

Urban Mobility Observatories

Session 1: Building a robust urban mobility observatory from scratch

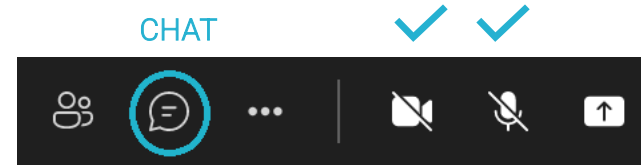
13th of June 2023

Laura Cornelis – Consultant, DVDH

Some general notes on this session



Make sure you are muted and your camera is turned off



This session will be recorded. You will not appear in the recording if your camera is kept off



Include your questions in the chat, we will pose them in the Q&A at the end of the session



Don't hesitate to share your ideas, comments and questions in the chat!

Learning objectives

- Understand the importance of collecting key data regarding urban mobility
- Understand the articulation between key data and the development of indicators for urban mobility
- Appreciate methods of defining urban mobility indicators measures.

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Welcome & Housekeeping

2

Why set up a Mobility Observatory?

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General organisation of the tool

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5

How to calculate the key indicators?

6

Q&A, Feedback and Farewell

Speakers



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Des Villes & Des Hommes



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Nicolas Cruz Gonzalez

Sustainable Mobility Expert
MobiliseYourCity Secretariat

General organisation of the tool

- Purpose of the observatory
- Mobility indicators
- SUMP trajectory
- SUMP management
- Digital participation

How to calculate the key indicators?

- ☒ Data to collect
- ☒ Reference values: are we on the right path?

General organisation of the tool

Purpose of the observatory



Observations



Analysis



Decision making



Purpose of the observatory

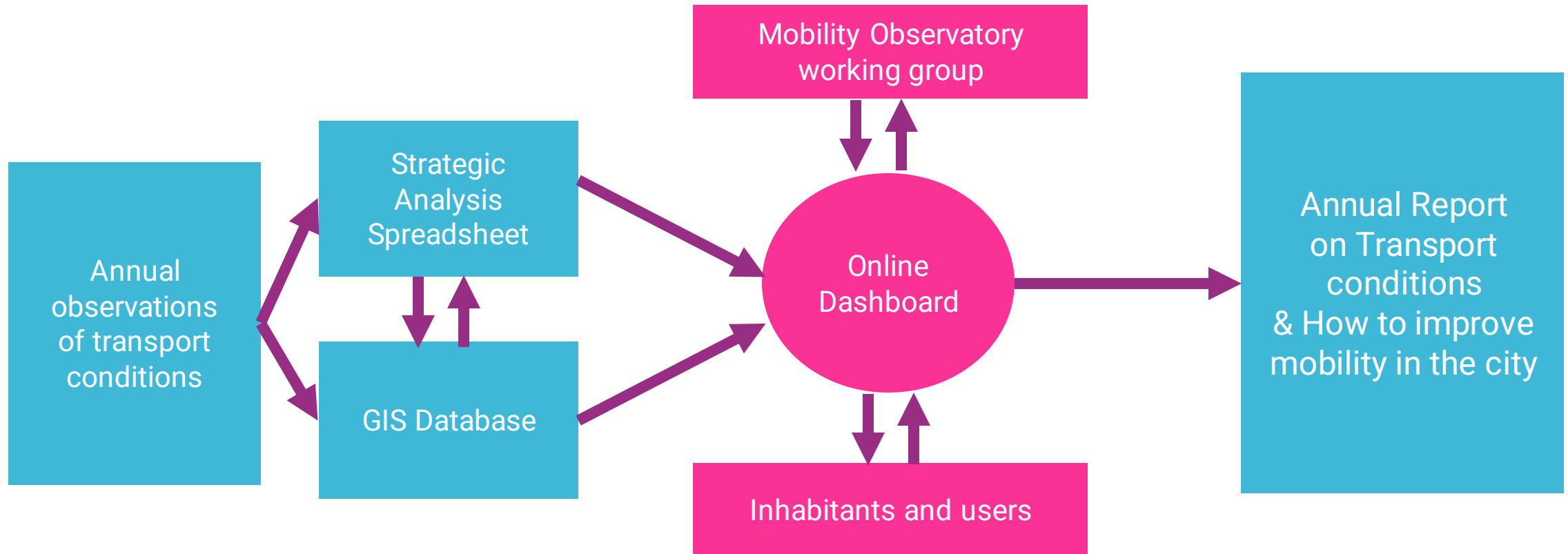
The **purpose** of an observatory of mobility is to **answer 4 questions**

1. Where do we stand regarding mobility?
2. Where do we go? Are we on the right path?
3. How far are we advanced?
4. What do people think of transport conditions and what are their expectations?

We have developed a **simple and visual online tool** which replies to these 4 questions for the cities of Kochi, Ahmedabad and Nagpur in India

The database can be **easily updated each year** with a limited effort of surveys and data collection

