immediately.

PHASE – 1 : To install a CAAQMS in Lingaraj Market Complex which is in the center of the LEZ.

For Future
Most suitable locations for establishing AQMS:
1. Mausima Chowk
2. Dak Bangla Chowk
As both these junctions are highly congested and susceptible to dust pollution



Proposal Cycle

S. No.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
	Ambient Air Quality Monitoring and Communication	OSPCB/BMC/BDA			
1.1	Finalization of location for installation of the sensors		P		
1.2	RFP: Procurement of Real-time Ambient Air Quality Monitoring System and selection of the agency		P		
1.3	Installation of the sensors		P		
1.4	Monitoring and supervision by the regulatory authority			R	

4.7.2. Public Outreach

Air Quality Dissemination System

It is very important to maintain public awareness regarding the levels of air pollution in easily understandable nomenclature. Air quality data should be translated into public friendly format of AQI which represents the overall level of pollution in the ambient air using basic numerals and colors. This data should then be displayed on LED/LCD screens at strategic locations across the LEZ.



BMC will be responsible for air quality dissemination to the citizens as per the activities listed under the Air Action plan of Bhubaneswar.

Installation of clear & prominent signages at LEZ entry points to inform citizens and tourists about the area's purpose in reducing air pollution, complying with relevant regulations.

To promote responsible behavior within a Low Emission Zone (LEZ), it is recommended to provide clear guidelines on the Dos and Don'ts when entering or operating within the designated area.
May include regulations and restrictions on vehicle types and emissions standards, speed limits, and specific routes

Public Engagement Through Workshops

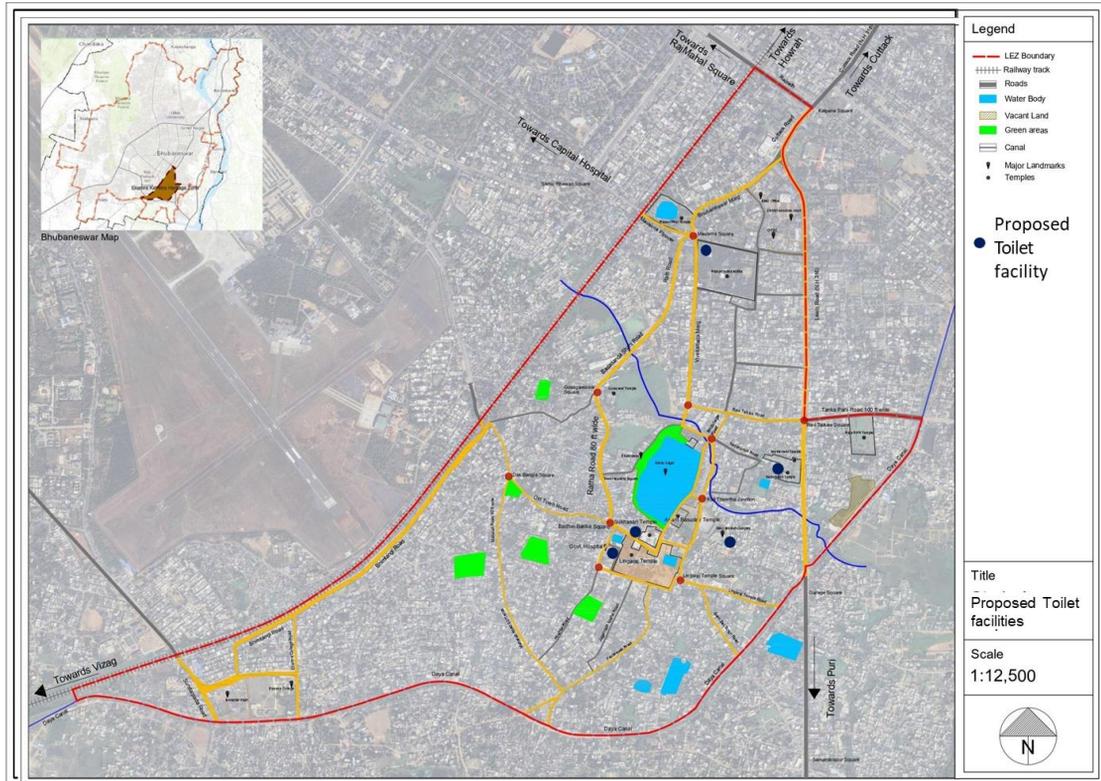
It is important to conduct public engagement including Workshops/Programs in Schools & Colleges regarding air pollution in the city of Bhubaneswar and air pollution control measures.

SPCB, Odisha will be responsible for conducting such sessions with help/assistance by an A&PR agency.

Raising awareness among the youth on air pollution related matters will instill a sense of knowledge and understanding into the minds of the next generation on matters related to sustainable development.

