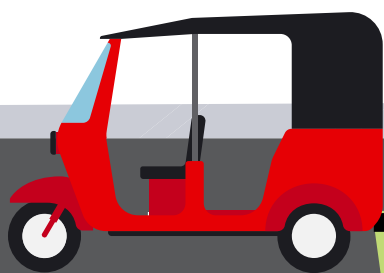




 **मुंबई**
CLIMATE ACTION PLAN

CHARGING UP MUMBAI'S ELECTRIC VEHICLE TRANSITION

Roadmap for Mumbai's Electric Vehicle Charging Policy





OVERVIEW

Mumbai is one of the most vulnerable cities to the hazards of climate change. The Government of Maharashtra is currently drafting Mumbai's Climate Action Plan (in collaboration with WRI India) to set and implement tangible emission reduction targets for the city. The state government has also laid emphasis on adoption of zero-tailpipe-emission vehicles, especially in heavily polluted urban areas like Mumbai.

The adoption of electric vehicles (EVs) is instrumental in meeting a plethora of sustainability goals. An accessible and robust network of charging infrastructure will be pivotal in facilitating Mumbai's transition to electric mobility. WRI India is supporting the city of Mumbai to effectively plan and roll out EV charging infrastructure. We have undertaken a geospatial analysis to map the distribution of EV charging demand across the city at a granular level. The analysis supports location planning of public charging infrastructure and aims to maximize access and utilization of charging facilities while minimizing their implementation cost.

INSIDE

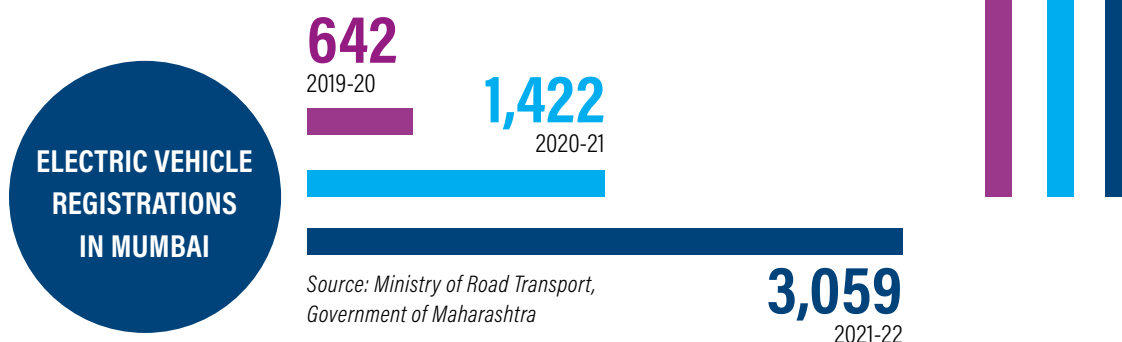
- 03 Mumbai's EV growth trajectory
- 04 Charting Mumbai's EV roadmap
- 05 Methodology

- 06 Blueprint for EV charging policy
- 07 Mapping of demand clusters
- 12 The handbook for EV charging

MUMBAI'S EV GROWTH TRAJECTORY

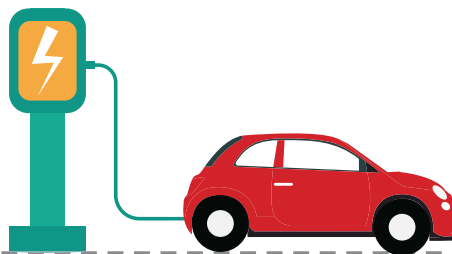
Maharashtra was one of the first states to implement an EV policy and after its renewal in 2021, it is among the most ambitious policies in the country.

As of December 2021, the state recorded over 24,000 EV registrations in FY 2022 so far – a massive 157% year-on-year rise. Mumbai specifically has also demonstrated a discernible shift towards e-mobility with a 112% rise in EV registrations in the same period.



RISE IN MUMBAI'S
ELECTRIC VEHICLE
REGISTRATIONS IN FY 2022

112%



12,08,704
2030

CHARTING MUMBAI'S EV ROADMAP

Maharashtra's electric vehicle policy aims to achieve 10% share of EVs in new vehicle registrations by 2025. The state's EV policy also includes city-specific charging infrastructure development plan that aims to cater to the projected levels of EV penetration in 2025. Maharashtra's EV policy mandates setting up of at least one public charging station in every 3x3 km. grid. It is, therefore, crucial to acknowledge the critical need for suitable infrastructure and customize it to meet unique city-specific parameters. Simultaneously, it is also vital to build capacity among stakeholders and integrate the transition with distribution companies (DISCOMs) and the state's transport ecosystem.