The set-up of a Mobility observatory



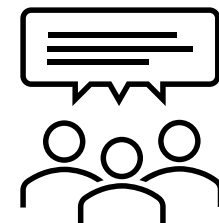
Observations



Analysis



Decision making



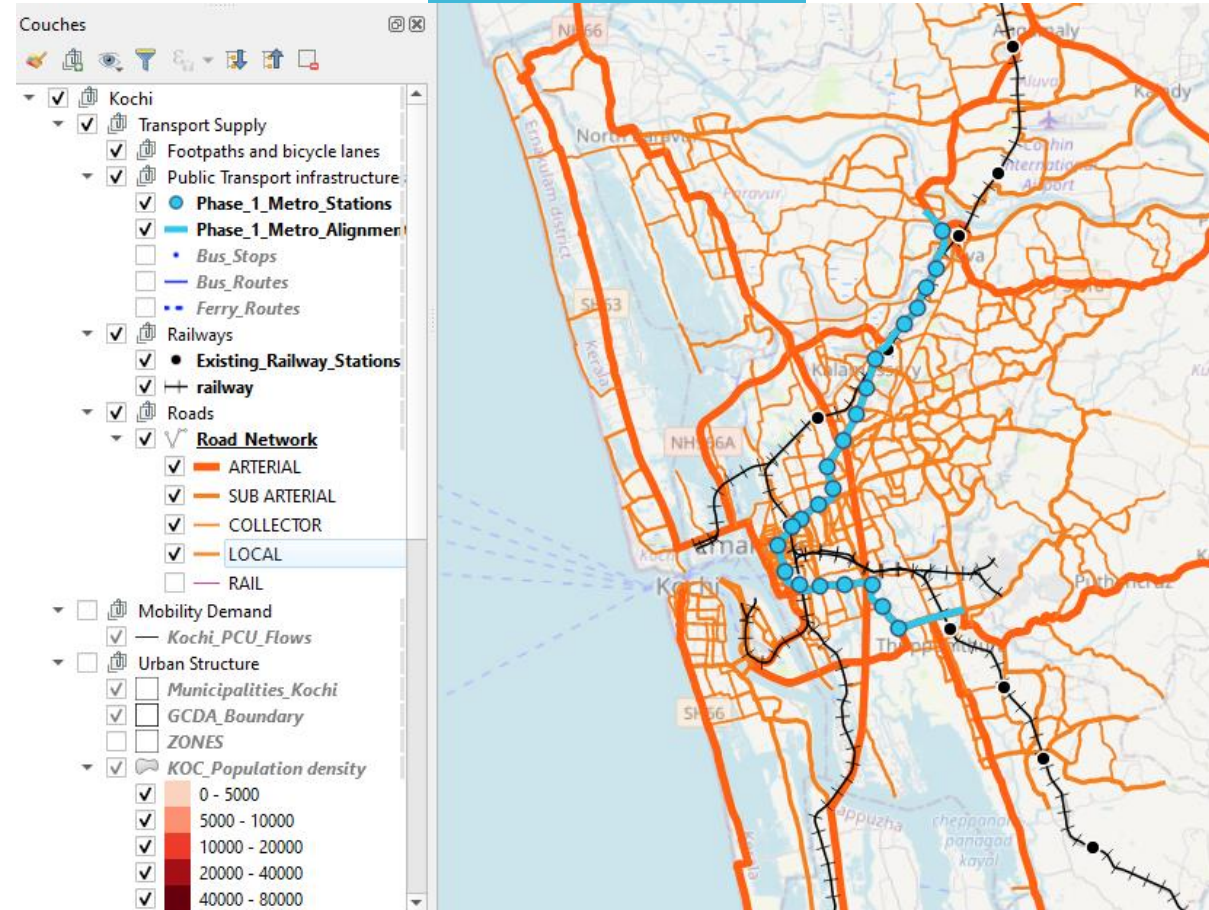
Strategic Analysis Spreadsheet

id	id_sas	Section	1991	2001	2011	2015	2022	2025	2030	2035	2040	2050	Source / Method of calculation
A.1 DEMOGRAPHY AND GDP													
Demography													
12	(a)	Population of urban area (CMP/SUMP perimeter)	1 670 000	1 838 000	2 001 072	2 028 893	2 078 513	2 100 149	2 136 710	2 173 908	2 211 753	2 289 431	Population data census (1991, 2001, 2011) +
13	(b)	Population of urban area (annual growth rate)	0.96%	0.85%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	Calculated from (a) for 2001, 2011. Coming from
14	*	Average household size (Kerala)	5.67	5.58	5.33	5.41	5.40	5.40	5.40	5.40	5.40	5.40	Source: https://globaldatalab.org/areas/data/
15	(c)	Average household size	4.71	4.51	3.77	3.40	2.95	2.78	2.51	2.39	2.27	2.27	Coming from official Kerala data for 1991, 20
16	(d)	Average household size (annual growth rate)	-0.4%	-0.4%	-1.8%	-2.5%	-2.0%	-2.0%	-2.0%	-1.0%	-1.0%	0.0%	Calculated from (c) for previous years. Assun
Surface													
18	*	Urban growth ratio (base 100 in 2022)	40	35	35	35	35	35	35	35	35	35	Analysis of satellite images (Source: Google E
19	(e)	Built up area (sq.km)	302.5	378.2	453.8	479.8	504.2	515.4	531.1	547.2	561.0	589.7	Coming from analysis of satellite images for
20	(f)	Built up area (annual growth rate)	2.3%	1.8%	1.4%	0.7%	0.7%	0.7%	0.6%	0.6%	0.5%	0.5%	Calculated from (e) for previous years. Assun
21	Indicator_1	Indicator #1	5 520	4 860	4 410	4 236	4 122	4 075	4 023	3 973	3 942	3 882	=(a)/(e)
Gross Domestic Product													
23	(g)	GDP per inhabitant PPP (\$ 2011)	2 448	3 633	6 000	7 719	9 493	10 373	12 026	13 277	14 659	16 193	Coming from official statistics for Kerala up
24	(h)	GDP per inhabitant PPP (annual growth rate)	4.0%	5.2%	6.5%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	1.0%	Calculated from (g) up to 2011. Coming from
A.2 MOBILITY DEMAND													
Coming from the RITES study for 2001, other s transport 2022 come from SYSTRA study.													
Number of trips per mode													
27		Trips_PublicTransport	976 518	1 107 970	1 040 000	885 032	976 938	1 238 601	1 441 689	1 516 334	1 554 981	1 683 979	
28		Trips_Minibus											
29		Trips_Bus											
30		Trips_BRT	837 951	959 403	901 433	746 465	900 000	1 090 663	1 183 751	1 108 396	1 147 043	1 276 041	
31		Trips_Tramway											
32		Trips_Metro	0	0	0	0	52 000	80 000	150 000	250 000	250 000	250 000	
33		Trips_Train	7 938	7 938	7 938	7 938	7 938	7 938	7 938	7 938	7 938	7 938	
34		Trips_Ferry	130 629	130 629	130 629	130 629	17 000	60 000	100 000	150 000	150 000	150 000	
35		Trips_Private-modes	96 276	198 178	560 054	906 104	1 073 649	934 383	810 950	746 851	765 886	829 422	
36		Trips_2W	27 508	80 221	280 000	547 877	663 531	564 976	450 528	407 373	417 756	452 412	
37		Trips_3W	41 261	60 741	100 054	147 505	164 047	152 109	146 422	135 791	139 252	150 804	
38		Trips_4W	27 508	54 215	180 000	210 722	246 070	217 298	214 001	203 687	208 878	226 206	
39		Trips_Bicycle	27 508	33 674	40 021	63 217	72 374	76 694	140 790	150 879	331 553	386 677	

Sub-section
Indicator

Source: CMP
Source: other official study
Consultant Assumptions
Consultant Estimations

GIS Database



Online Dashboard

Urban Mobility Observatories



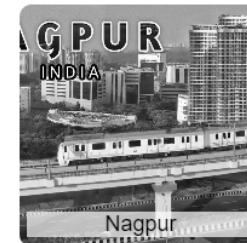
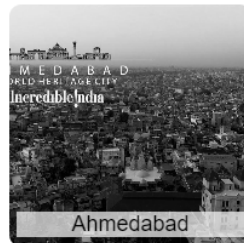
The Urban Mobility Observatories present a complete analysis of interesting mobility data coming from indian cities. **Ahmedabad, Kochi** and **Nagpur** are the three first cities to benefit from this tool.

A set of mobility indicators has been defined to measure the evolution of the urban mobility characteristics and to follow-up the implementation of the Comprehensive Mobility Plan (CMP) or Sustainable Urban Mobility Plan (SUMP) in each city. This Measure, Report, Verify (MRV) tool focuses on the reduction of transport-related GHG emissions, as per MobiliseYourCity objectives ([more here](#)).

The Urban Mobility Observatories comprise the following sections:

- **MOBILITY INDICATORS**, with a set of 20 indicators to understand the past trends
- **SUMP TRAJECTORY**, to look at the future trends in terms of mobility and verify that the objectives are met for 2050
- **SUMP MANAGEMENT**, to follow-up the implementation of the SUMP or CMP action plan
- **DIGITAL PARTICIPATION**, to collect your feedback and perception on the current mobility conditions

Thank you for visiting.



