

Towards Cleaner Air in Surat

Air Pollution

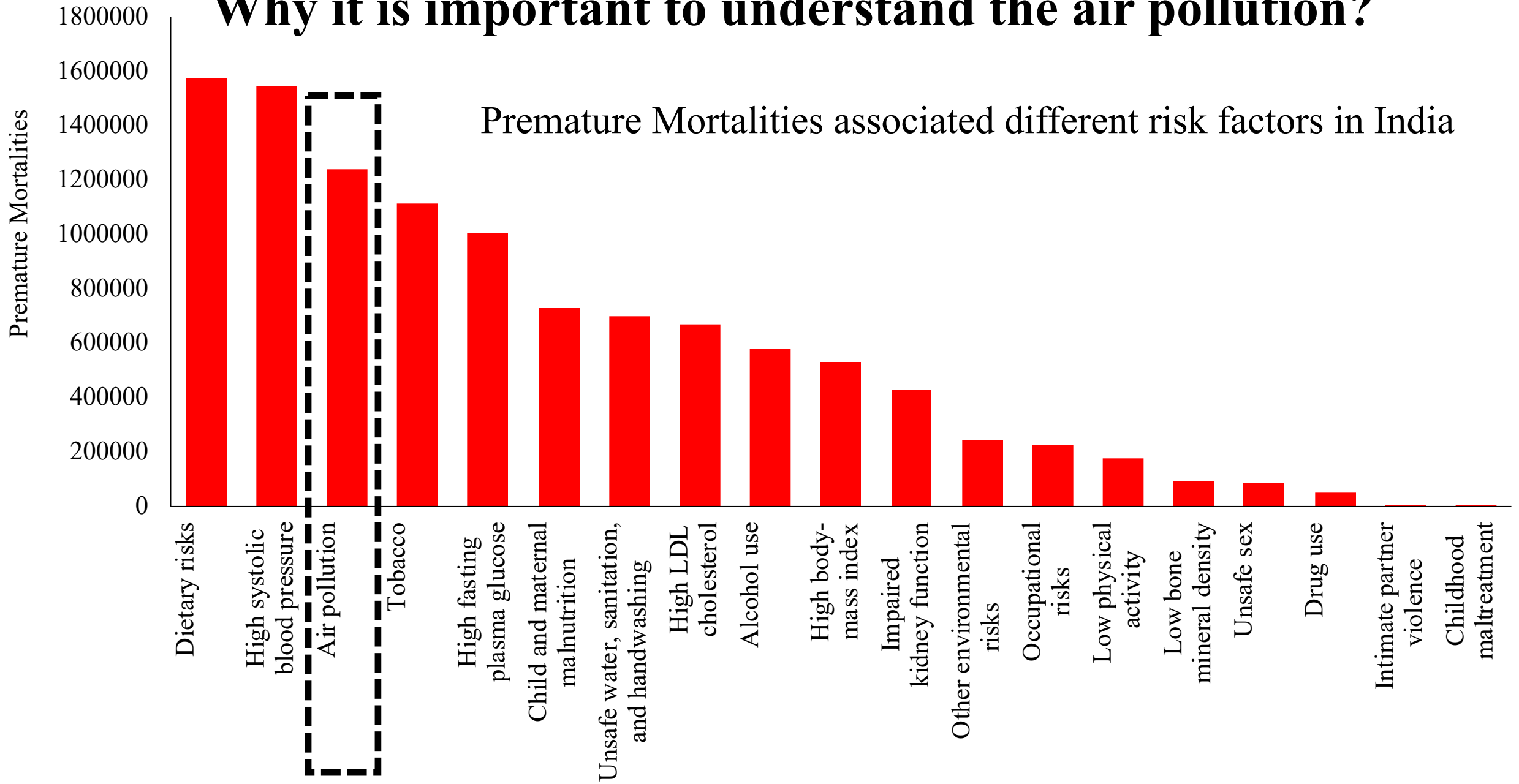
Chemicals/particulate matter added to the atmosphere by human activities or natural events



Understanding the air pollution is essential for each us to help reduce emissions, protect human health and the environment.



Why it is important to understand the air pollution?



WHAT NO ONE CHARTED: 300% JUMP IN CASES AT AIIMS OPD, RESPIRATORY WARD

Records accessed by *The Indian Express* show how the number of OPD cases of respiratory ailments at AIIMS has been rising since 2006-07 — to an average of over 100 a day now



* AIIMS started a full-fledged respiratory department only in 2013, patients were treated in the chest unit till then

NAME: VAIBHAV SHARMA

AGE: 13

Home: Sahibabad

Ailments: Suffers from allergies, chronic cough and breathing difficulty

Life: Forced to skip school often, needed 3 hospital visits this winter



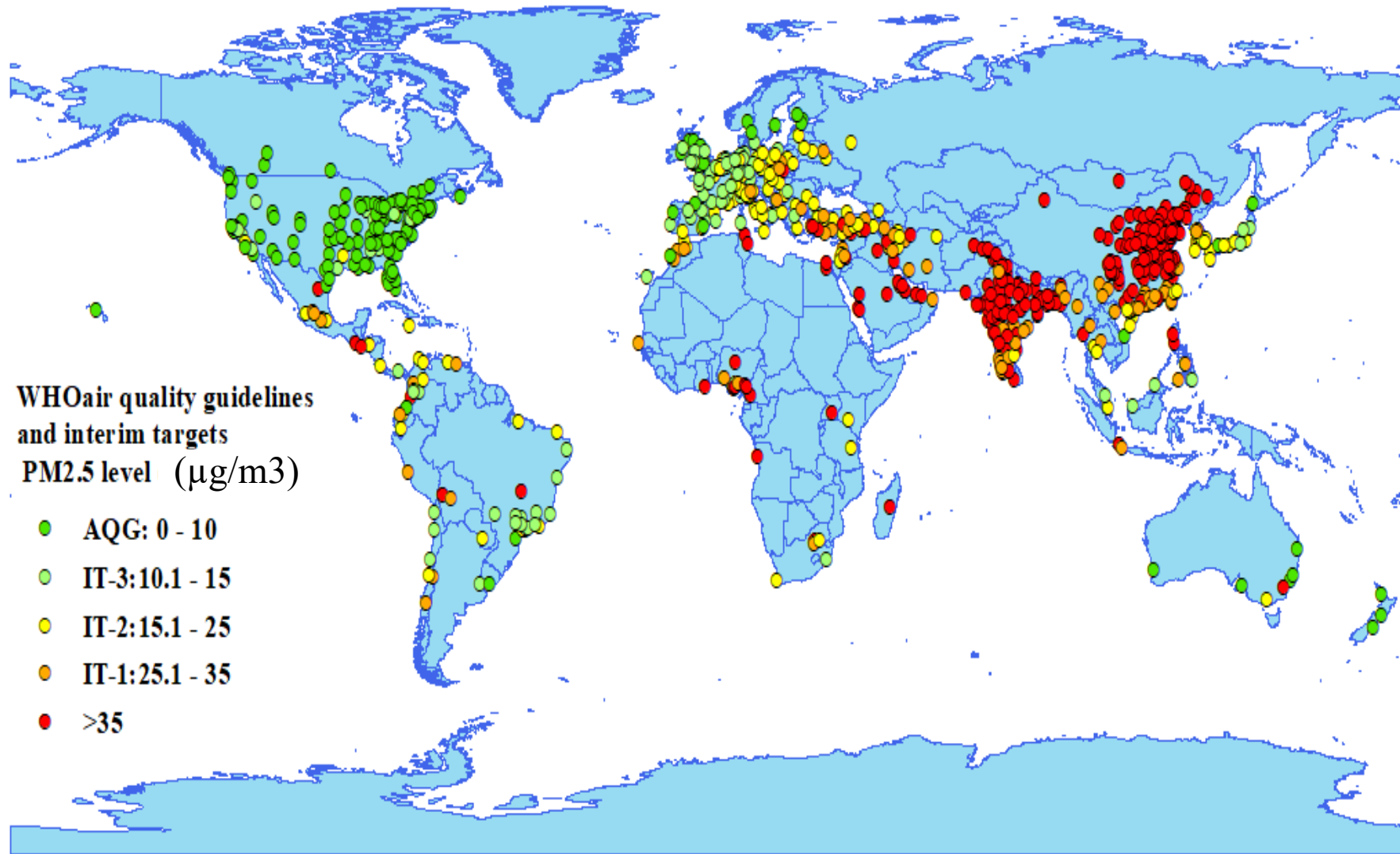
Common Pollutants that are of Human Health Concern

- Carbon monoxide (CO)
- Nitrogen dioxide (NO₂)
- Lead (Pb)
- Sulfur dioxide (SO₂)
- Ozone (O₃)
- Particulate matter (PM_{2.5}, PM₁₀)

Major sources of Air Pollution



PM2.5 Concentration in cities (year 2014-15)



NCAP: National Clean Air Programme

The goal of the NCAP is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated timeframe (long-term).

TENURE

Mid-term five (5) years action plan to begin with keeping 2019 as base year. Further extendable to 20-25 years in long-term after mid-term review of the outcomes.

OBJECTIVES

- Stringent implementation of mitigation measures for prevention, control and abatement of air pollution.
- Augment and strengthen air quality monitoring network across the country.
 - Augment public awareness and capacity building measures.



TARGET

National level target of 20-30% reduction of PM2.5 and PM10 concentration by 2024.

APPROACH

- Multi-sectoral & Collaborative.
- Mainstreaming and integration into the existing policies and programmes of GoI including NAPCC.
- Use Smart Cities framework to launch NCAP in the 43 smart cities falling in the list of 102 non-attainment cities.

National Ambient Air Quality Standards (NAAQS)

Sr. No	Pollutants	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural, and Other Areas	Ecologically Sensitive Area
1	Sulphur dioxide (SO ₂), µg/m ³	Annual*	50	20
		24 hours**	80	80
2	Nitrogen dioxide (NO ₂), µg/m ³	Annual*	40	30
		24 hours**	80	80
3	Particulate matter (Size <10 µm) or PM ₁₀ µg/m ³	Annual*	60	60
		24 hours**	100	100
4	Particulate matter (Size <2.5 µm) or PM _{2.5} µg/m ³	Annual*	40	40
		24 hours**	60	60
5	Ozone (O ₃), µg/m ³	8 hours**	100	100
		1 hours**	180	180
6	Lead (Pb), µg/m ³	Annual*	0.50	0.50
		24 hours**	1.0	1.0
7	Carbon monoxide (CO), mg/m ³	8 hours**	02	02
		1 hours**	04	04
8	Ammonia (NH ₃), µg/m ³	Annual*	100	100
		24 hours**	400	400
9	Benzene (C ₆ H ₆), µg/m ³	Annual*	05	05
10	Benzo(a) pyrene (BaP)- particulate phase only, ng/m ³	Annual*	01	01
11	Arsenic (As), ng/m ³	Annual*	06	06
12	Nickel (Ni), ng/m ³	Annual*	20	20