2,19,345
2025

ESTIMATED
NUMBER OF EVs IN
MAHARASHTRA

ESTIMATED NUMBER OF EVs IN MAHARASHTRA BY 2025 AND 2030

ELECTRIC VEHICLE SEGMENTS	EV PENETRATION RATE ²		NUMBER OF EVs (ON-ROAD)	
	2025	2030	2025	2030
PRIVATE	e-2Ws	20%	1,83,396	9,60,652
	e-4Ws	3%	5,866	40,962
COMMERCIAL	e-3Ws	15%	21,980	1,51,045
	e-4Ws	10%	8,103	56,044
TOTAL EVs (ON-ROAD)			2,19,345	12,08,704
TOTAL NO. OF CHARGERS REQUIRED			21,096	1,41,988

¹ Vehicular count considered here for Mumbai is taken from Annual report (Motor Transport Statistics of Maharashtra)

² EV penetration rate: Avg of NITI Aayog, IEA and BNEF



DEMAND MAPPING FOR MUMBAI

Given the meteoric rise in the number of EVs expected over the next decade, it is pertinent to devise and implement a comprehensive plan for the fuel of EVs – charging infrastructure.

Maharashtra's EV policy targets setting up at least 1,500 charging stations in the state by 2025. In establishing a public EV charging network, it is important to understand where the demand for public charging will arise. Spatial distribution of parameters such as population densities, traffic volumes, commercial and institutional/workplace clusters can help predict the charging demand in different parts of the city. This, in turn, helps authorities or charge point operators in deciding the number of chargers required in a given area.

Our analysis estimates EV charging demand at a localized level for Mumbai. We considered several spatial parameters like income, public amenities (like bus stops, railway stations), points of interest (shopping malls, eateries, etc.) and population density utilizing Geographic Information System (GIS) platforms to project public EV charging demand.

**KEY ASPECTS
OF DEMAND
MAPPING
ANALYSIS**



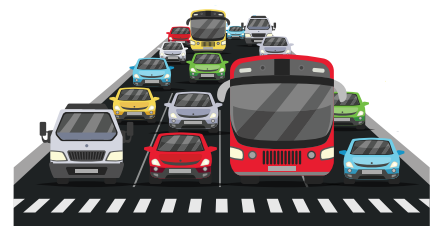
**Divide Mumbai's
area of 458.6 sq km into
grids of 1x1 sq km. each**