The set-up of a Mobility observatory

We propose to organize the online tool according to 4 components bringing some responses to the 4 main questions

1/ Where do we stand regarding mobility?

2/ Where do we go? Are we on the right path?

3/ How far are we advanced?

4/ What do people think of transport conditions and what are their expectations?

MOBILITY INDICATORS

SUMP TRAJECTORY

SUMP MANAGEMENT

DIGITAL PARTICIPATION

1/ Where do we stand regarding mobility?



MOBILITY INDICATORS

SUMP TRAJECTORY

SUMP MANAGEMENT

DIGITAL PARTICIPATION

Kochi

Build Date: 12/7/2022, 4:25:44 PM

Indicators

- Urban Structure
 - Population density
- Mobility Demand
- Transport Supply
- Motorisation
- Externalities
- Economics of mobility

Year 2015

Map

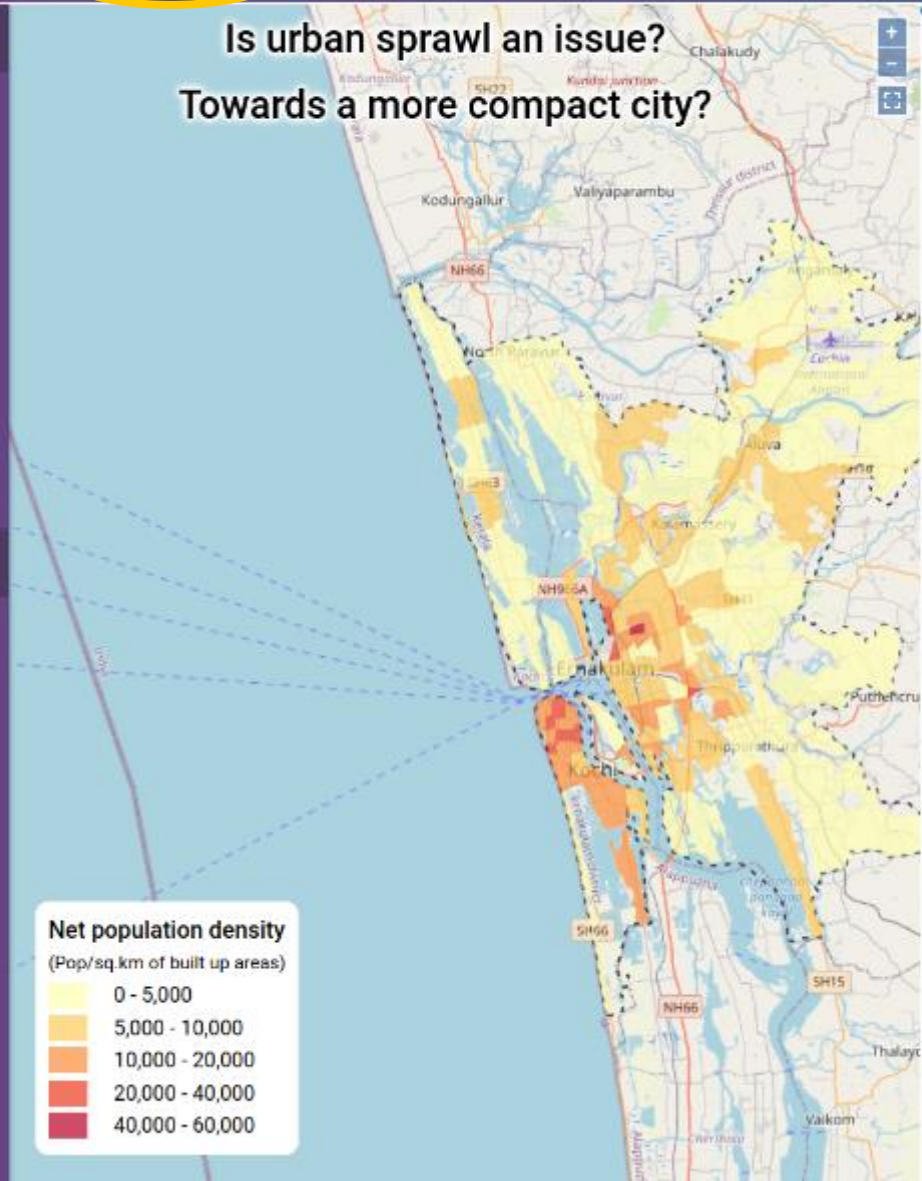
- View the map
- Metropolitan area
- Urban Structure
 - Net population density
 - Zoning

Net population density

(Pop/sq.km of built up areas)



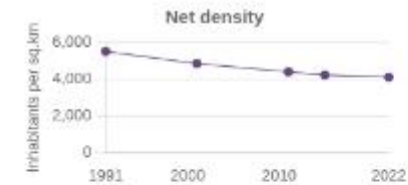
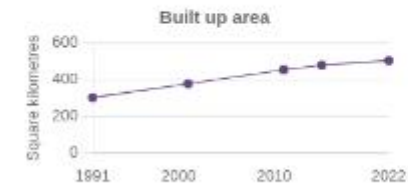
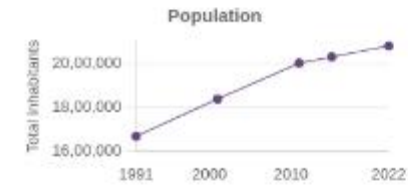
Is urban sprawl an issue?
Towards a more compact city?



Urban Structure

Net density of population

4,240 inhabitants per sq.km



1/ Where do we stand regarding mobility?

Urban Mobility Observatory
20 key indicators

- 6 sub-sections
 - Demography
 - Mobility demand
 - Transport supply
 - Motorisation
 - Externalities
 - Economics