4.7.3. Improvement of Toilet Facilities

To address sanitation-related issues, it is important to provide adequate toilet facilities near parking spots, inside temple complexes and other areas inside the LEZ. It is also important to conduct education and awareness campaigns to promote good sanitation practices, which would bring forth a behavioral change amongst the public.



Proposal Cycle

S.no.	Proposed projects	Nodal Agency	Short term	Medium term	Long term
	Sanitation	BMC, Temple Trust			
i)	RFP for installation/procurement of the mobile toilets				
ii)	Selection of agency for installation of the mobile toilets				

Cost Estimates

S. No.	Proposed projects	Nodal Agency	Quantity	Unit	Rate per unit (INR)	Amount (INR)
	Sanitation	BMC, Temple Trust				
i)	Mobile Toilet (1 seater modular toilet with each cubicle of size 915mm X 915mm x 1980mm and with Sludge tank capacity-200ltrs with 75mm outlet facility through butterfly valve and hose pipe(For 1-seater and 2-seater)		6	1	50,000-65,000	3,00,000-3,90,000





Implementation Models

5

Implementation Models

Public-Private Partnership (PPP)



PPP refers to a collaborative arrangement between a government entity and a private sector organization or consortium. In this model, both parties pool their resources, expertise, and responsibilities to implement interventions. The government provides regulatory oversight and may contribute funding, while the private sector brings in specialized knowledge, technology, and operational efficiency. PPPs are often used for large-scale infrastructure projects, healthcare initiatives, and public services delivery.

Completely Government



In a completely government-driven implementation model, the government takes full responsibility for planning, financing, and executing interventions. This model is typically employed when the government has the necessary resources, infrastructure, and administrative capacity to implement the interventions effectively. Government agencies and departments coordinate with each other to carry out the various stages of the intervention, such as policy formulation, program design, resource allocation, and service delivery.

Completely Private



In a completely private implementation model, the responsibility for implementing interventions rests solely with private sector entities, such as corporations, non-profit organizations, or community groups. The private sector mobilizes its own resources, expertise, and networks to design and deliver the interventions. This model is often seen in corporate social responsibility initiatives, philanthropic projects, and community-driven development programs.

Household/ Temple Level



The household/temple level implementation model focuses on individual households or religious institutions as the primary units for implementing interventions. In this model, interventions are designed to be implemented at a micro-level, targeting specific households or temples. The responsibility for implementing the interventions lies with the respective households or temple authorities. This model is commonly used for initiatives related to household-level behavior change, religious practices, and community-based interventions.

It's important to note that the choice of implementation model depends on various factors such as the nature of the intervention, available resources, institutional capacity, and stakeholder engagement. Often, a combination of these models may be employed to leverage the strengths and capabilities of different sectors and actors to achieve the desired outcomes.

Implementation Approach

	Sector	PPP	Completely Private	Completely Government	Household/ Temple level
	Transport Emissions	Road & junction improvements		Green Sticker system Licence Plate video recognition Parking Management	
	E-mobility			E-rickshaw vehicles & routes	
	Industrial Emissions	-	-	-	-
	Integrated Waste Management	Mobi-trash Floral Waste management		Banning Single Use Plastic	Micro-composting
	Power Sector		Promoting Renewable Energy Sources	Restriction on the Use of DG Sets	
	Agricultural Emissions	-	-	-	-
	Indoor Air Pollution	-	-	-	-
	Including Clean Cooking				
	Clean Construction and Road Dust Management			Pollution control on construction sites Increasing Green cover Restoration of Water Bodies	Increasing Green cover Restoration of Water Bodies



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| Annexurés

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A. Traffic Count survey on Lingaraj temple road

Traffic Count Survey Form										
Date	16/12/2022		Count Station	KEUTASAH SQUARE			Direction	towards Lingaraj Temp		
City	BHUBANESWAR		Road Name	Lingaraj Temple Road			Shift Time	8:00AM-8:00PM		
Time		Two Wheeler	Three Wheeler		Car	LCV	Bus	Truck	Tractor/ Trailors	
From	To		Passenger	Goods						
8:00AM	8:30AM	130	5	1	13	0	0	0	2	
8:30AM	9:00AM	155	7	0	10	1	0	0	0	
9:00AM	9:30AM	195	9	0	11	1	0	0	1	
9:30AM	10:00AM	255	6	0	15	3	0	0	0	
10:00AM	10:30AM	212	8	0	19	4	0	0	0	
10:30AM	11:00AM	245	7	2	23	2	0	0	1	
11:00AM	11:30AM	177	6	1	17	1	0	0	0	
11:30AM	12:00PM	189	11	3	21	4	0	1	0	
12:00PM	12:30PM	194	6	2	18	3	1	0	1	
4:00PM	4:30PM	167	9	0	17	2	1	0	0	
4:30PM	5:00PM	154	7	1	13	1	2	0	0	
5:00PM	5:30PM	186	5	0	12	0	0	0	1	
5:30PM	6:00PM	178	12	0	15	2	0	0	0	
6:00PM	6:30PM	193	15	1	14	0	0	0	0	
6:30PM	7:00PM	205	8	0	19	1	0	0	0	
7:00PM	7:30PM	172	6	3	10	0	0	0	0	
7:30PM	8:00PM	161	4	0	9	0	0	0	0	
WEEKDAY										