**Identify spatial parameters
like population density and
public amenities**



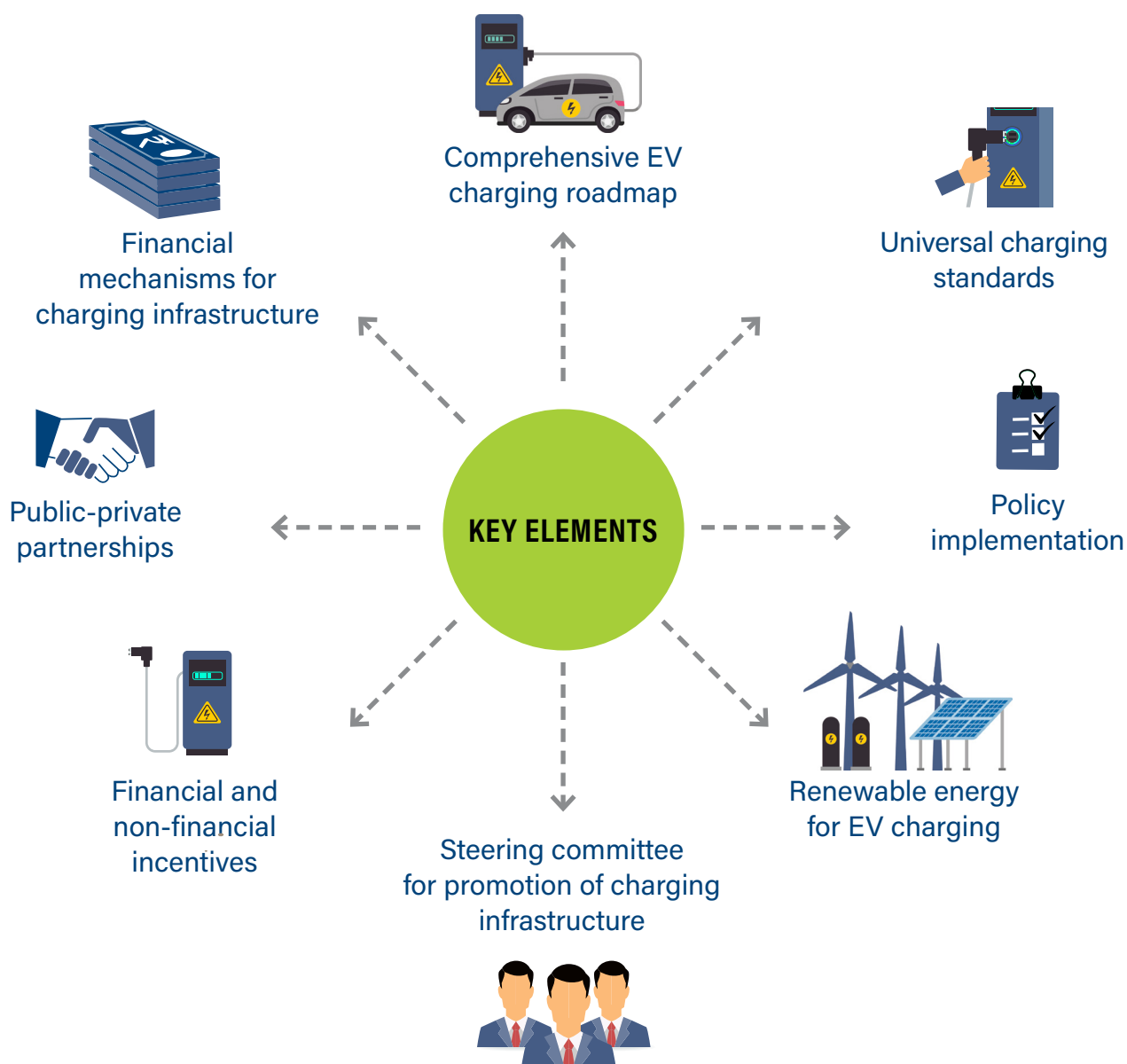
**Conduct spatial
analysis using GIS**



**Arrive at Mumbai's
key demand clusters**

BLUEPRINT FOR MUMBAI'S EV CHARGING INFRASTRUCTURE POLICY

While mapping of demand clusters in the city is a crucial step, several other mechanisms incorporated in Mumbai's EV charging infrastructure policy would catalyze its effective rollout. Some key recommendations for the implementation of EV charging policy would be constituting a steering committee to facilitate implementation and address major impediments, encouraging public-private partnerships, announcing fiscal and non-fiscal incentives, increasing consumer awareness through promotional activities, amending Development Control Regulation and promoting solar generation to meet the energy requirements. For brevity, key elements for the rollout of an effective EV charging policy are highlighted below.



POPULATION COUNT

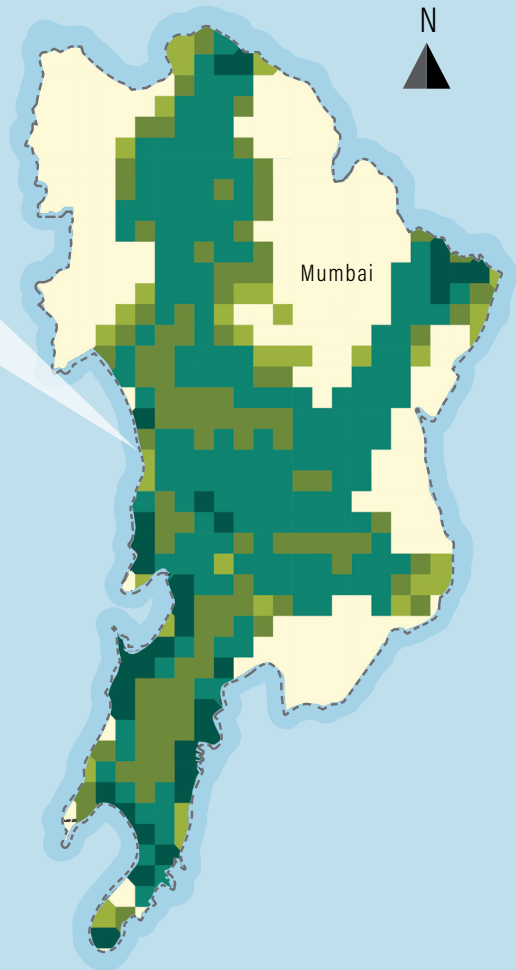
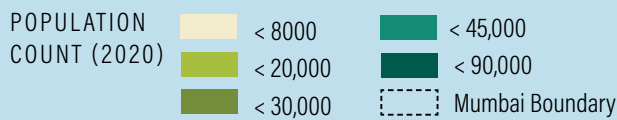
Vehicular movement is typically higher in areas with high population density