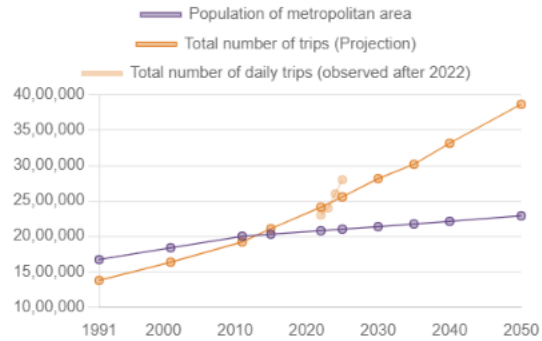
- 20 indicators



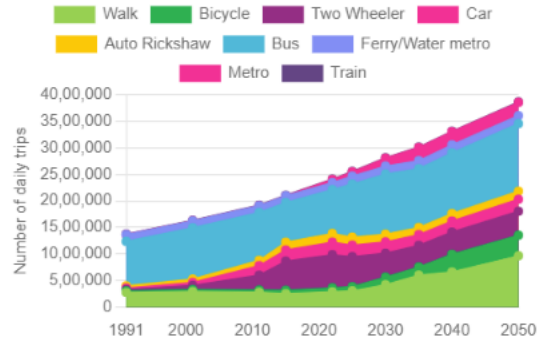
Indicator	Usual range	Unit	Methodology for annual update
A.1 DEMOGRAPHY			
1	Net population density for built up areas	2,000 - 10,000 inhabitants / sq.km	Analysis of satellite photos
A.2 MOBILITY DEMAND			
2	Average number of trips per inhabitant	1.00 - 4.00 trips / day / inhabitant	Annual calculation using Household surveys results (no annual update) and demographic evolution.
3	Immobility rate	10 - 50% % per day of population staying at home	Annual calculation using Household surveys results (no annual update) and demographic evolution.
4	Average trip length for mechanised modes	5.00 - 10.00 km / mechanised trip	Annual calculation using Household surveys results (no annual update) and demographic evolution.
5	Modal share for Public Transportation	10 - 60% % of all trips	Annual calculation using Household surveys results (no annual update) and demographic evolution.
A.3 TRANSPORT SUPPLY			
6	Road network extension per lakh population	50 - 250 km / lakh inhabitants	Annual statistics coming from local government
7	Mass transit system extension per lakh population	0 - 10 km / lakh inhabitants	Annual statistics coming from local government, or operator
8	Footpaths extension per lakh population	0 - 50 km / lakh inhabitants	Annual statistics coming from local government
9	Bicycle lanes extension per lakh population	0 - 50 km / lakh inhabitants	Annual statistics coming from local government
10	Number of buses per lakh population	50 - 150 buses / lakh inhabitants	Annual statistics coming from local government, or operator
11	Bus seat kilometers per lakh population	0 - 1 seat km / lakh inhabitants	Annual statistics coming from local government, or operator
12	Number of active IPT vehicles per lakh population	0 - 1,000 IPT vehicles / lakh inhabitants	Annual statistics coming from local government
A.4 MOTORIZATION			
13	Number of cars per 1,000 population	20 - 750 cars / 1,000 inhabitants	Annual statistics coming from local government
14	Number of motorcycles per 1,000 population	50 - 600 motorcycles / 1,000 inhabitants	Annual statistics coming from local government
A.5 EXTERNALITIES			
15	Traffic fatalities per lakh population	2 - 30 fatalities / lakh inhabitants	Annual statistics coming from local government
16	Air Quality (PM10)	5 - 100 µg / m3	Annual average coming from local measurement stations
17	GHG emissions for transport sector	100 - 1,000 kgCO2 / year / inhabitant	Annual calculation using MYC tool
A.6 ECONOMICS			
18	Household budget dedicated to transportation in low-income families	5 - 25% % of household budget	Annual calculation using statistics on GDP evolution and average monthly expenditures per household per month
19	Average annual budget for investment in Public Transport in the last 10 years	0 - 20,000 INR / inhabitant / year	Annual statistics coming from local government, or operator
20	Annual budget for operations and administration of urban mobility	0 - 10,000 INR / inhabitant / year	Annual statistics coming from local government, or operator

2/ Where do we go? Are we on the right path?

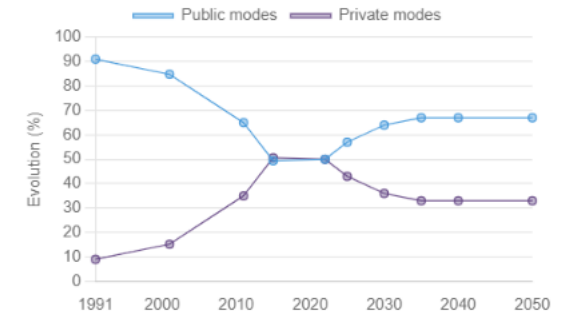
Population and mobility



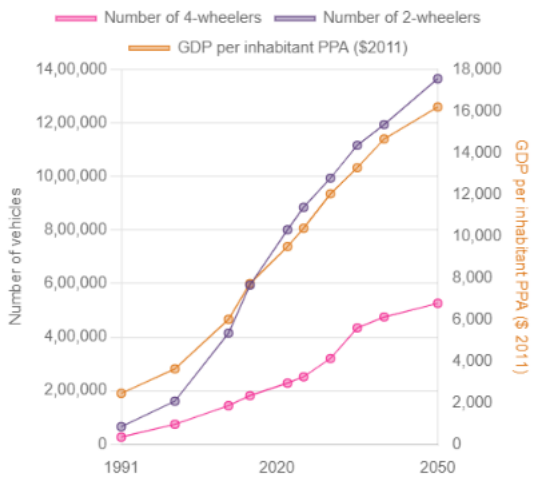
Daily number of trips per mode



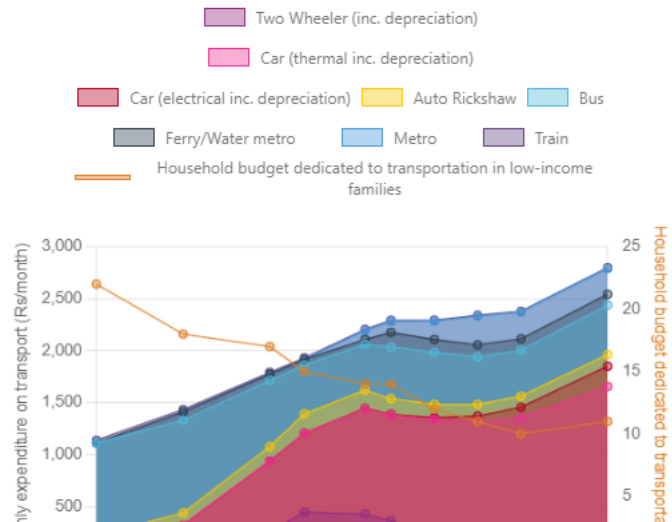
Modal share evolution between private modes and public modes