NATIONAL CLEAN AIR ACTION PLAN



KEY SECTORAL INTERVENTIONS UNDER NCAAP



E-mobility



Power Sector Emissions



**Indoor Air Pollution
including Clean
Cooking**



**Integrated Waste
Management**



**Transport
Emissions**



**Industrial
Emissions**



**Agricultural
Emissions**

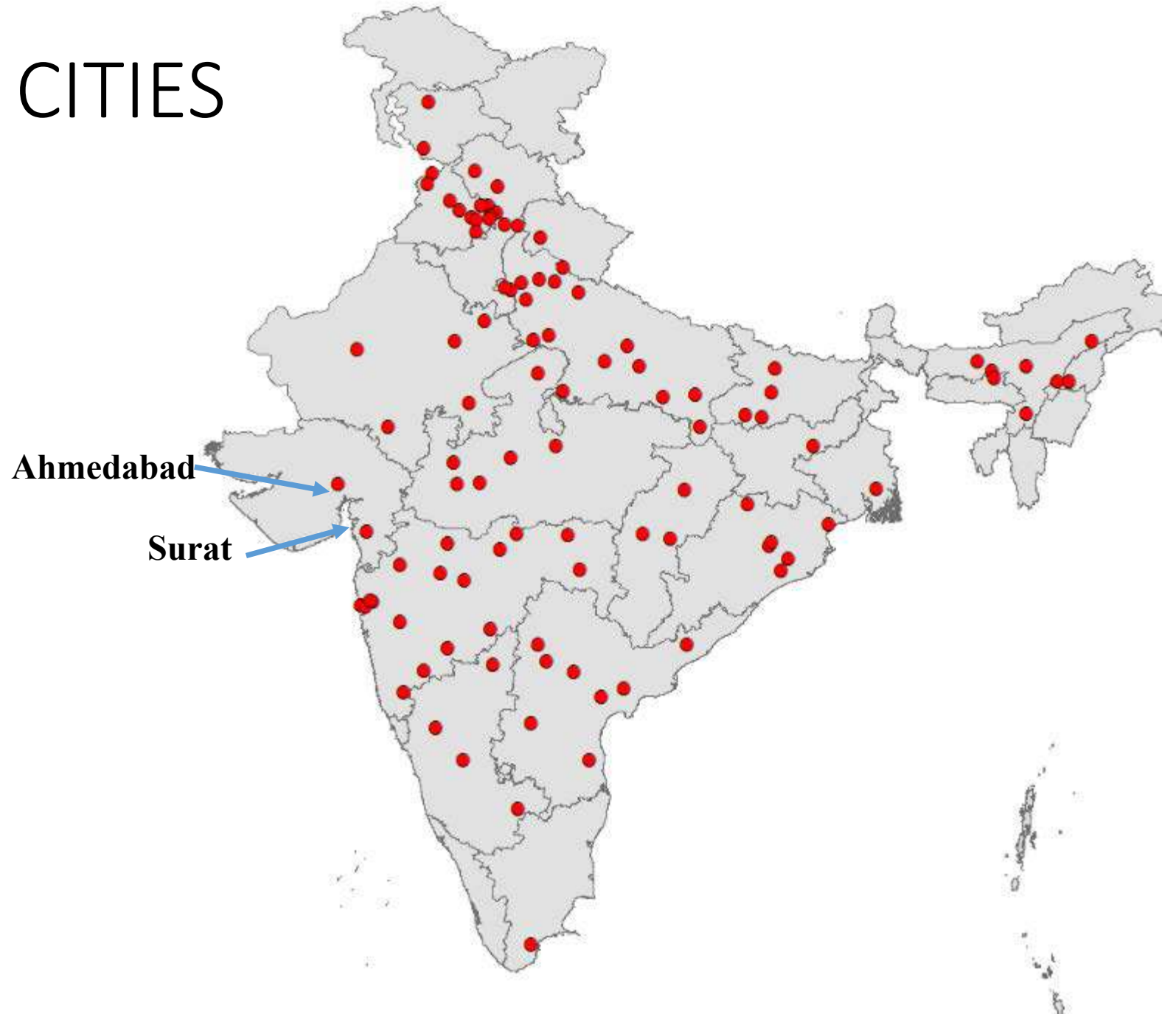


**Clean construction
and Road dust
management**

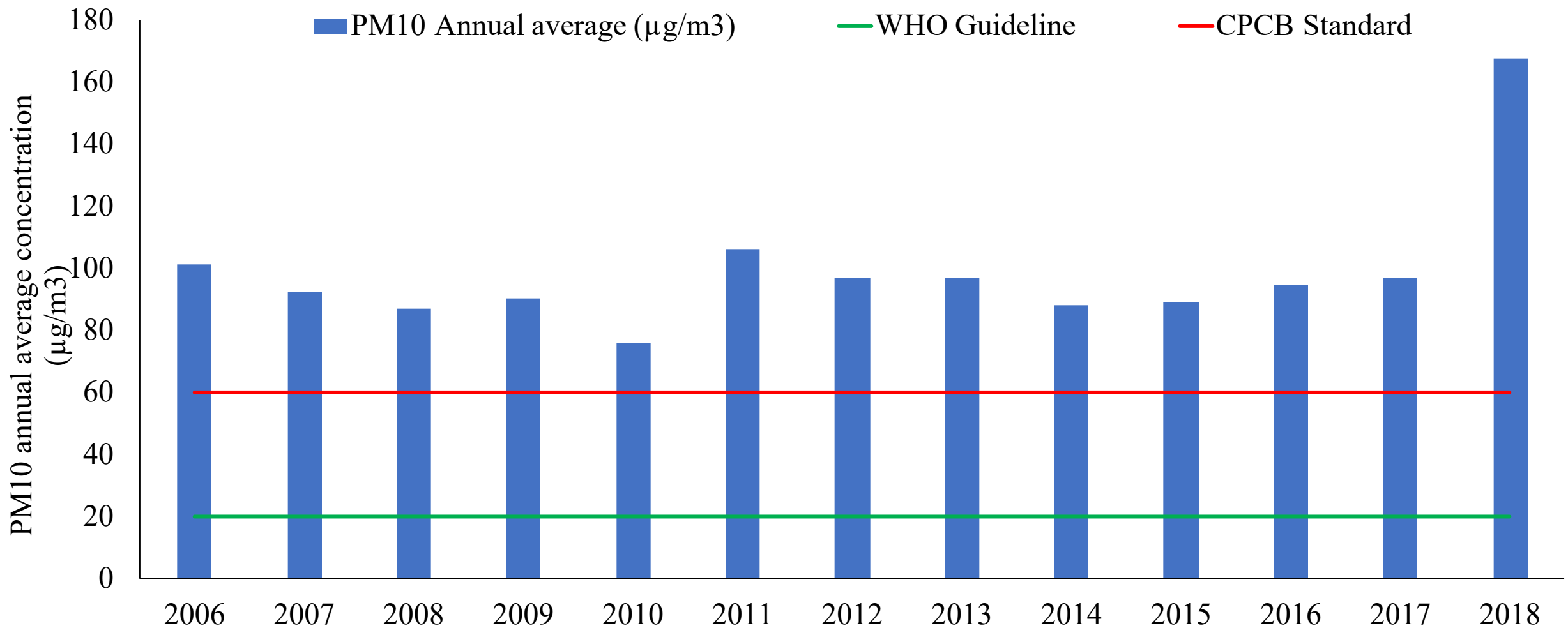
KEY COMPONENTS OF NCAAP



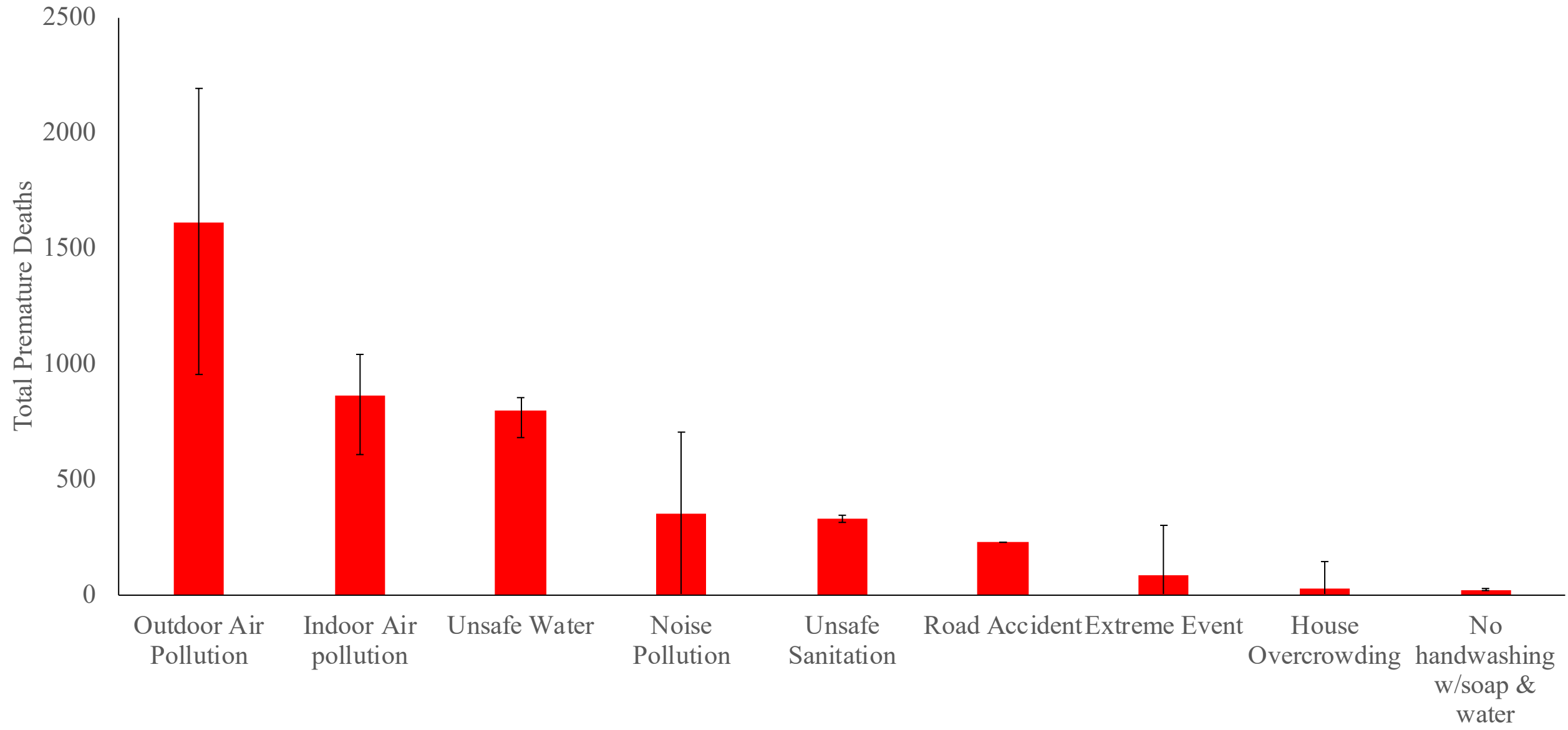
NON-ATTAINMENT CITIES



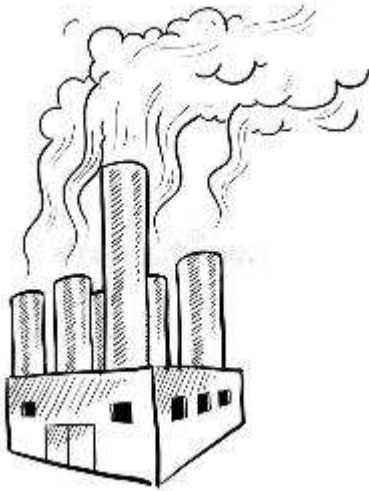
Annual average ambient concentration of particulate matter (PM10) in Surat Municipal Corporation with WHO guideline and Central Pollution Control Board (CPCB) standard for