458.62
sq.km

TOTAL AREA

20.6
Million

TOTAL POPULATION
IN MUMBAI (2020)



PUBLIC AMENITIES

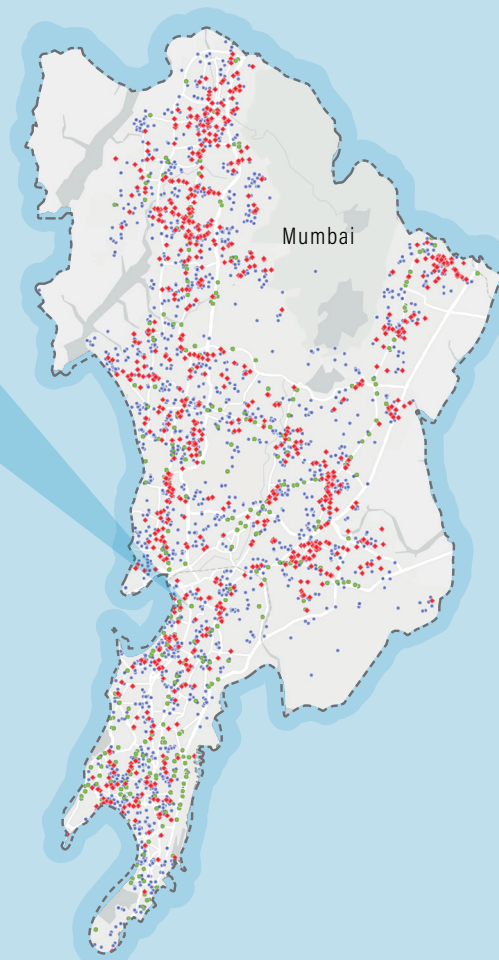
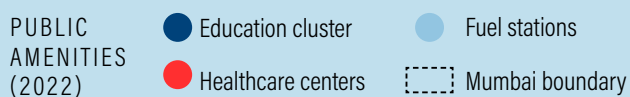
Public amenities are a proxy for high traffic volumes – indicating higher activity along corridors with numerous amenities

852

HEALTHCARE
CENTERS

1,567

COLLEGES AND
UNIVERSITIES



139

MGL CNG
STATIONS

300

PETROL AND
DIESEL STATIONS



POINTS OF INTEREST

Recreational centers in the city like eateries, movie theatres and shopping malls witness a high footfall, especially during weekends

17,048

EATERIES

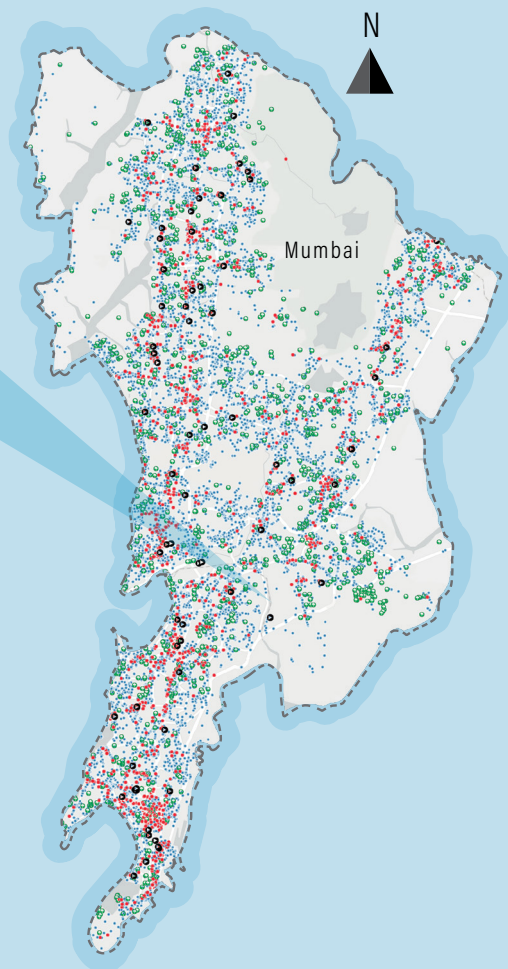
79

MOVIE
THEATRES

1,960

SHOPPING
MALLS

POINTS OF INTEREST



LOCAL BUSINESSES

Local businesses are surrounded with high vehicular activity due to hyperlocal delivery fleets and private two and four-wheelers