Source: Survey conducted by ARAI, Pune; OSPCB-2022-23

B. Traffic Count survey on Mahatab Road

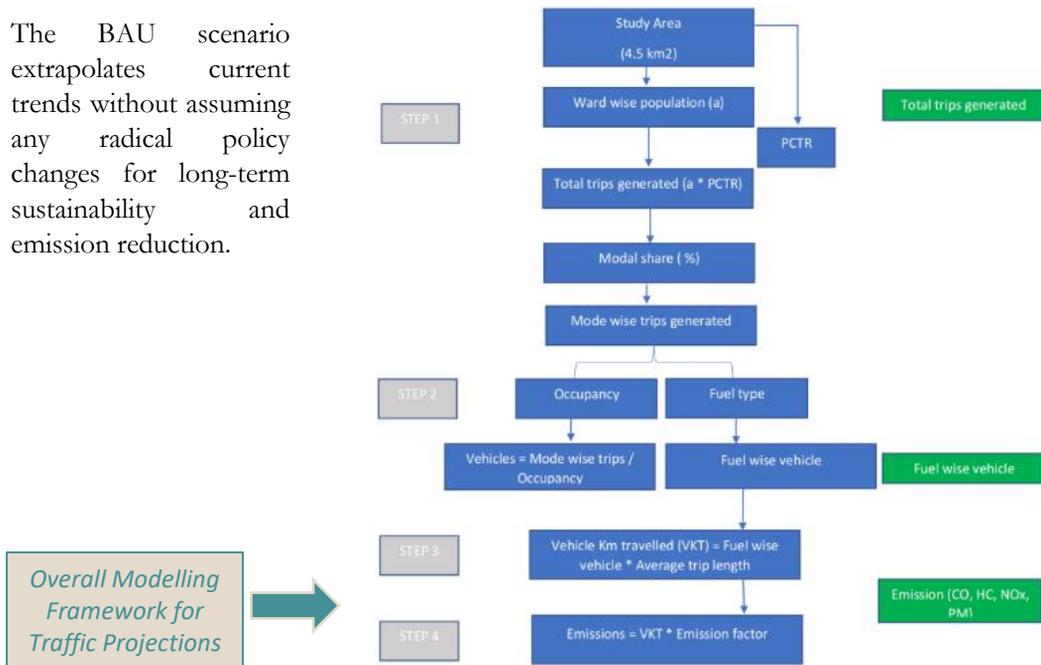
Traffic Count Survey Form										
Date	15/12/2022		Count Station	AXIS BANK ATM			Direction	BOTH DIRECTION		
City	BHUBANESWAR		Road Name	MAHATAB ROAD			Shift Time	8:00AM-8:00PM		
Time		Two Wheeler	Three Wheeler		Car	LCV	Bus	Truck	Tractor/ Trailors	
From	To		Passenger	Goods						
8:00AM	8:30AM	215	4	0	14	9	2	0	1	
8:30AM	9:00AM	278	4	0	11	7	0	1	1	
9:00AM	9:30AM	337	13	1	26	16	4	0	0	
9:30AM	10:00AM	441	17	2	19	15	11	4	1	
10:00AM	10:30AM	429	14	0	28	14	9	3	0	
10:30AM	11:00AM	411	19	1	24	12	6	1	0	
11:00AM	11:30AM	396	15	0	20	13	0	0	2	
11:30AM	12:00PM	439	11	0	27	10	1	2	0	
12:00PM	12:30PM	389	10	1	19	11	2	1	1	
4:00PM	4:30PM	342	4	0	10	6	2	0	0	
4:30PM	5:00PM	368	9	1	17	9	4	0	1	
5:00PM	5:30PM	Traffic disruption stopped counting								
5:30PM	6:00PM	317	7	2	15	4	0	0	0	
6:00PM	6:30PM	271	5	0	9	3	1	0	0	
6:30PM	7:00PM	264	4	1	11	1	0	0	1	
7:00PM	7:30PM	292	6	1	7	2	1	1	1	
7:30PM	8:00PM	216	3	0	9	0	0	1	0	
WEEKDAY										

Source: Survey conducted by ARAI, Pune; OSPCB-2022-23

C. Impact of proposed measures on mode choice - 2030

1. Development of Business as Usual (BAU) Scenario

The BAU scenario extrapolates current trends without assuming any radical policy changes for long-term sustainability and emission reduction.