Health Risks benefits associated with different risk factors in Surat



Key Sectors for Surat City



Industries



**Household
Cooking**



Transportation

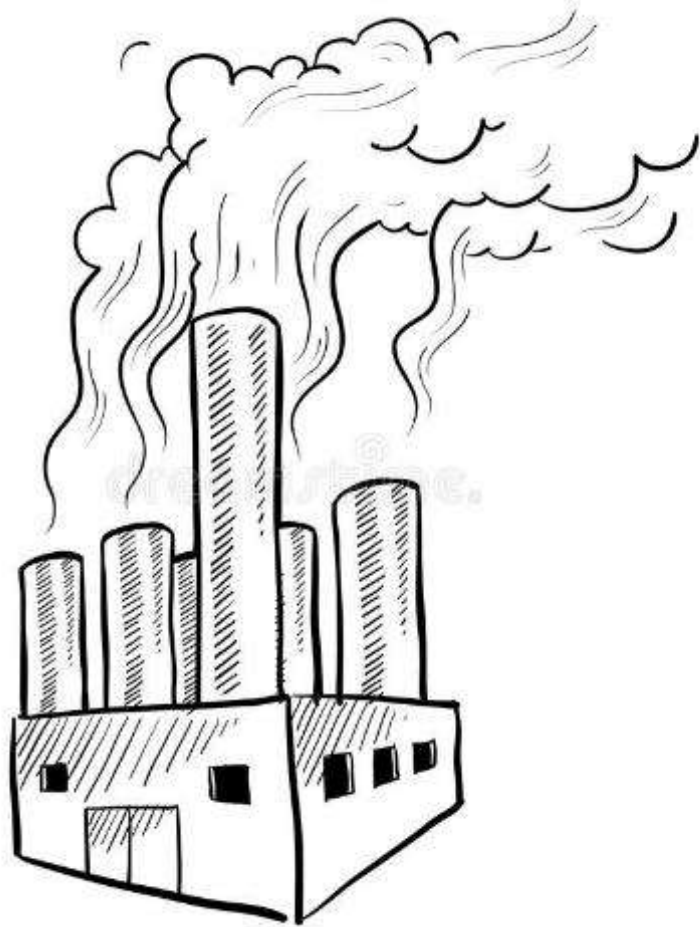


Construction



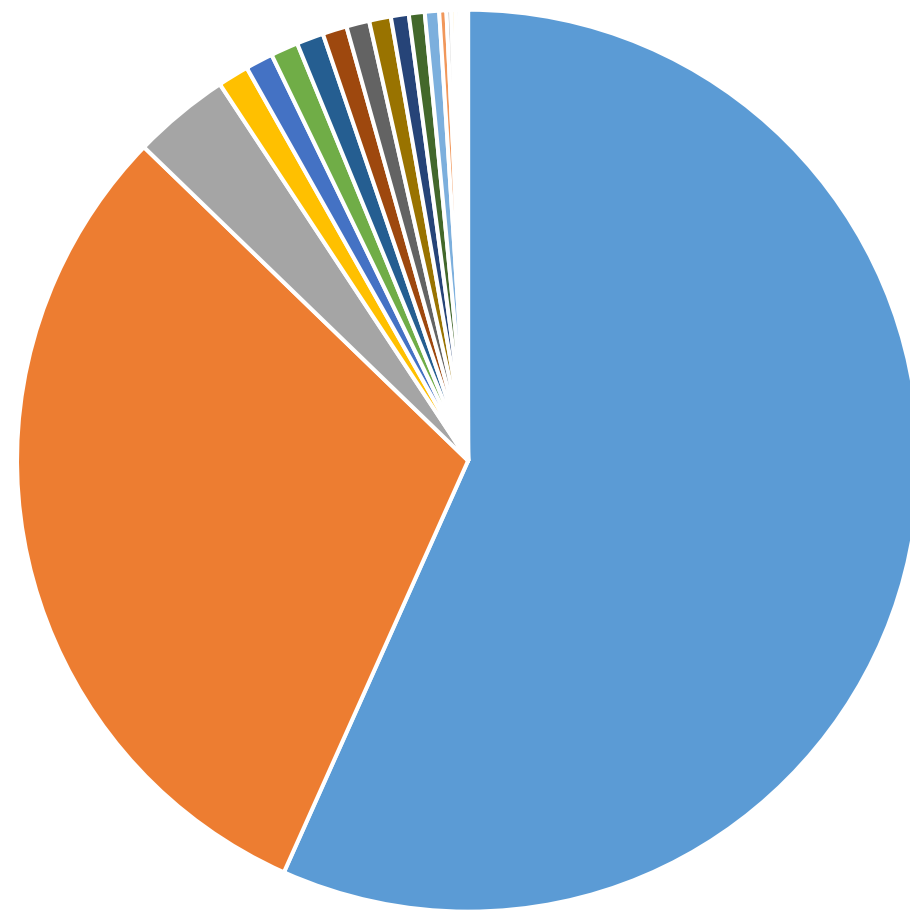
**Municipal Solid
Waste**

Industries

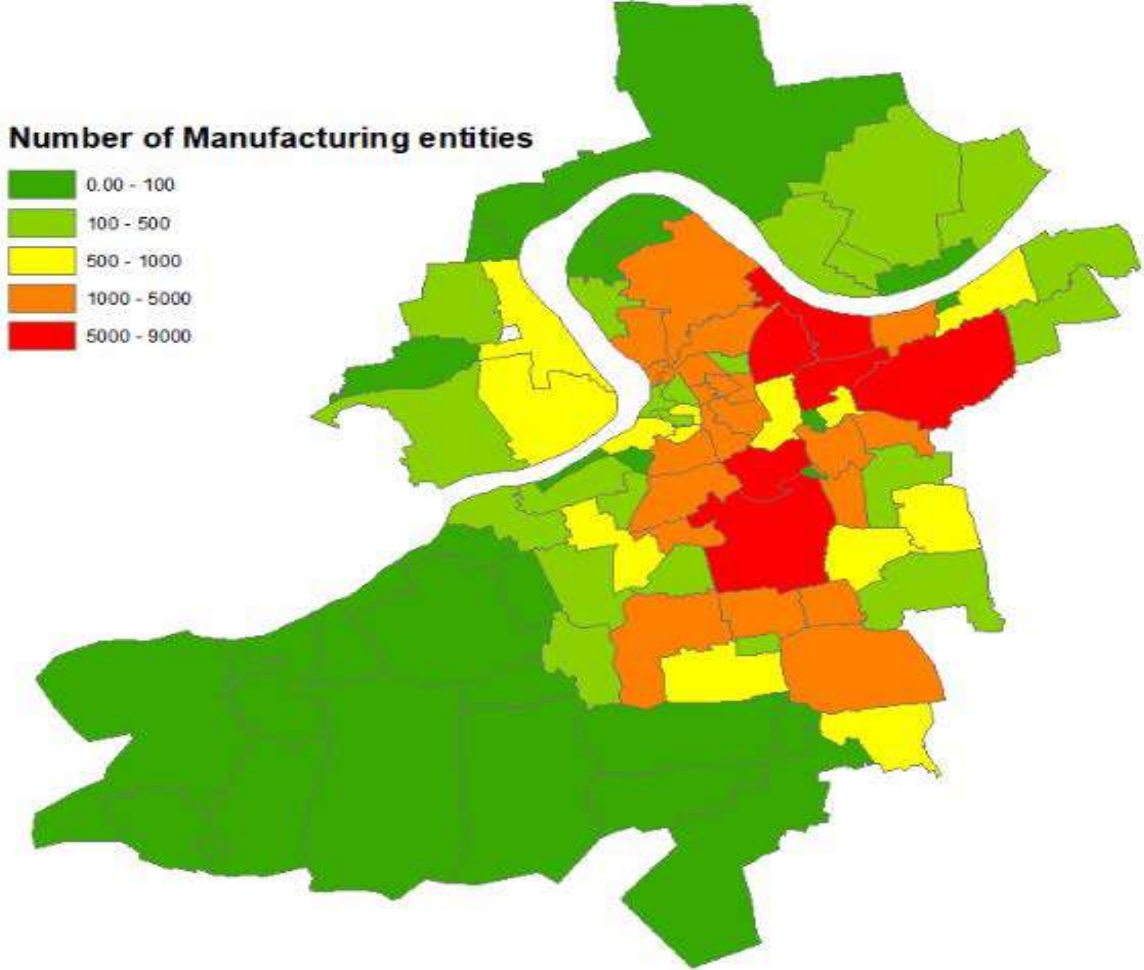
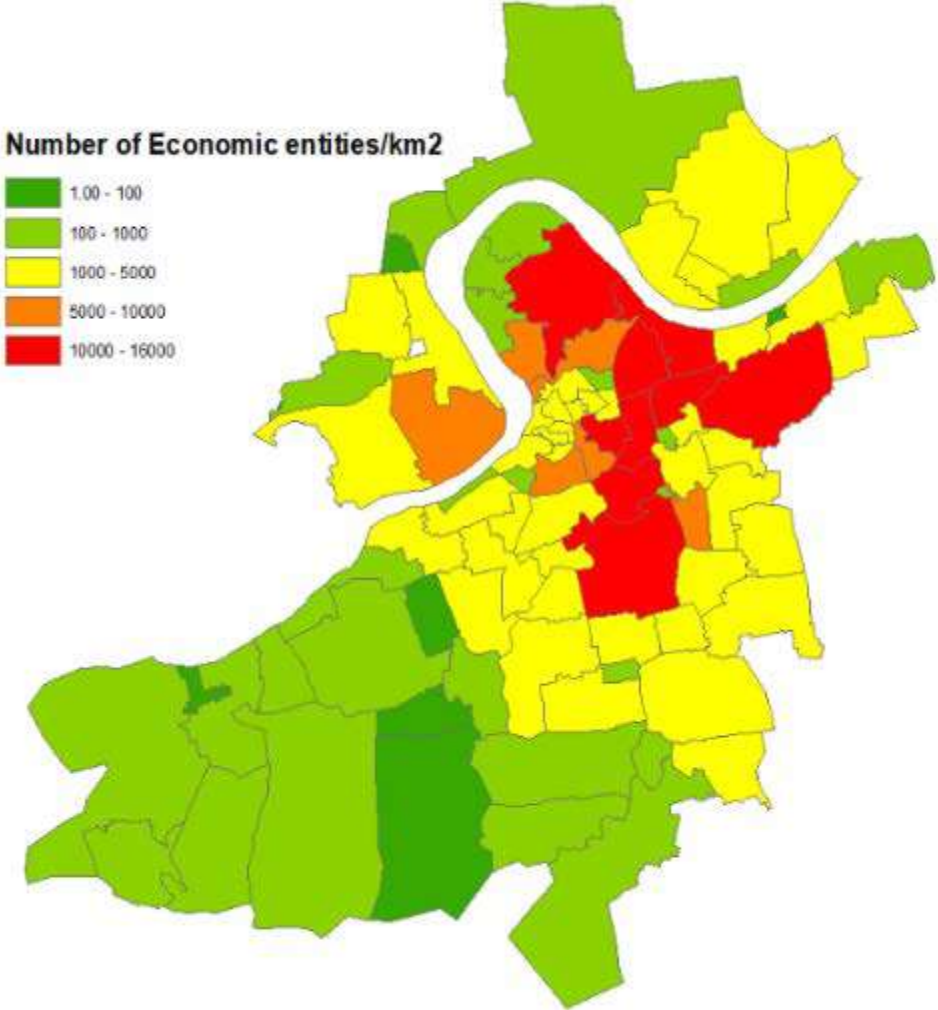


Percentage of workers (main and marginal) working in different manufacturing sectors in Surat Municipal Corporation.

- Textiles
- Other
- Wearing apparel
- Food products
- Fabricated metal products, except machinery and equipment
- Machinery and equipment n.e.c.
- Furniture
- Basic metals
- Wood and products of wood and cork, except furniture;
- Chemicals and chemical products
- Rubber and plastics products
- Electrical equipment
- Other non-metallic mineral products
- Paper and paper products
- Coke and refined petroleum products
- Pharmaceuticals, medicinal chemical and botanical products
- Leather and related products
- Beverages
- Computer, electronic and optical products
- Other transport equipment
- Tobacco products
- Motor vehicles, trailers and semi-trailers



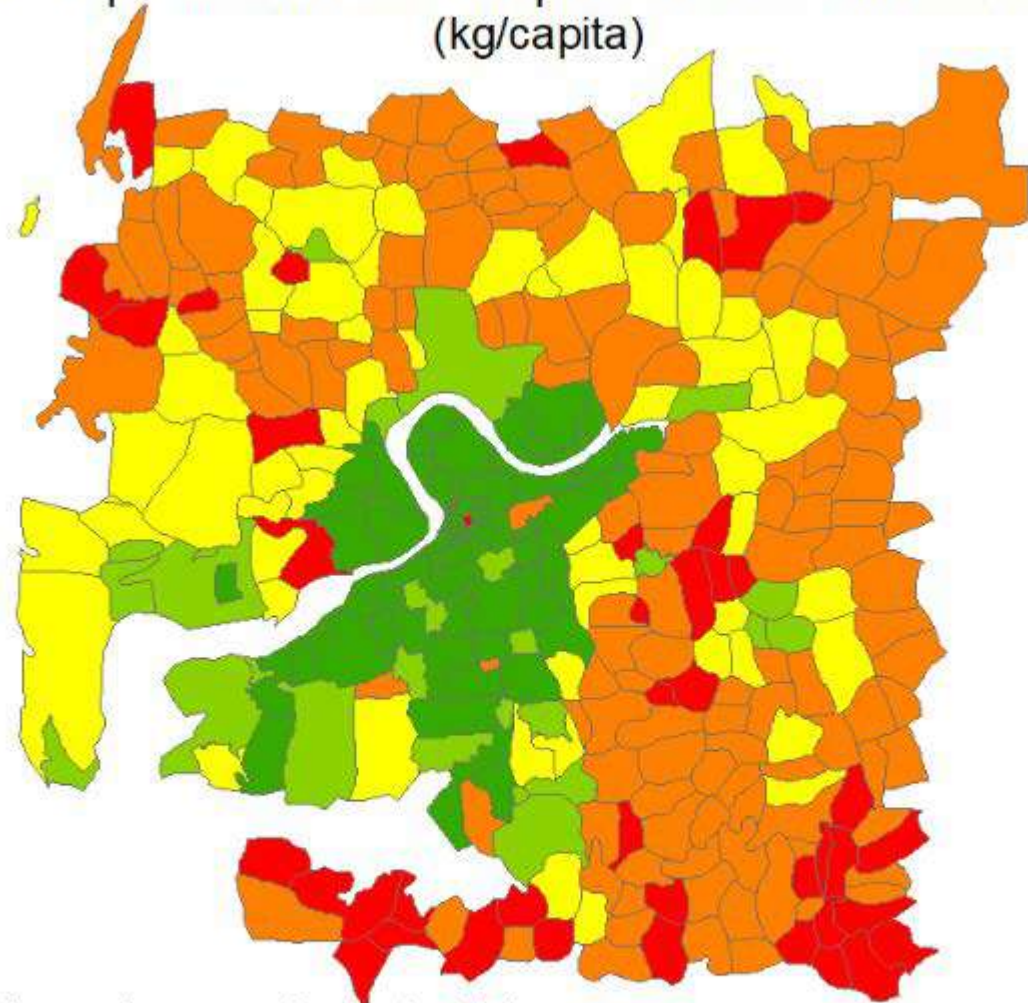
Number of different economic and manufacturing entities in Surat Municipal Corporation.