938

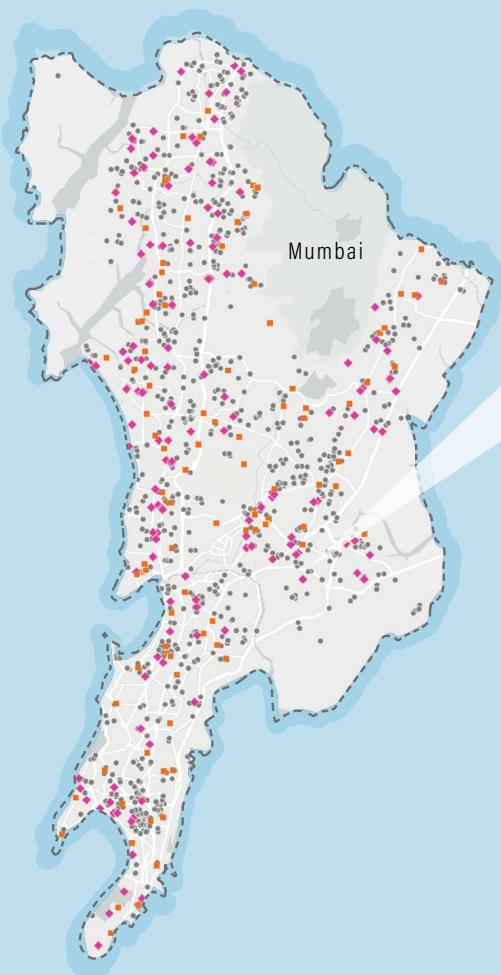
SUPERMARKETS

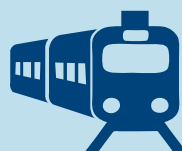
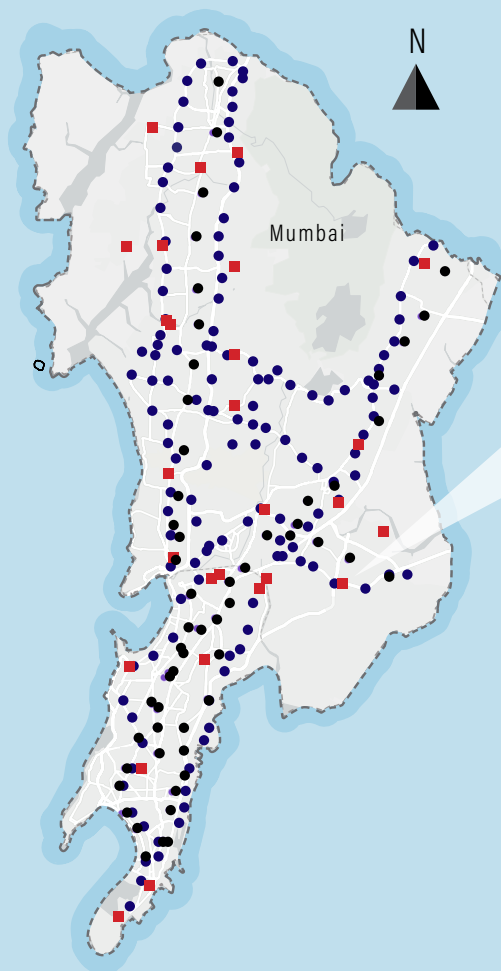
142

DEPARTMENTAL
STORE

102

CONVENIENCE
STORE





TRANSIT STATIONS

Movement of taxi fleets and urban freight is high along public transit networks. Park-and-go facilities around these amenities also attract private vehicles

27

BEST
BUS DEPOTS

139

METRO
STATIONS

57

RAILWAY
STATIONS

TRANSIT
STATIONS

● Metro Stations

● Railway Stations

● BEST Bus Stops

--- Mumbai Boundary

Source: Google API



WORKPLACE LOCATIONS

Areas with a significant number of workplace locations witness high private vehicle activity, pick-up and drop services and freight movement