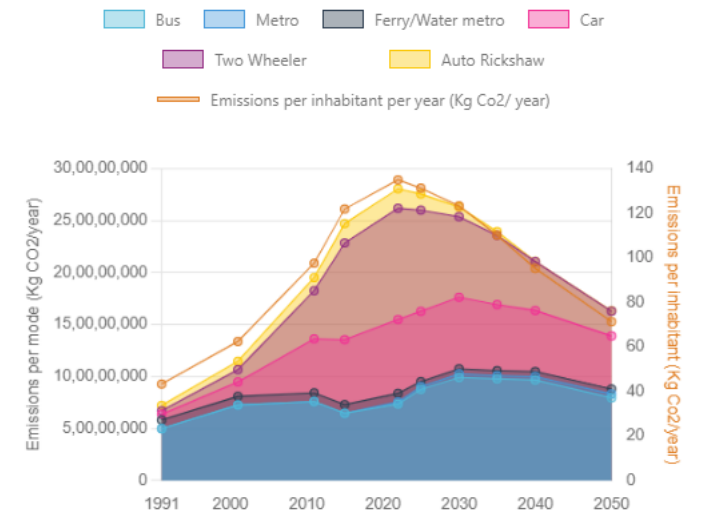
Motorization level



Evolution of the cost of transportation per mode

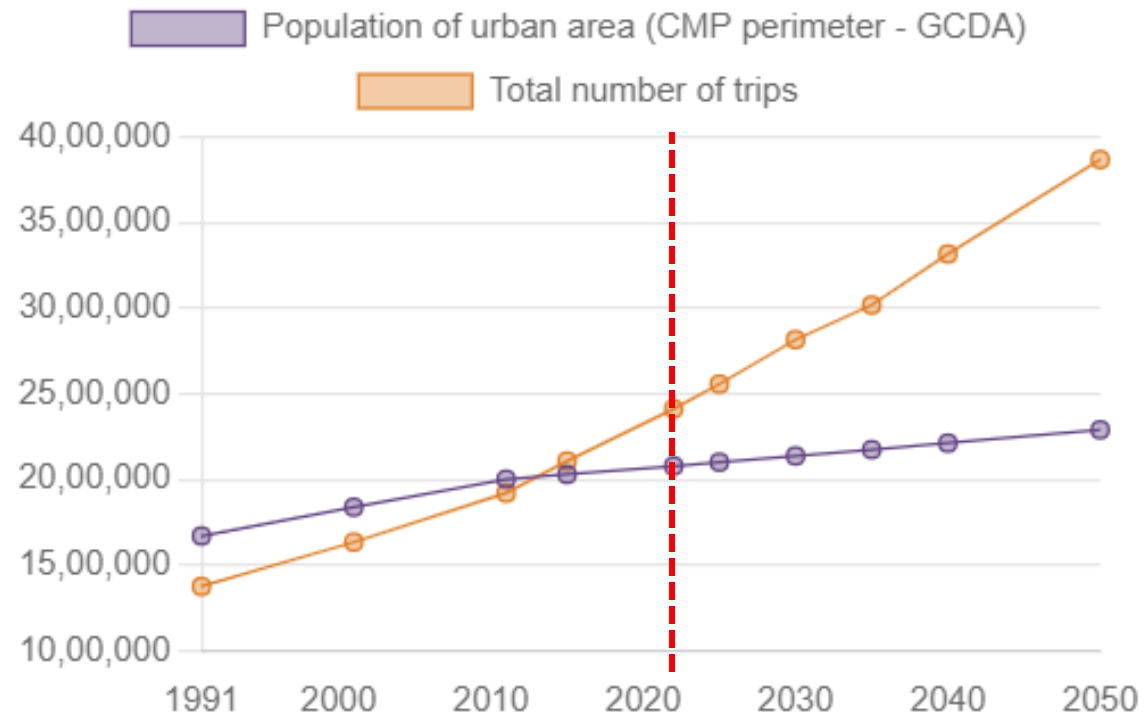


CO2 emissions



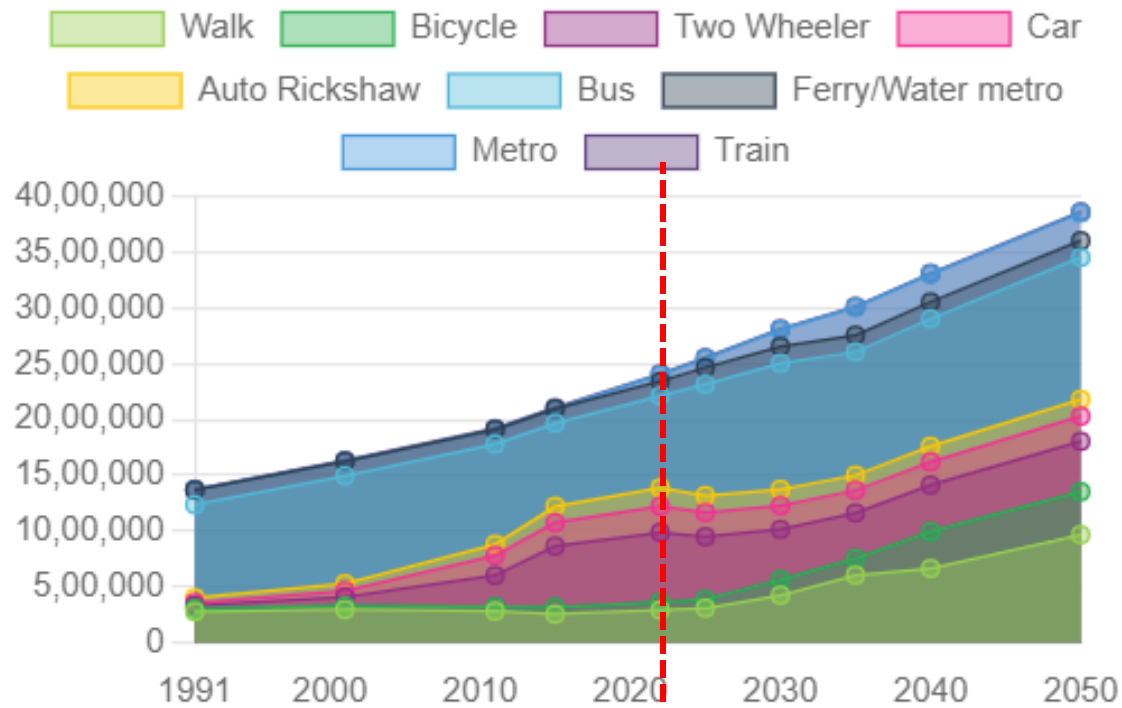
2/ Where do we go? Are we on the right path?

Population and mobility



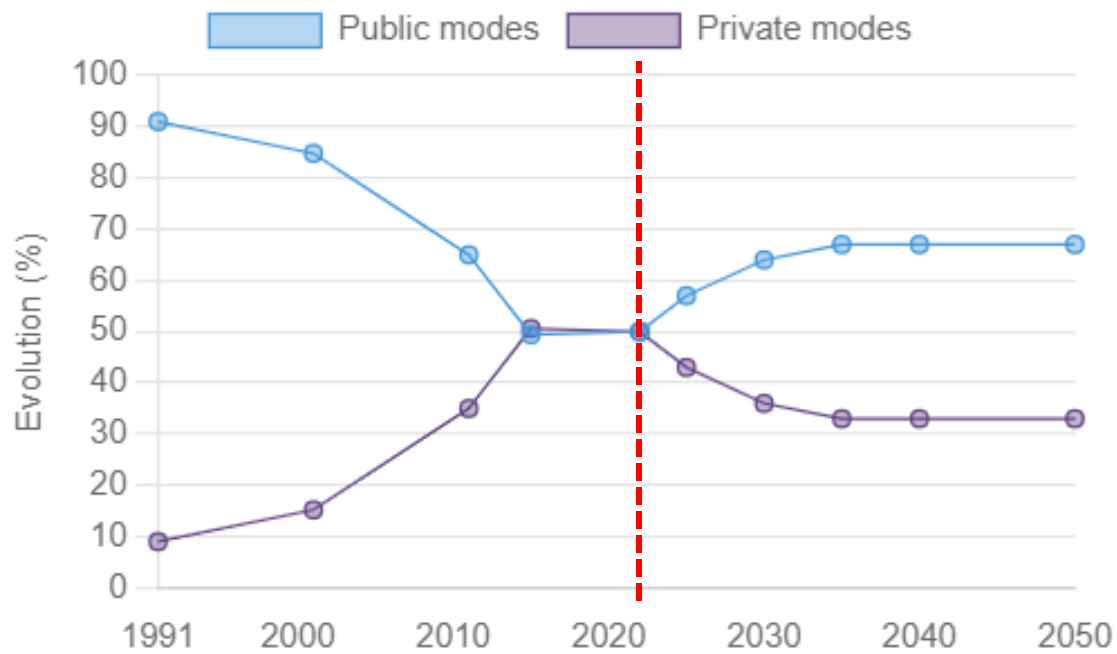
2/ Where do we go? Are we on the right path?