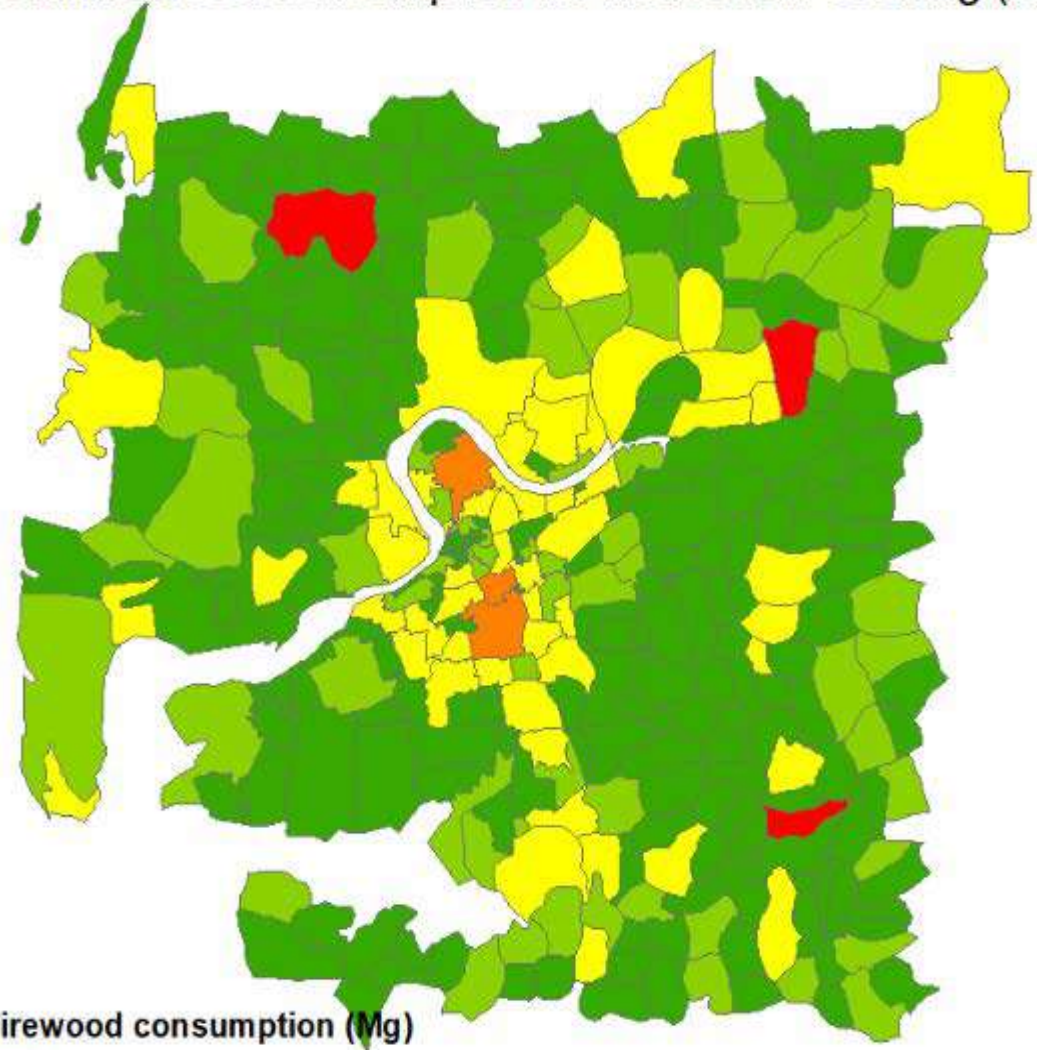
Household Cooking



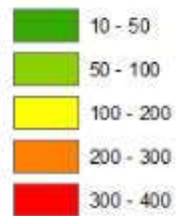
Per capita firewood consumption for household cooking
(kg/capita)



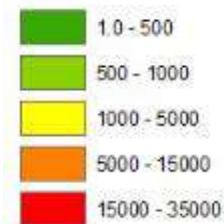
Total firewood consumption for household cooking (Mg)



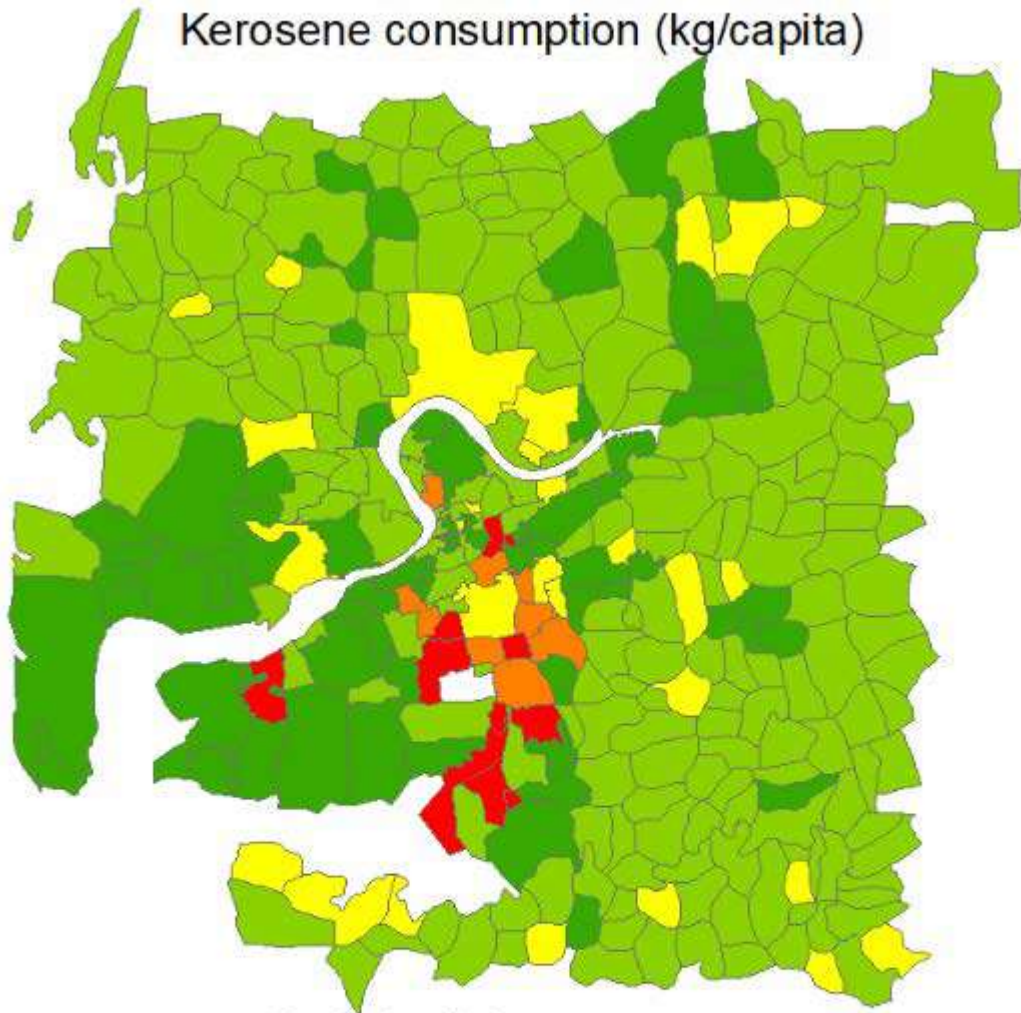
Firewood consumption (kg/capita)



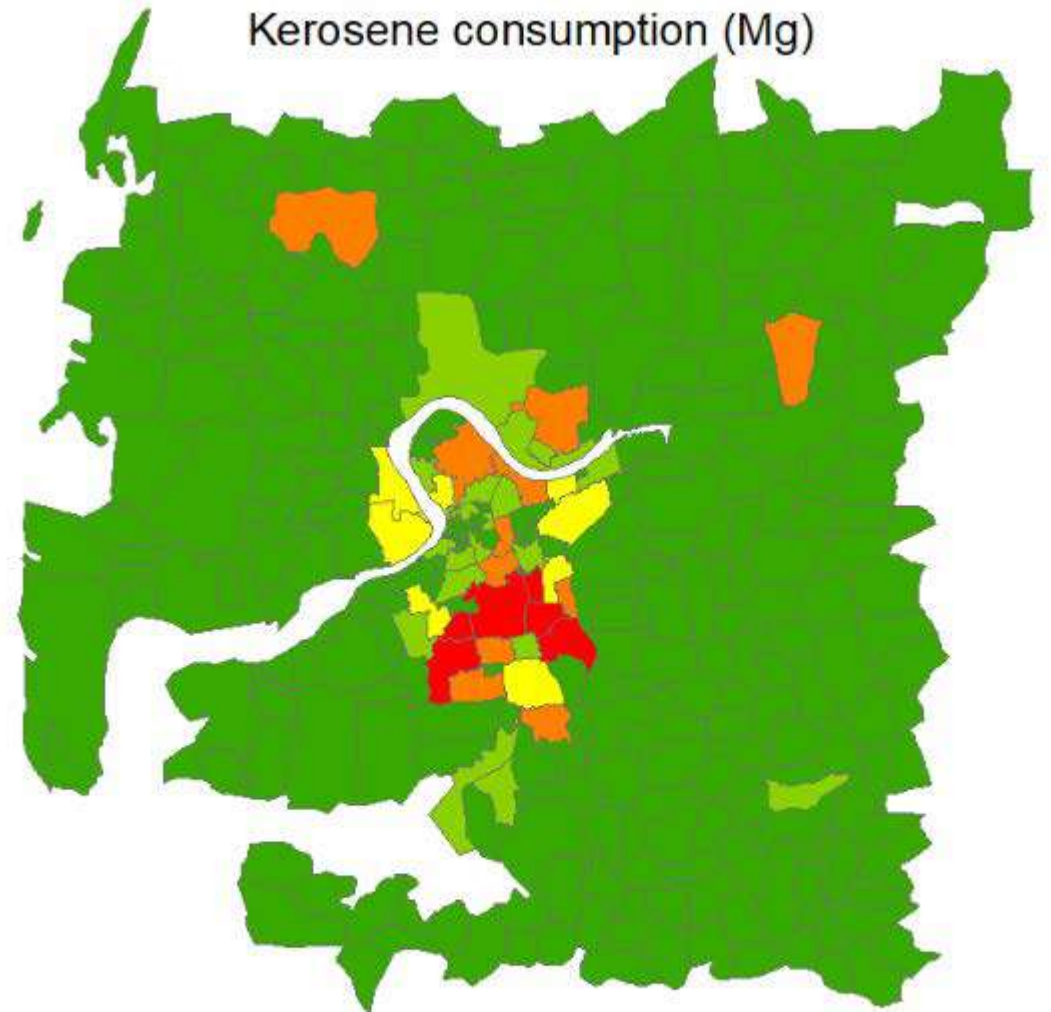
Firewood consumption (Mg)



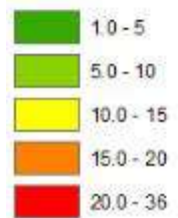
Kerosene consumption (kg/capita)



Kerosene consumption (Mg)