1,099

PRIVATE
OFFICES

246

GOVERNMENT
OFFICES

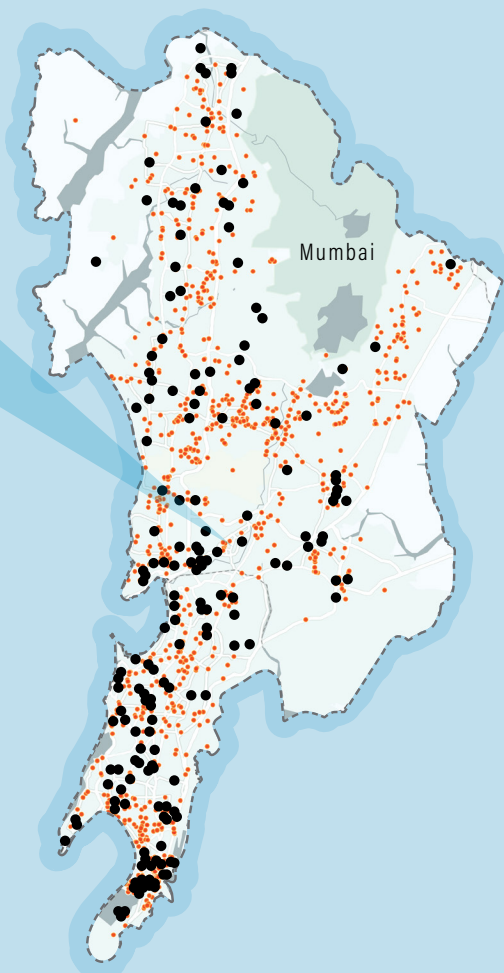
WORKPLACE LOCATIONS

● Government Offices

● Private Offices

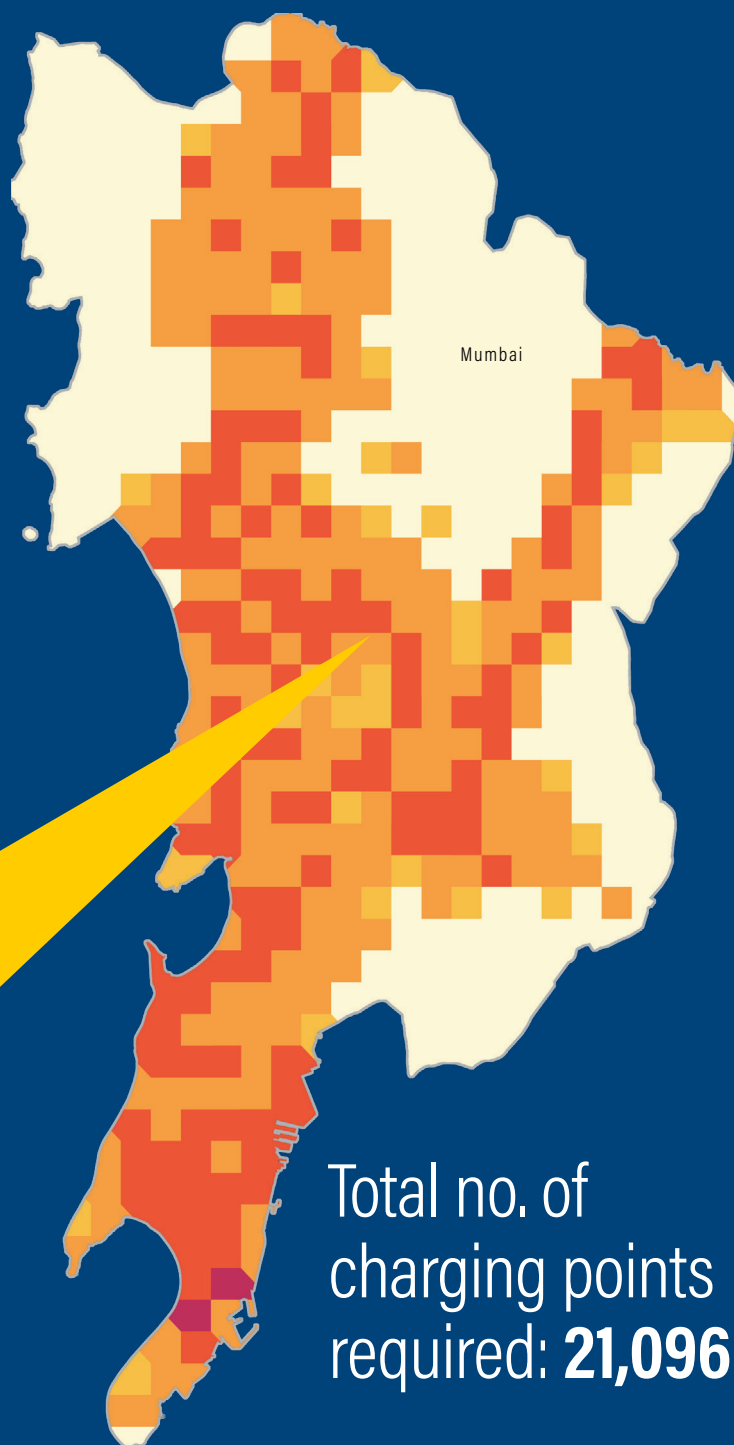
--- Mumbai Boundary

Source: Google API



TOTAL ENERGY DEMAND 2025

The total EV charging energy demand of the city in 2025 is expected to be **550 MW**