Annual number of trips per mode



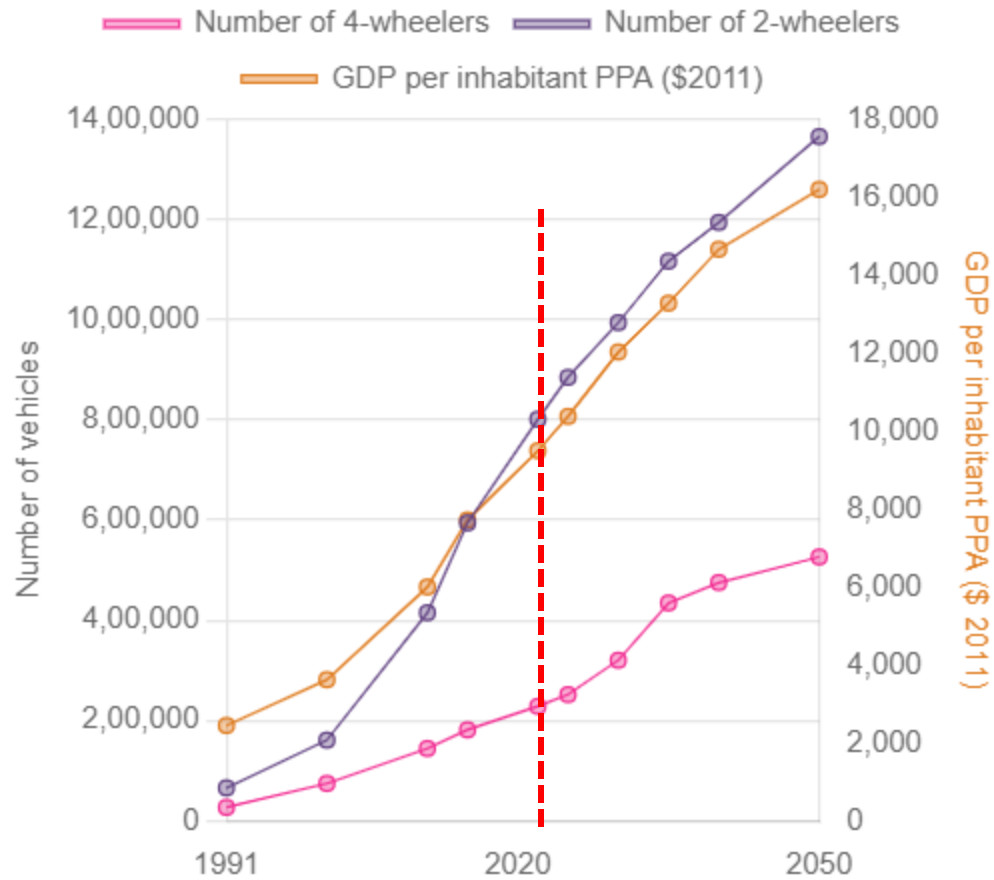
2/ Where do we go? Are we on the right path?

Modal share evolution between private modes and public modes

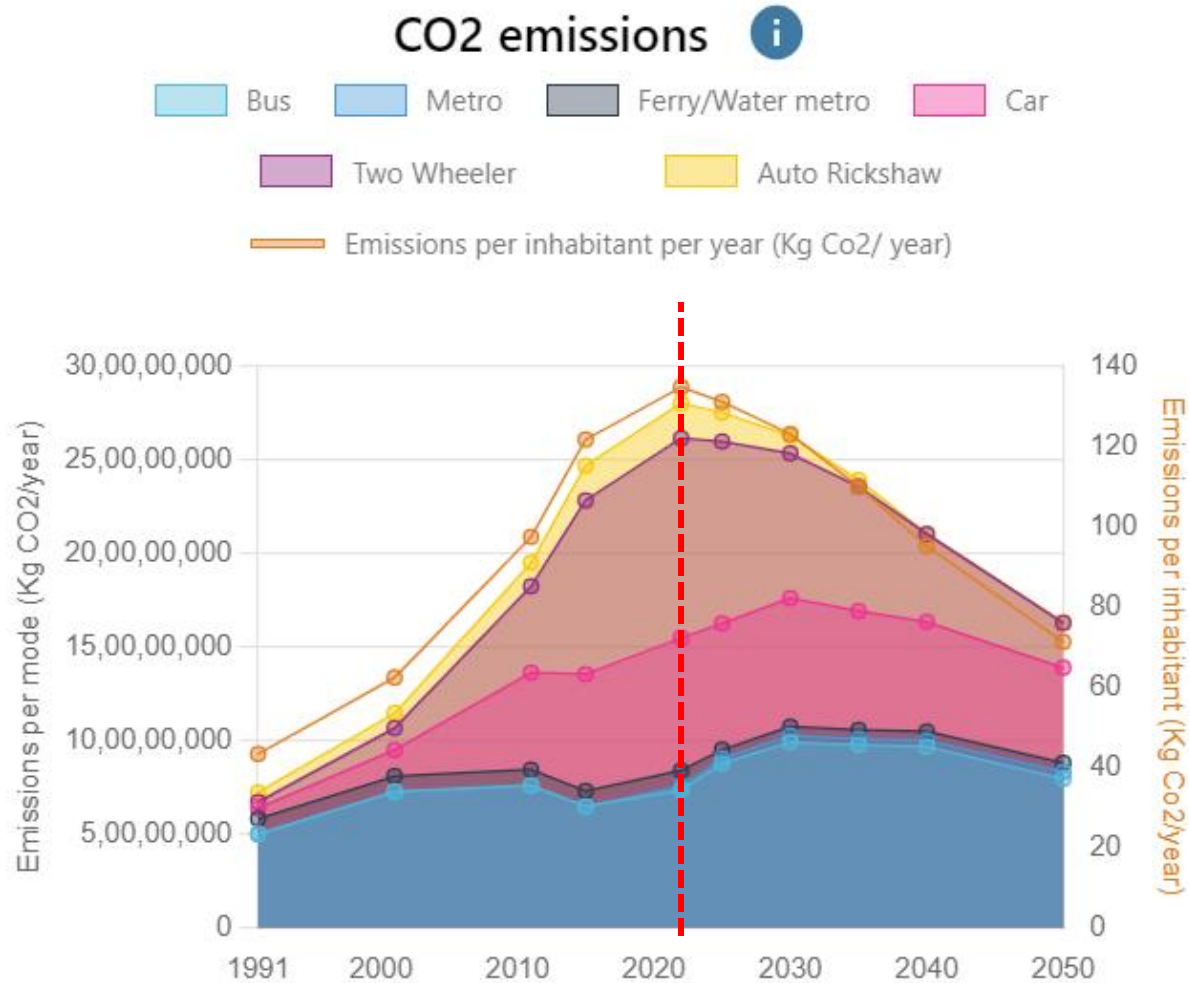


2/ Where do we go? Are we on the right path?