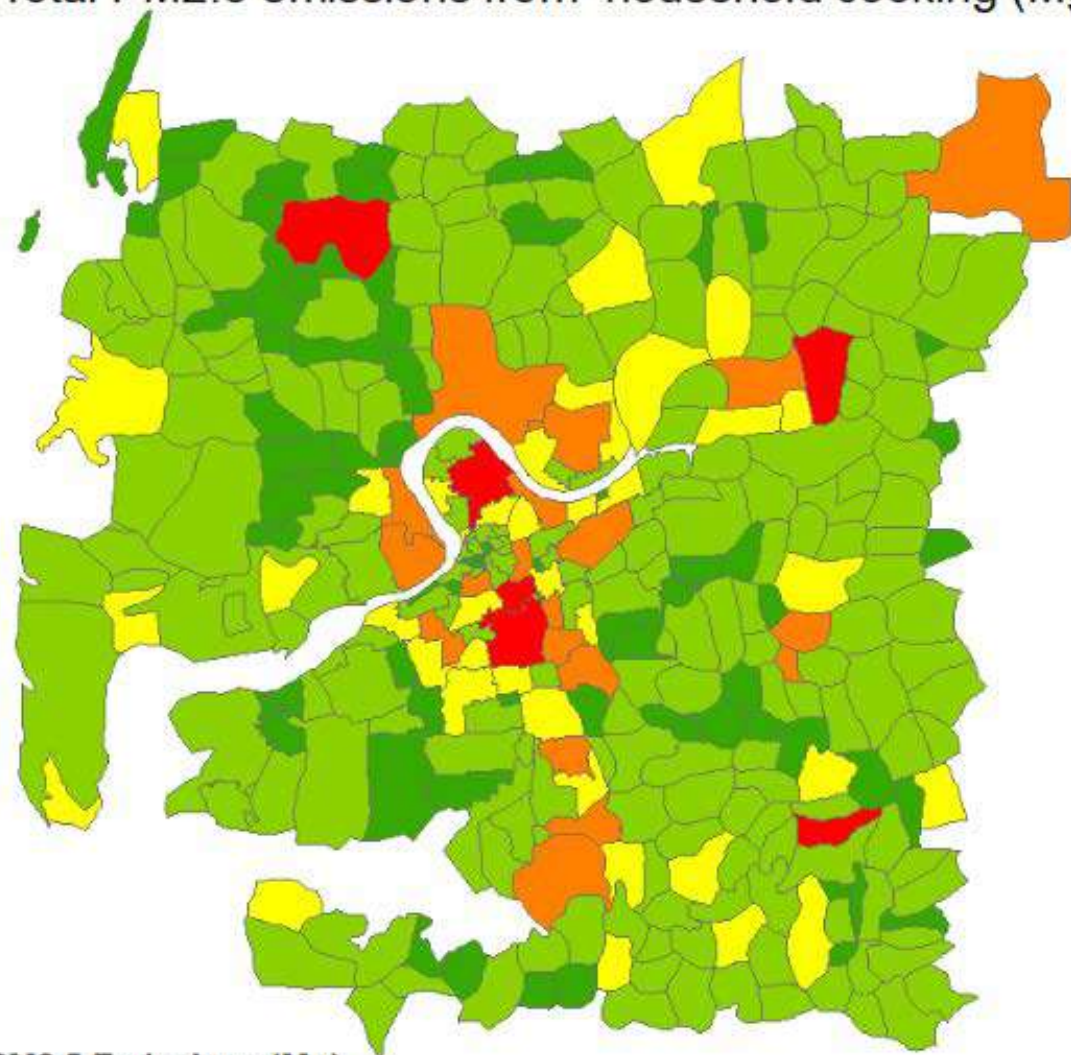
Kerosene consumption (kg/capita)



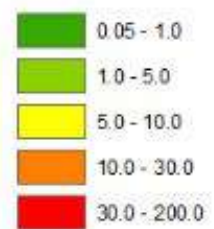
Kerosene consumption (Mg)



Total PM2.5 emissions from household cooking (Mg)

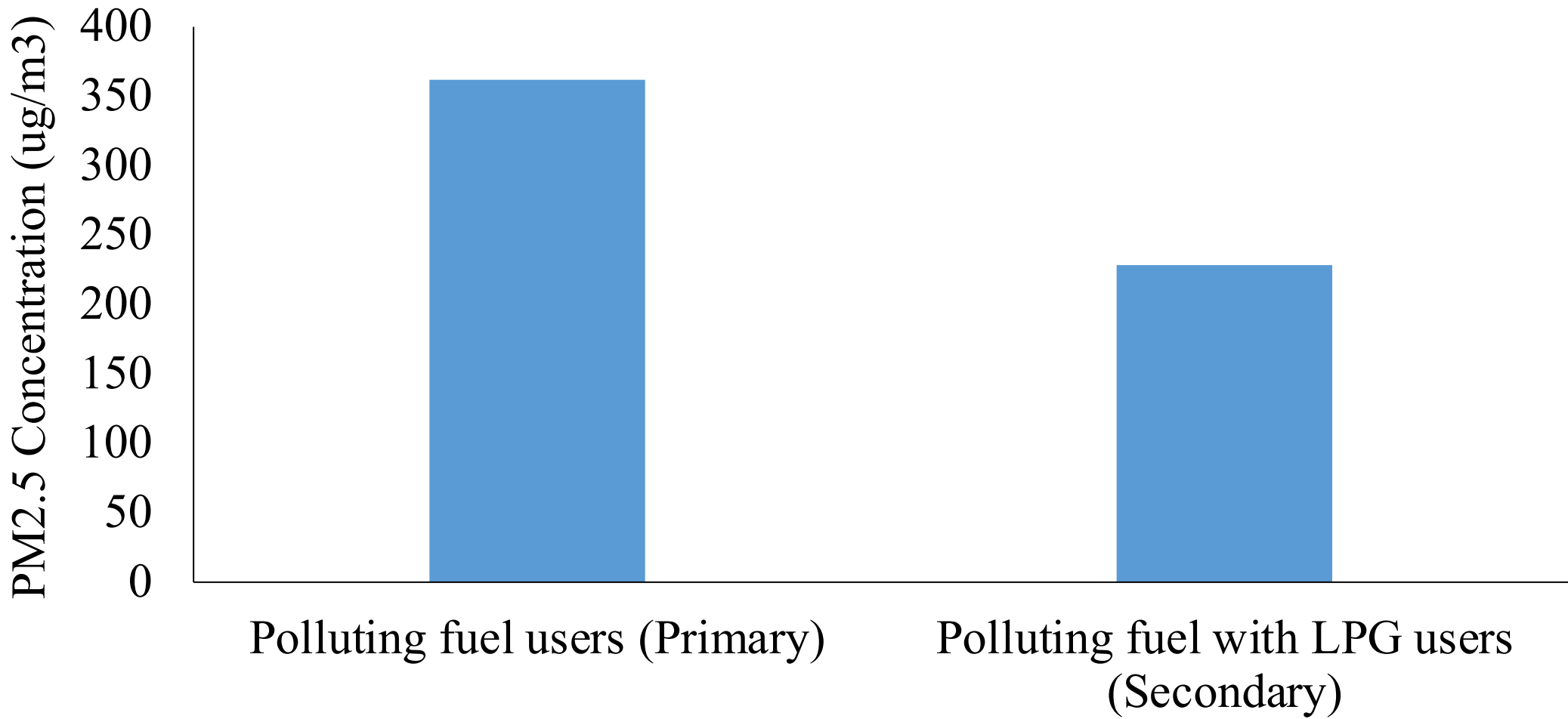


PM2.5 Emissions (Mg)



Modeled Household PM2.5 concentration in Surat

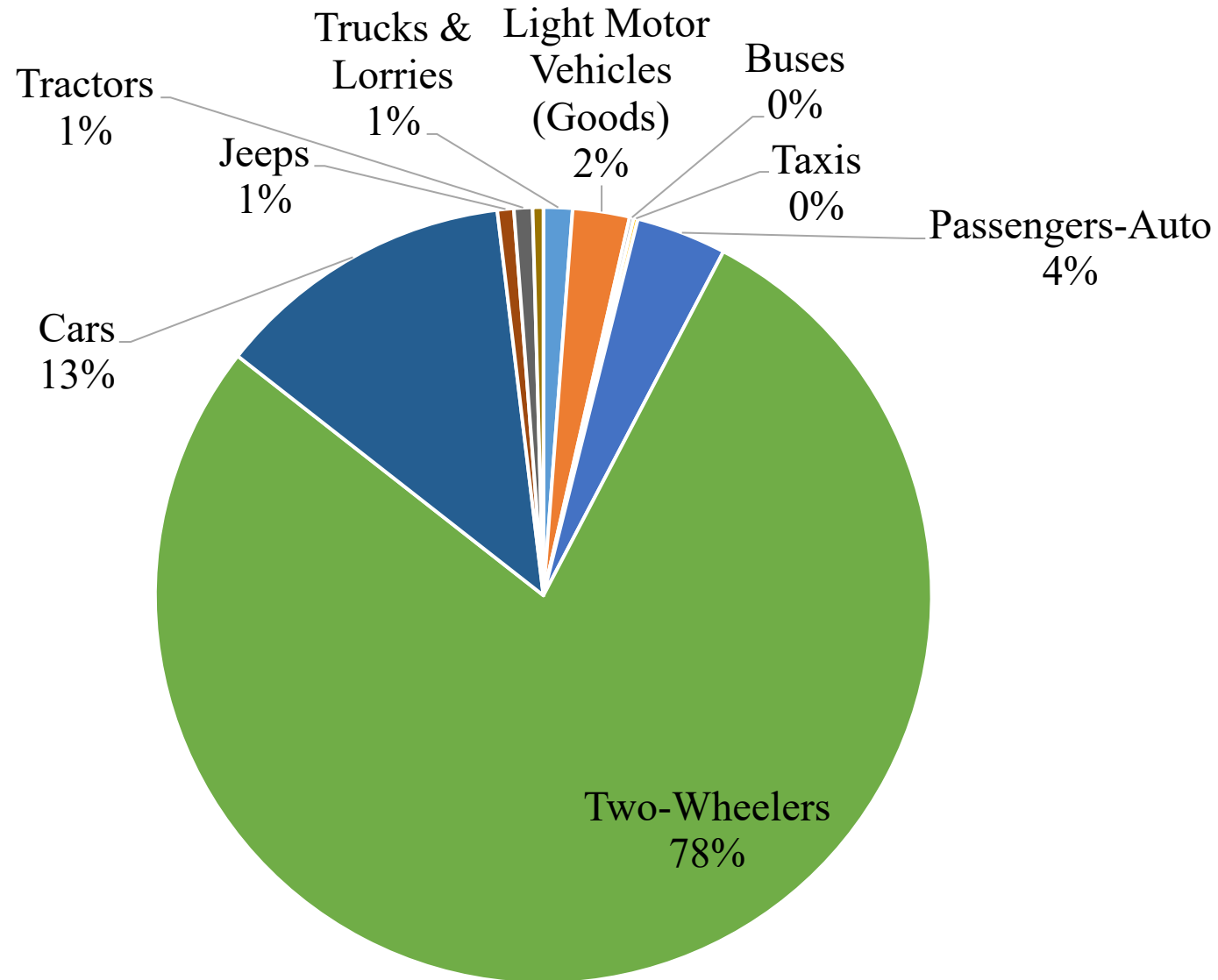
Surat



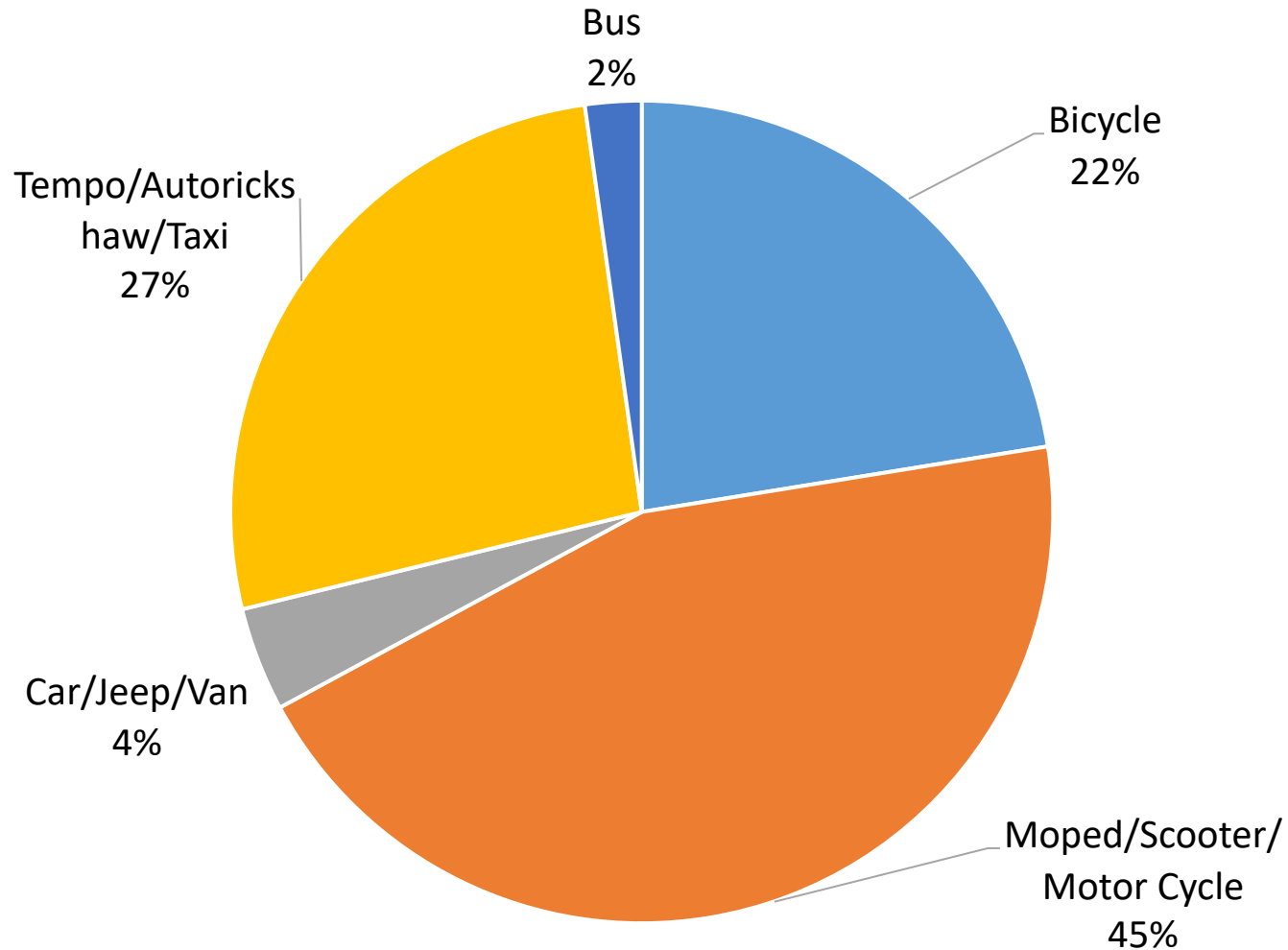
Transportation



Category-wise total registered motor vehicles (transport & non-transport) in Surat as on 31st March 2015