Total no. of
charging points
required: **21,096**

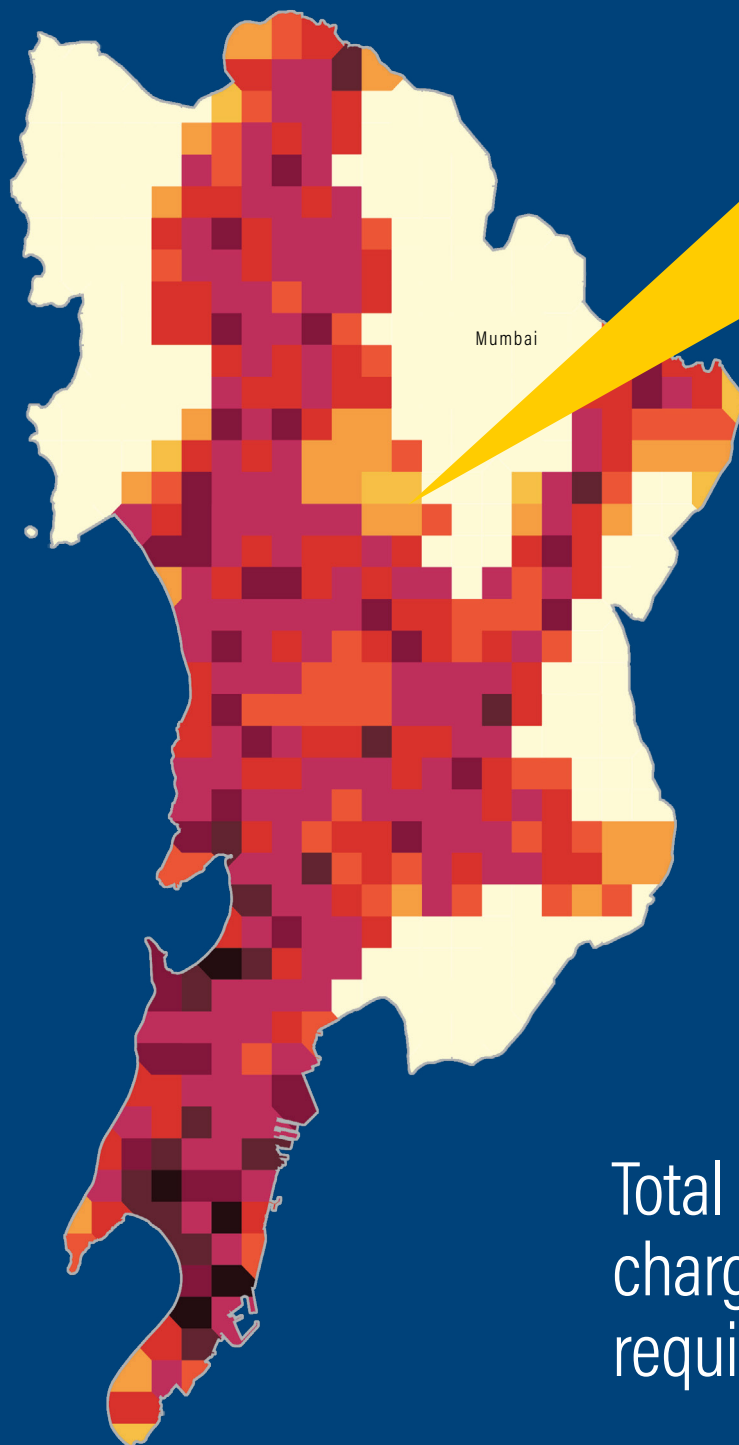


TOTAL ENERGY
DEMAND 2025
(in kWh)

< 250
< 550
< 2,000

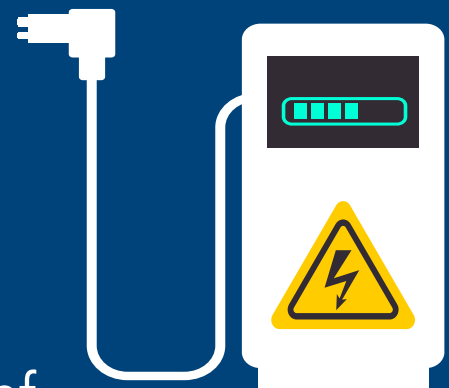
< 5,000
< 8,500

MUMBAI BOUNDARY

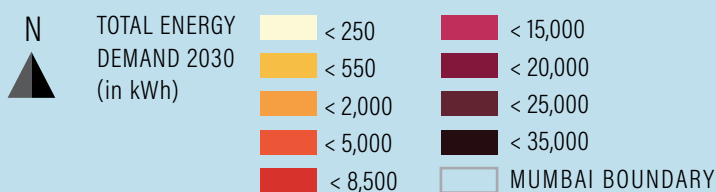


The total EV charging energy demand of the city in 2030 is expected to be **3,416 MW**