Motorization level



2/ Where do we go? Are we on the right path?



Home > States > Kerala

Mercury rising, heat wave-like conditions likely in northern Kerala districts

Incidents of wildfire rise in Kerala | People urged to be cautious against sunburn



Published: 08th March 2022 05:59 AM | Last Updated: 08th March 2022 05:59 AM

A+ A A-



A view of the mirage on the road in the scorching summer at Vellayil in Kozhikode | T P Sooraj

4 - What do people think of transport conditions and what are their expectations?



Tell us about your recent experience in the streets of **kochi**

This survey will be open until *February 28th, 2023*. Please take 5 minutes to provide your feedback before that time. Your answers are anonymous and will be analysed for our upcoming report on Urban Mobility User Perception.

For this survey, we are focusing on 3 modes of transport: Bus, Bicycle and Walk.

This feedback is very helpful for the Urban Mobility Observatory and will be updated every year. Thank you so much for taking the time to complete this survey.

I am

A WOMAN	A MAN	OTHER
---------	-------	-------

I am (years old)

0-14	15-29	30-44	45-59	60+
------	-------	-------	-------	-----

My household is composed of

SINGLE PERSON	2 MEMBERS	3 MEMBERS	4 MEMBERS	5 MEMBERS	6 MEMBERS AND +
---------------	-----------	-----------	-----------	-----------	-----------------

My household owns a vehicle

NO	1 VEHICLE	2 VEHICLES	3 VEHICLES	4 VEHICLES	5 VEHICLES AND +
----	-----------	------------	------------	------------	------------------

For my daily trips, I go by

WALK	BICYCLE	BUS	OTHER PUBLIC TRANSPORT	MY OWN VEHICLE (FAMILY VEHICLE)	OTHERS
------	---------	-----	------------------------	---------------------------------	--------

[i](#)

I use

CAR	ELECTRIC CAR	TWO-WHEELER	ELECTRIC TWO-WHEELER
-----	--------------	-------------	----------------------

I use

TAXI	AUTO RICKSHAW	MY WORK TRANSPORT SYSTEM	MY SCHOOL TRANSPORT SYSTEM
------	---------------	--------------------------	----------------------------

4 - What do people think of transport conditions and what are their expectations?

		1	2	3	4	5	6
		Strongly disagree					Strongly agree
Bus							
Using the bus in ----- is pleasant	<p>I can move around quickly and easily</p> <p>The ticket price is acceptable</p> <p>The vehicle is comfortable and adapted to all type of users (disabled, pregnant, elderly)</p> <p>It is easy to access a bus station, even for disabled, pregnant or elderly persons</p>						
It is safe to take the bus in -----	<p>It is safe to wait at a station, whether by day or night</p> <p>It is safe inside the bus, whether by day or night</p> <p>The driver/collector can be helpful in case of harassment</p> <p>It is safe for women</p>						
The efforts made by the municipality to develop public transport are significant	<p>All parts of the agglomeration are accessible by bus</p> <p>Bus lanes exist to favour public transport in the heavy traffic</p> <p>Low-emission vehicles progressively replace the old fleet</p> <p>Fare integration system with other public transport modes exist or is under implementation</p>						
Walk							
Walking in ----- is pleasant	<p>Walkways are large and comfortable along main roads</p> <p>Walkways are large and comfortable in residential areas</p> <p>When walking, I find that motorised traffic (volume and speed) is not annoying</p>						
It is safe to walk in -----	<p>I can walk safely along main roads</p> <p>I can walk safely along residential streets</p> <p>It is not dangerous to cross a crossroads or roundabout</p> <p>The street are safe for children and elderly people</p>						
The efforts made by the municipality to promote the walk are significant	<p>Pedestrian areas and parks exist in the city</p> <p>New pedestrian areas or walkways are under implementation</p> <p>Communication in favour of walking is important</p>						

Q&A

3

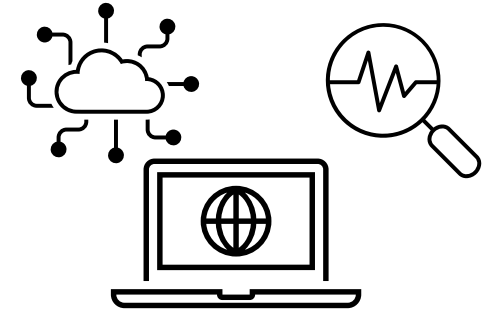


How to calculate the key indicators?

Data to collect

Each year, the following actions could be conducted to update the databases:

- ❑ Collect fresh data **coming from official reports** for:
 - Public transports ridership – from the operators
 - Registered vehicles – records from the RTO
 - GDP – from national economic statistics
 - Additional infrastructures – from metropolitan information and annual reports
 - Costs and revenues of public transport systems – annual reports from operators
 - Traffic fatalities – from Traffic police records
 - Air quality measures – from local stations



Data to collect

Each year, the following actions could be conducted to update the databases:

Conduct **limited surveys**:

- Make some road counts on identified points of CVC to have fresh information on the evolution of vehicular traffic and passenger flows (CVC surveys and Occupancy surveys).
- Conduct limited Household surveys to update data on the household composition, modal share, and evolution of passenger flows per mode.

Make an **evaluation of urban sprawl and demographic growth** through photo satellites or Google Earth analysis.

Launch an **annual satisfaction survey** by promoting the « DIGITAL PARTICIPATION » section of the online observatory.

Collect data from the local Transport Authority to **follow up the implementation progress of the SUMP** action plan.

Every 10 years, once known the results of the decennial population census, complete Household surveys should be carried out.



a

Reference values: are we on the right path?

Urban Mobility Observatory 20 key indicators

Indicator	Usual range	Unit	Methodology for annual update
A.1 DEMOGRAPHY			
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20 Annual budget for operations and administration of urban mobility	0 - 10,000	INR / inhabitant / year	Annual statistics coming from local government, or operator

Reference values: are we on the right path?

Important **to check the consistency of the data** collected

Make some cross-check verification between data:

- Example: population data coming from photo satellite analysis -> is the annual growth rate completely different from the year $x-1$?
- Example: ridership coming from public transport operator reports -> how much persons per bus per day? Is it plausible?

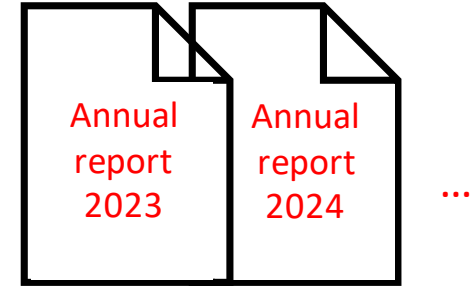
When updating the database, do not forget **to check the trajectory and adjust** the assumptions for the future years.