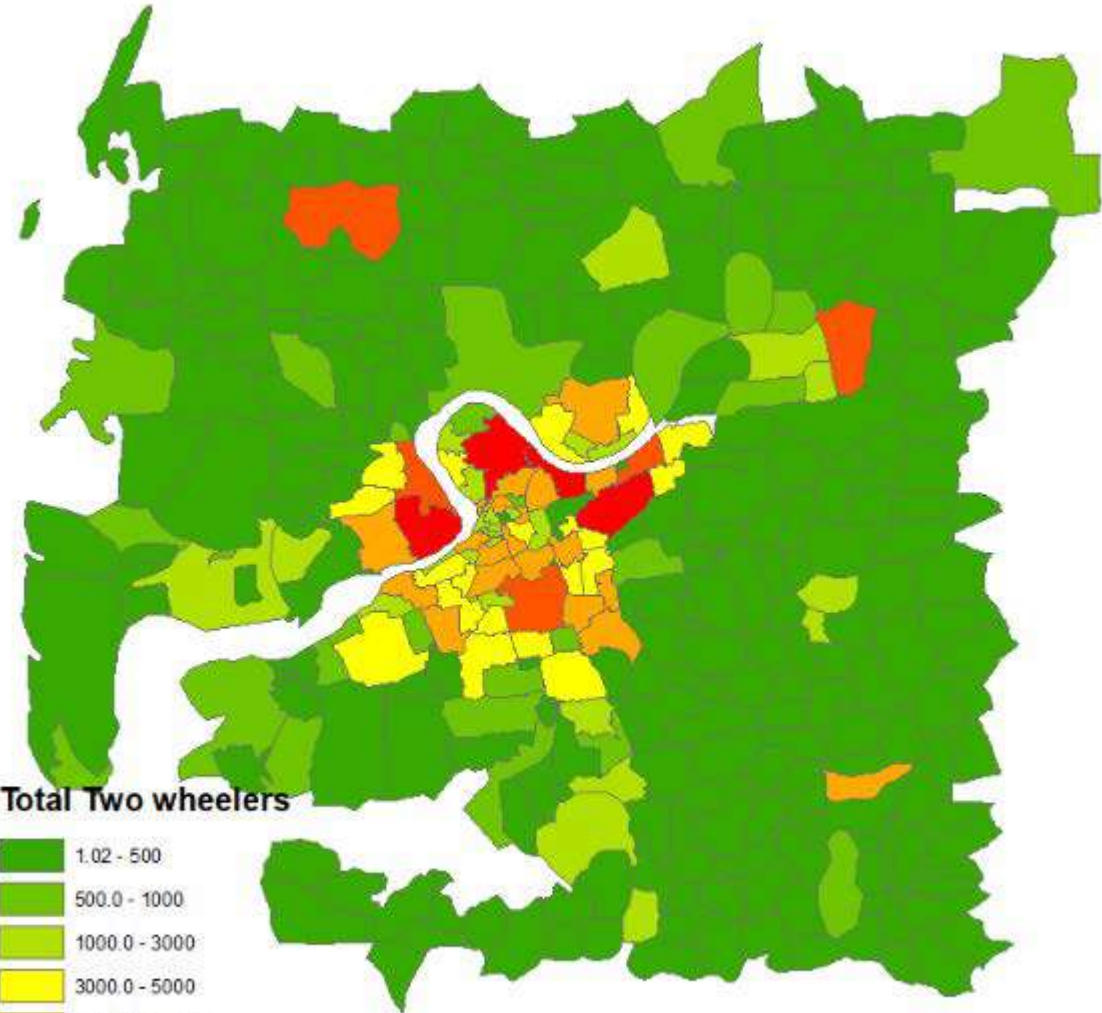
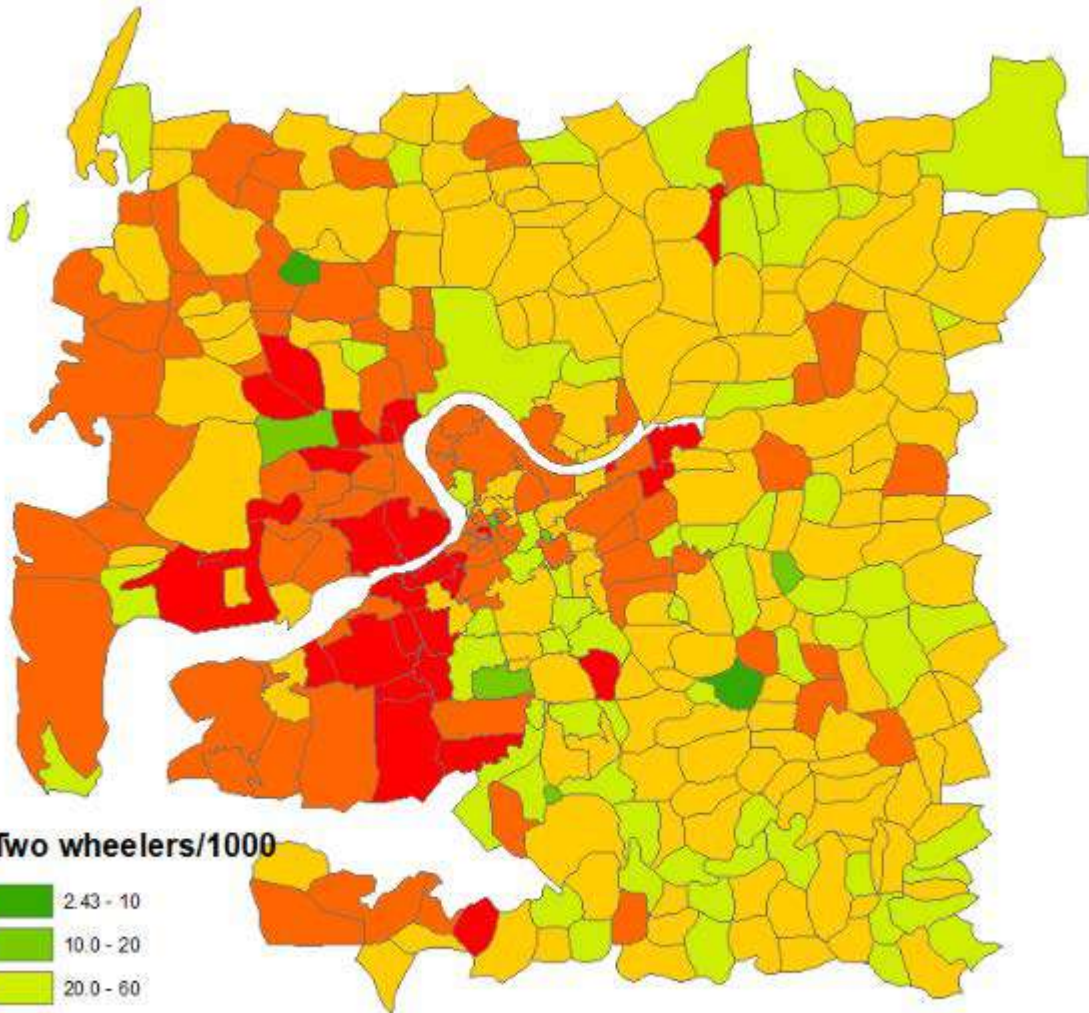