TOTAL ENERGY DEMAND 2030



Total no. of charging points required: **1,41,988**



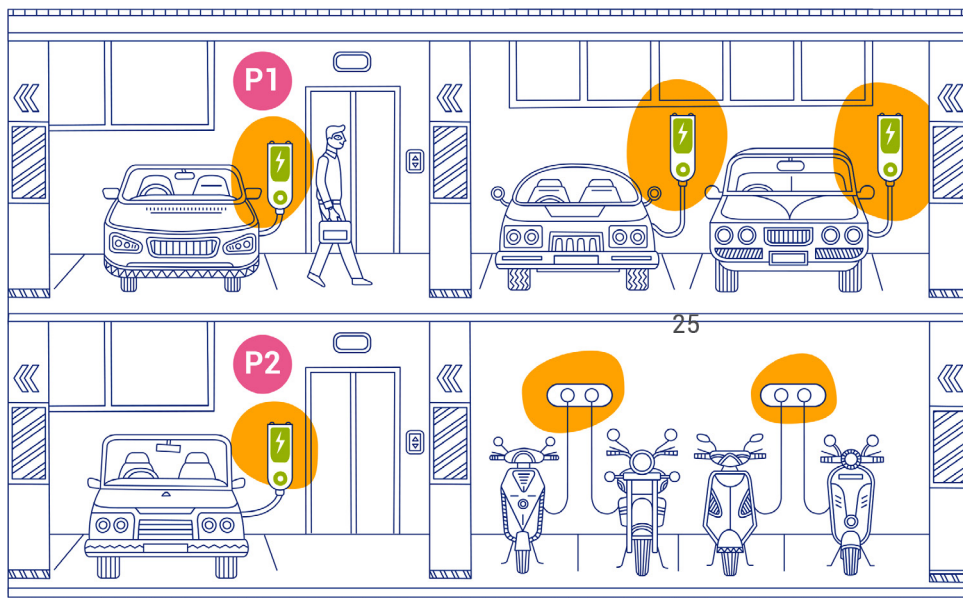


ILLUSTRATION BY: LOCOPOPO

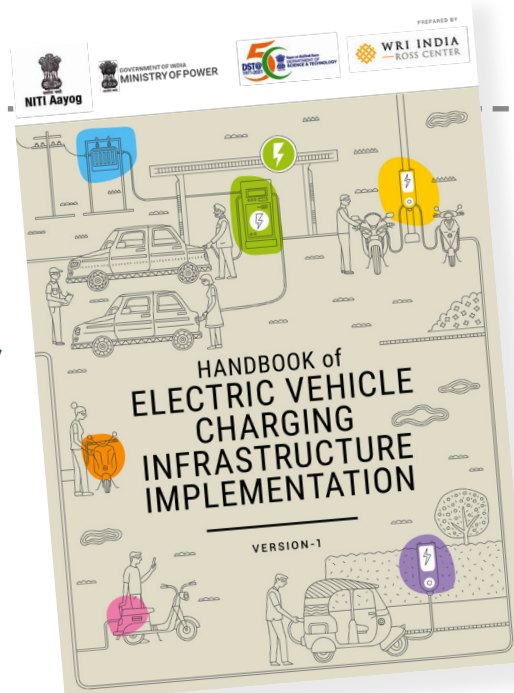
THE HANDBOOK FOR EV CHARGING INFRASTRUCTURE IMPLEMENTATION

In collaboration with NITI Aayog, Ministry of Power, Department of Science and Technology and Bureau of Energy Efficiency (BEE), WRI India has developed [The Handbook for EV Charging Infrastructure Implementation](#). The Handbook offers a systematic approach that guides implementing authorities and stakeholders on planning, authorization, and execution of electric vehicle charging infrastructure.

KEY HIGHLIGHTS

► An overview of the technological and regulatory frameworks and governance structures needed to facilitate EV charging

► Defining a methodology to access energy demand for public EV charging



► A step-by-step approach to rolling out an implementation roadmap facilitate EV charging

► Smart charging to minimize adverse impacts of EV charging loads on the grid



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