Do-nothing scenarios has been projected for the year 2022 and 2030 for establishing the benchmarks.

Traffic assessment in Do nothing scenario

Traffic analysis has been calculated based on the ward wise population of the study area. Ward no.(s) 54,55,58,59,60 and 61 lies in the Ekamra kshetra area. In the Do-nothing scenario, 2022, Vehicle km travelled is shown in table below-

Wards (Ekamrakshetra Area)	(i)Population 2022	(ii)PCTR (Per capita trip rate) 2022	Total trips generated2 022	Modes	(iii) Modal share	Total No. of trips in 2022	Mode wise trips in 2022	(iv) Occupancy	Vehicles	(v) Type of fuel	Fuel wise vehicle	(vi) Average trip length (Km)	Veh. Km Travelled (in Km)		
54	15955	1.49	111428	Walk	7%	111428	7800	1	7800		7800	2.01	15678		
55	12249			Cycle	5%		5571	1	5571		3739	2.01	7515		
58	14,736			Car/ Van	7%		7800	1.50	5200	Petrol 62%	3198	8.12	25968		
59	16515			Scooter/Motorcycle	53%		59057	1.00	59057	Petrol 100%	59057	8.12	479542		
				Auto rickshaw/Taxi	18%		20057	2.00	10029	Petrol 8%	802	8.12	6515		
60	14509									Diesel 92%	9226		74917		
61	820														
Total	74784						Bus	10%	11143	60.00	186	Diesel 100%	186	11.59	2152

Table: Traffic Projections (Do nothing Scenario-2022)

Do-nothing scenario, 2030 in this scenario, 2022, Vehicle km travelled is shown in below-

Wards (Ekamrakshetra Area)	Population 2022	Population growth rate 2.65% (x)	Population 2030	PCTR (Per capita trip rate) 2030 (xi)	Total trips generated 2030	Modes	Modal share (xii)	Total No. of trips in 2030	Mode wise trips in 2030	Occupancy (xiv)	Vehicles	Type of fuel	Fuel wise vehicle	Average trip length (in Km)	VKT
54	15955	423	19668	1.61	146797	Walk	7%	146797	10276	1	10276		10276	2.01	20654
55	12249	325	15100			Cycle	5%		7340	1	7340		7340	2.01	14753
58	14,736	391	18166			Car/ Van	7%		10276	1.50	6851	Petrol 62%	4247	9.93	42176
59	16515	438	20359			Scooter/Motorcycle	53%		77803	1.00	77803	Petrol 100%	77803	9.93	772579
						Auto rickshaw/Taxi	18%		26424	2.00	13212	Petrol/CNG 8%	1057	9.93	10495
60	14509	384	17886												
61	820	22	1011												
Total	73964		91178			Bus	10%		14680	60.00	245	Diesel 100%	245	14.32	3504

Table: Traffic Projections (Do nothing Scenario-2030)

D. Development of Sustainable Urban Transport Scenarios

The scenario broadly assesses the impact of all measures together.

It may be noted that these are very broad assumptions based on secondary data available in different years. For detailed traffic modelling surveys are required to prepare a detailed model and assess all details.

Modes	Total mode wise trips_2030	% mode shift (assumptions)				Total shift	Occupancy	Vehicles	Type of fuel		Fuel wise vehicle	Average trip length	Total length of trip on the basis of fuel
		expected shift	Walk	Cycle	Public Transport				Fuel type	% share			
			5%	3%	7%								
Walk	10276					17305	1	17305			17305	2.01	34784
Cycle	7340					11558	1	11558			11558	2.01	23231
Car/Van	9035	5%	351	211	492	7980	1.50	5320	Petrol	62%	3298	9.93	32754
									Diesel	38%	2022		20075
Scooter/Motorcycle	77803	60%	4218	2531	5905	65149	1.00	65149	Petrol	100%	65149	9.93	646933
Auto rickshaw/Taxi	20650	35%	2460	1476	3444	13269	2.00	6635	Petrol/CNG	8%	531	9.93	5271
									Diesel	92%	6104		60612
Bus	15488					25329	60.00	422	Diesel	100%	422	14.32	6045
Total	140591					140591		106389			106389		

Table: Traffic Projections (Do something Scenario-2030)



Image Source: OSPCB - Aerial View of Ekamra Kshetra Zone

LOW EMISSION ZONE, EKAMRA KSHETRA

Bhubaneswar, Odisha