Mode of share for on-road transportation in Surat

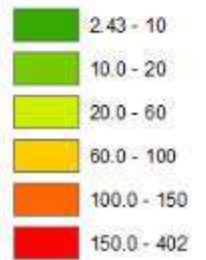


Number of two wheelers/1000 population

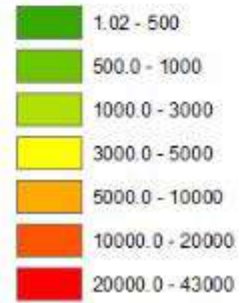
Total number of two wheelers



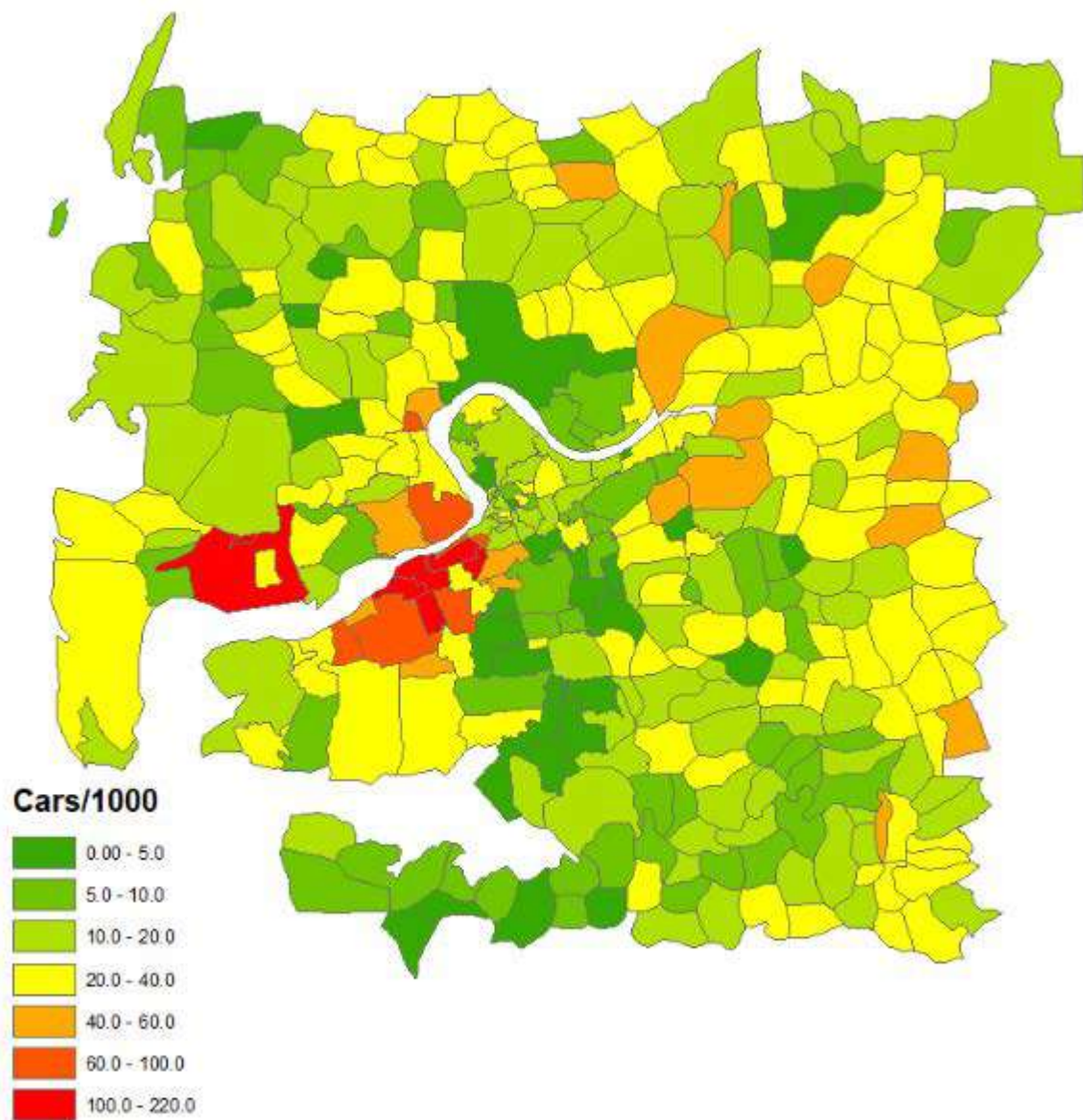
Two wheelers/1000



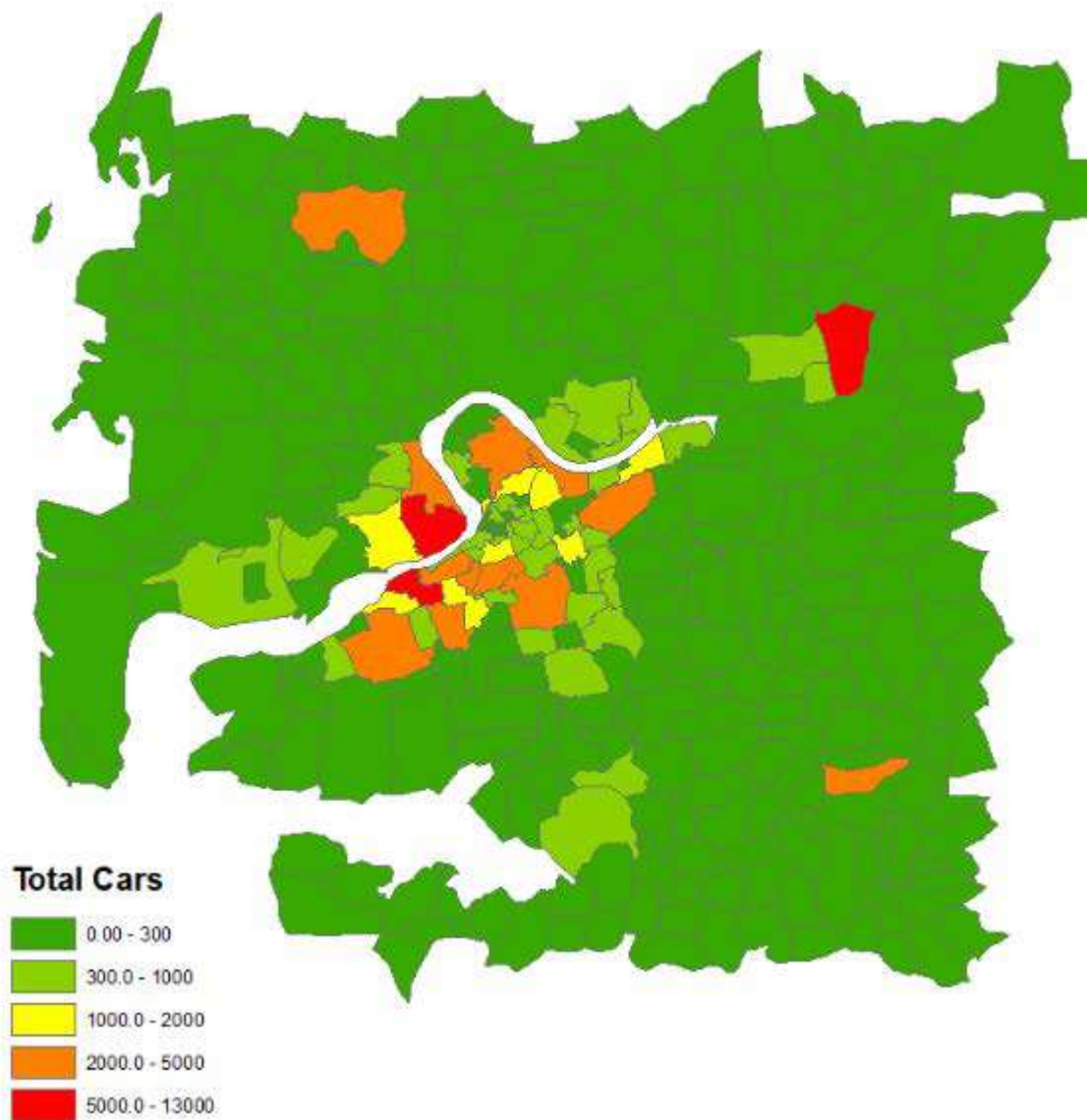
Total Two wheelers



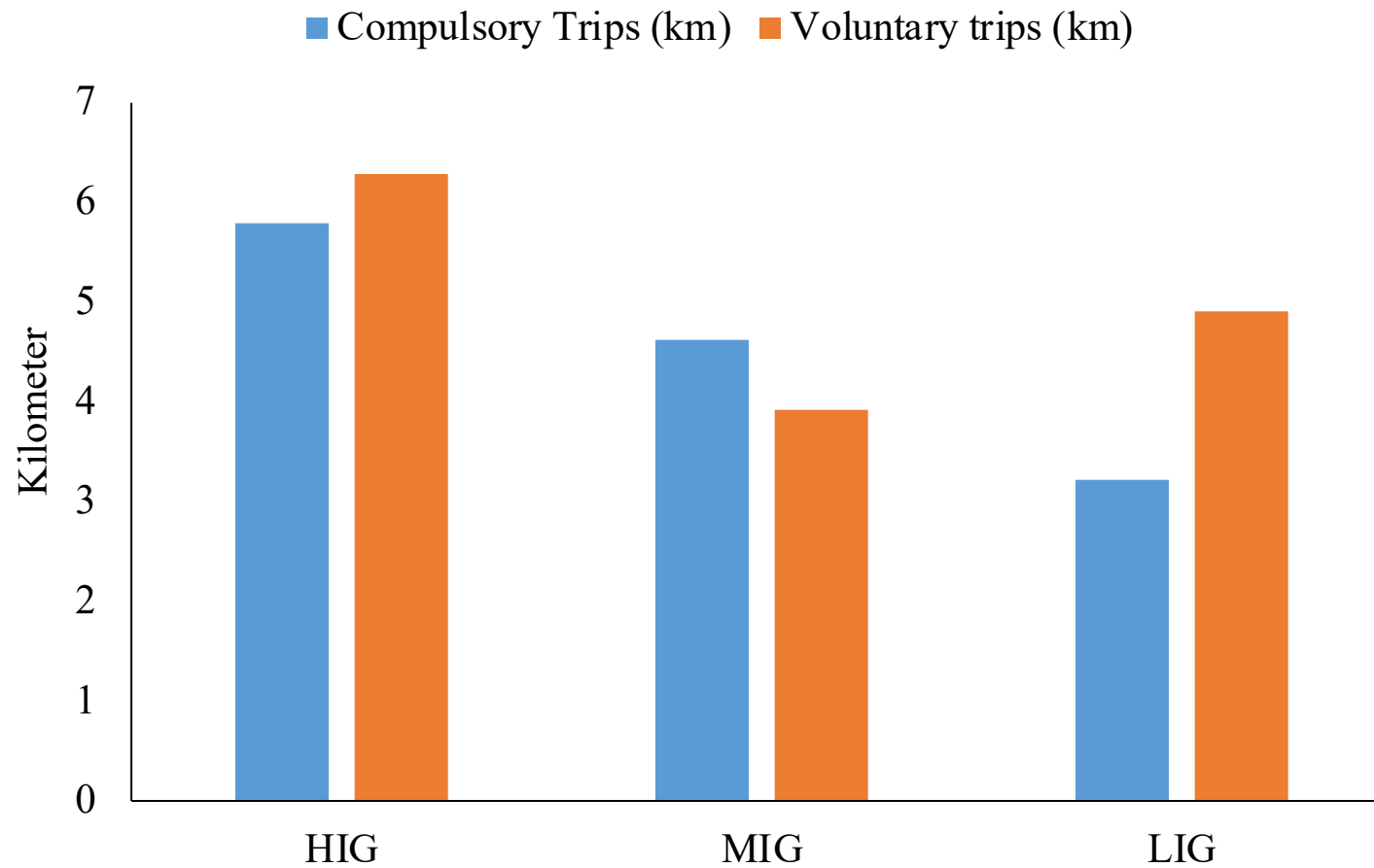
Number of cars/1000 population



Total number of cars owned by households



Average trip length



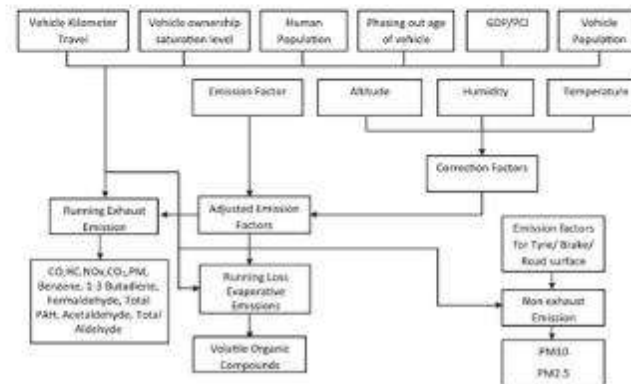
VEHICULAR AIR POLLUTION INVENTORY MODEL



Vehicular Air Pollution Inventory (VAPI) model is an on-road transportation emissions model especially designed for Indian data availability conditions. It is able to estimate exhaust, non-exhaust and evaporative emissions from on-road vehicles.

Home | Urban Infrastructure Database | Air Quality Database | Emission Factors | Solid Waste Database | Important Links | Publications | Collaboration

Vehicular Air Pollution Inventory (VAPI) Model for Developing Countries



Schematic diagram of core architecture of VAPI model.

QUICK START GUIDE

If you would like free copy of VAPI Model please email me at nagpureajay@gmail.com—include your name, business, and full mailing address.

Publications:

Nagpure, A. S., Gurjar, B. R., 2012. Development and Evaluation of Vehicular Air Pollution Inventory Model. Atmospheric Environment 59, 160-169. [Click Here](#)

Nagpure, A. S., Gurjar, B. R., Kumar, P., 2011. Impact of altitude on emission rates of ozone precursors from gasoline-driven light-duty commercial vehicles. Atmospheric Environment 45, 1413-1417. [Click Here](#)

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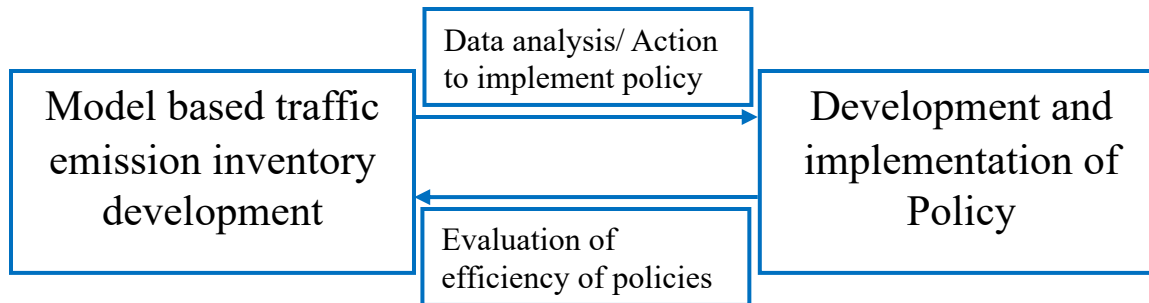


Traffic Emission Model

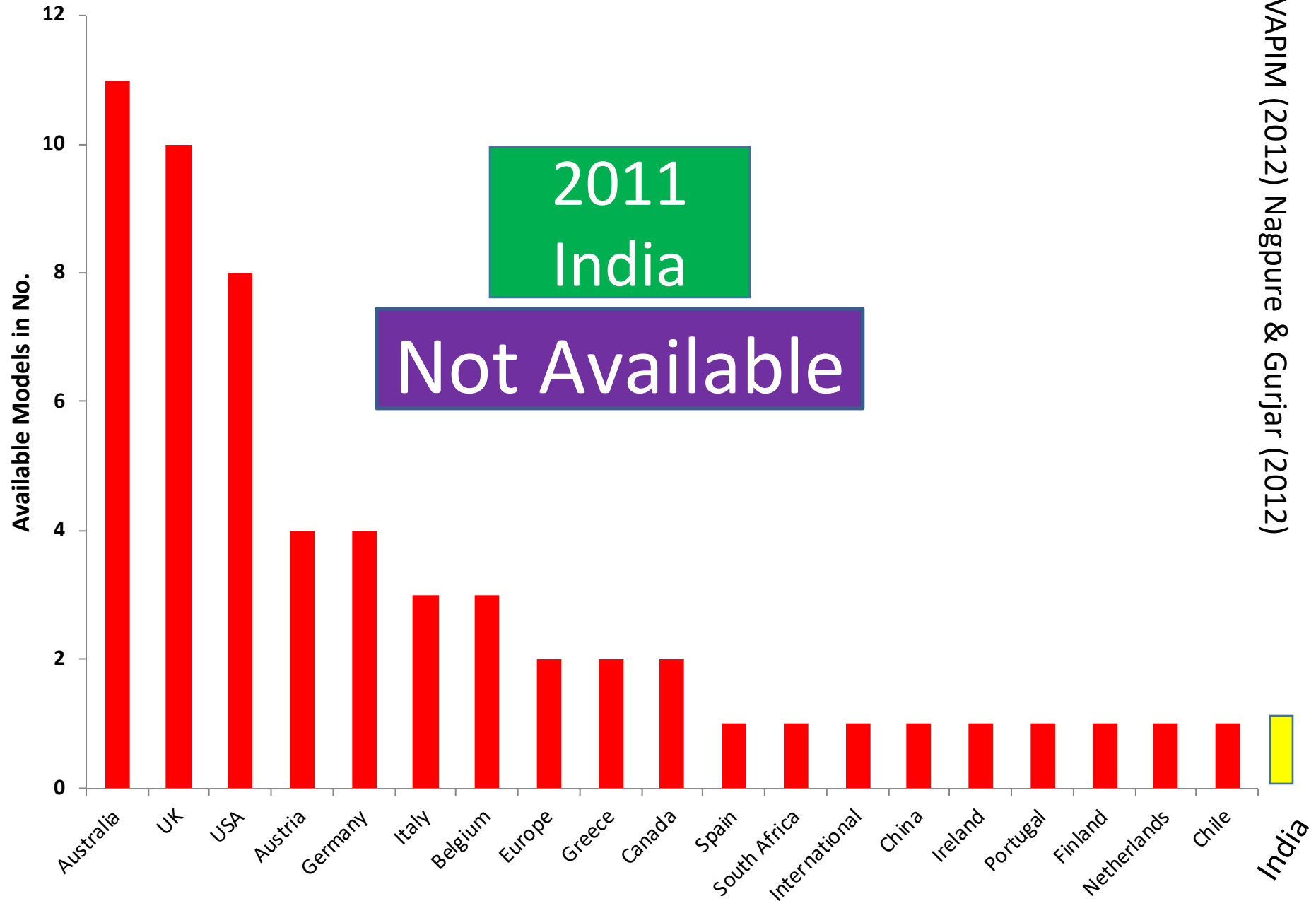
Traffic emission models are the computer program, which estimate emissions released by the vehicles during their operation and other activities during particular time span and region

They predict and evaluate the efficiency of emissions control measures (e.g. policy, technology change etc) in transport sector at local and regional level

Emission models can be used in the context of Decision Support Systems (DSS) to provide the analyst and the decision maker with quantitative estimates, trends, and insight on the policies simulated



Vehicle emissions models in various countries



VAPIM (2012) Nagpure & Gurjar (2012)

SOURCES OF VEHICLE EMISSIONS

Exhaust Emissions



Emissions of pollutants from the combustion process which are released from the tailpipe while a vehicle is operating: CO, HC, NO_x, CO₂, PM, VOC etc.

Evaporative Emissions

• Evaporative Emissions



• Refueling Losses

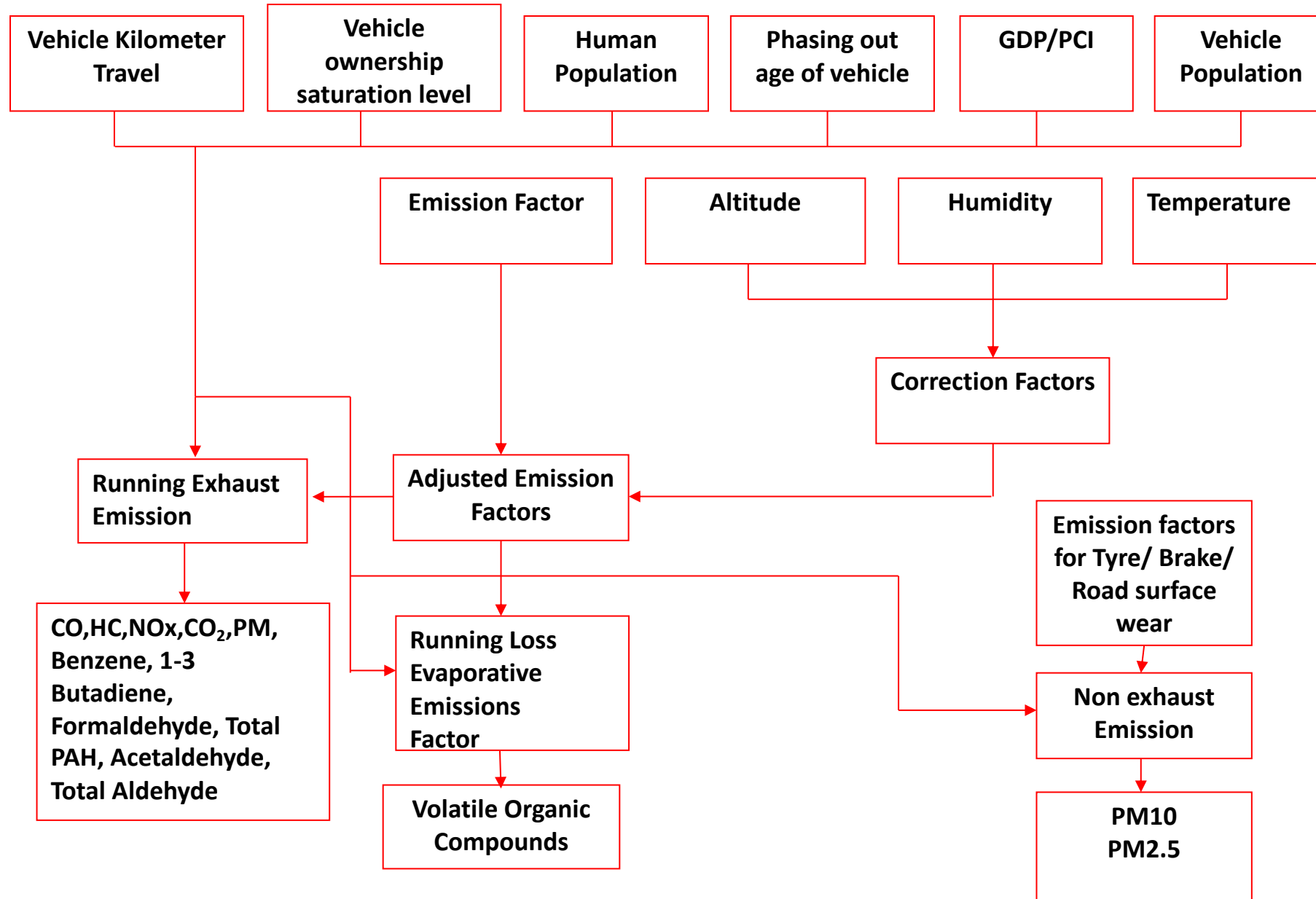
Volatile organic compounds (VOC) also escape into the air through fuel refueling and evaporation.

Non-exhaust Emissions

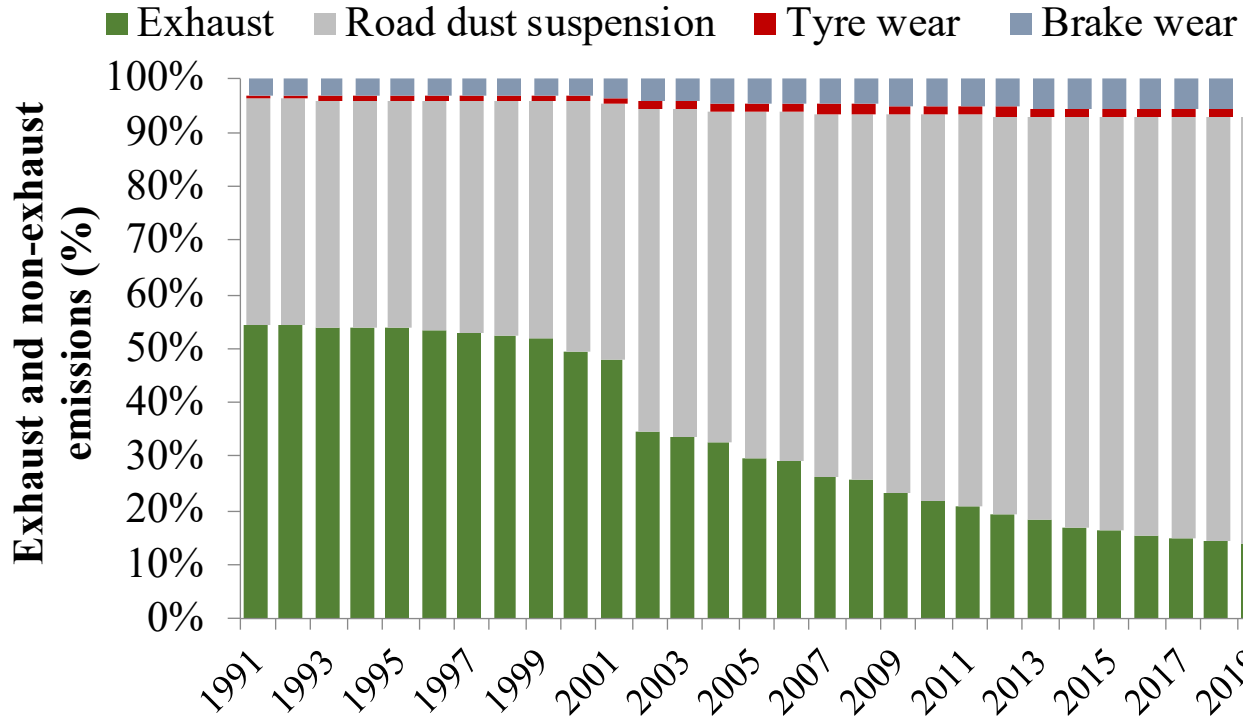
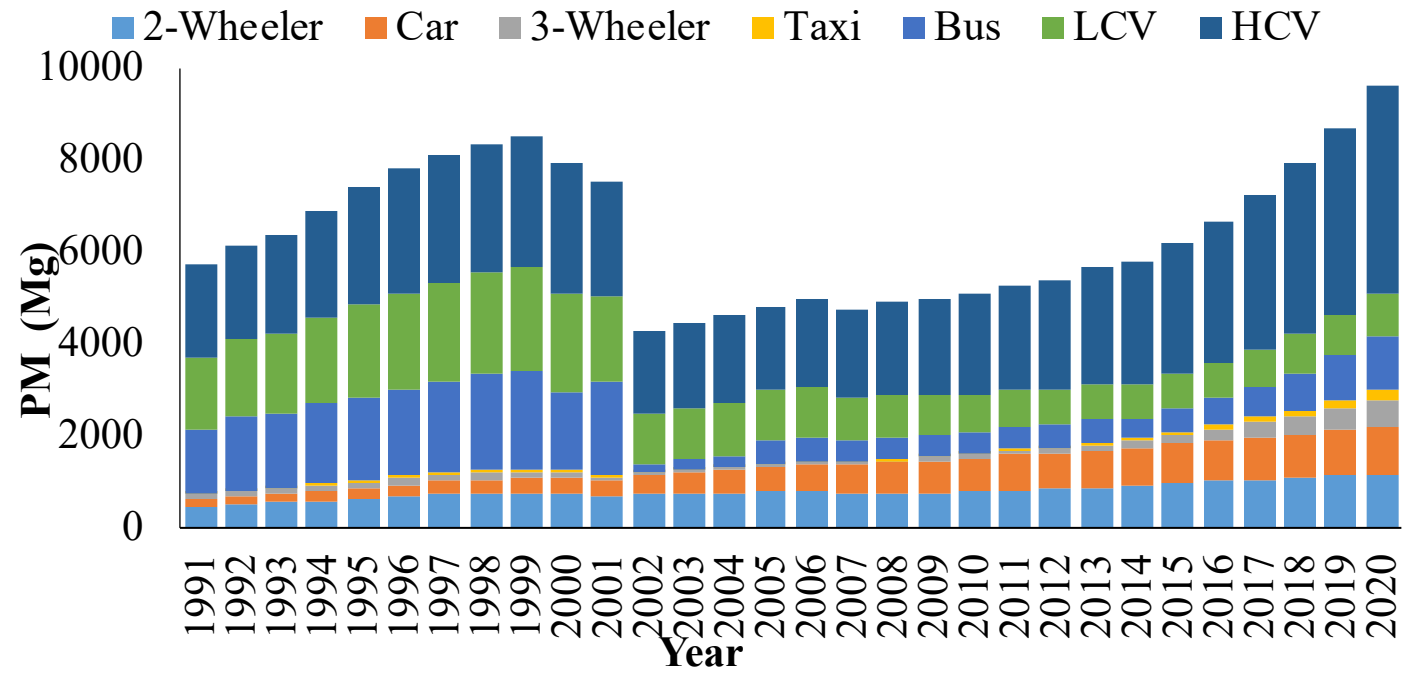


Emissions from tyre and break wear (PM, Dust)

MODEL DESIGN



PM10 from various vehicle categories in Delhi



Contribution of different vehicular sources for PM₁₀ emissions in Delhi