Each year an update of the Mobility Database and a new Mobility Report

The authority in charge shall elaborate each year at the same period an Annual Mobility Report for the previous year with:

- ❑ comments of the **evolution of main indicators**,
- ❑ **follow up** of the initially proposed **pathway** towards sustainable mobility,
- ❑ **follow up** of the implementation of **SUMP/CMP measures**,
- ❑ evolution of the **barometer of satisfaction**.



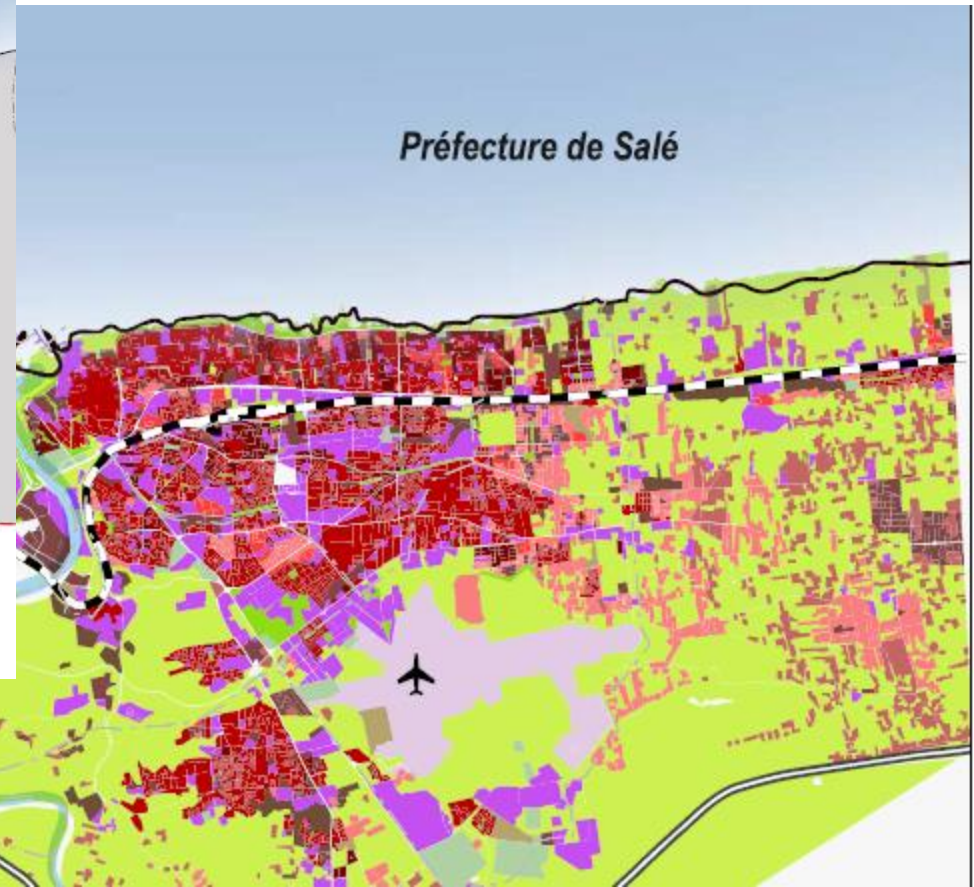
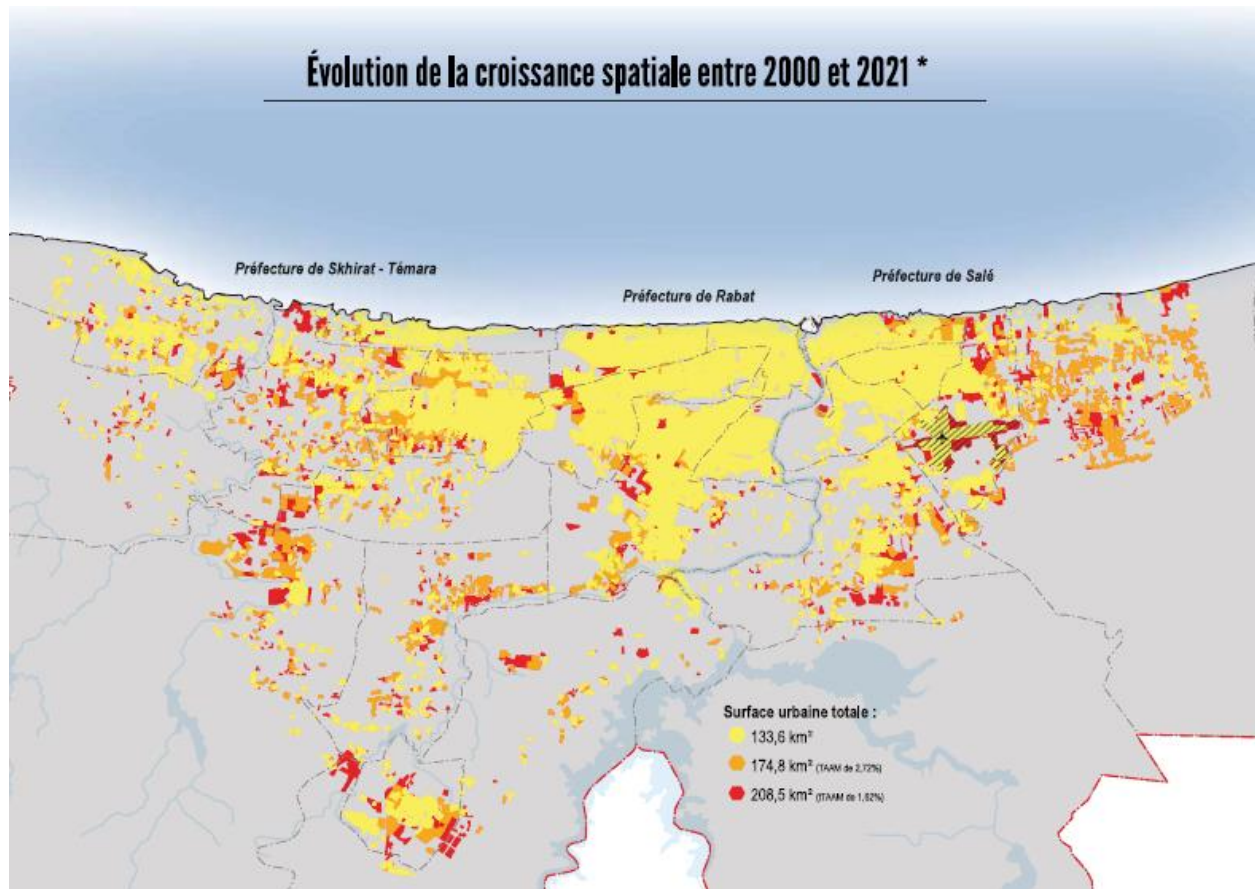
Possible future developments for the Mobility Observatory

- Automated photo interpretation of satellite images
- Automated analysis of traffic videos
- Spatial analysis of air quality
- Online household surveys
- Additional data

Possible future developments for the Mobility Observatory

- Automated photo interpretation of satellite images

Évolution de la croissance spatiale entre 2000 et 2021 *



* Sources : Carte produite par le groupement d'états et collectifs Localisation Satellite (3,5) sur base d'image (saté) de 2021.

Possible future developments for the Mobility Observatory

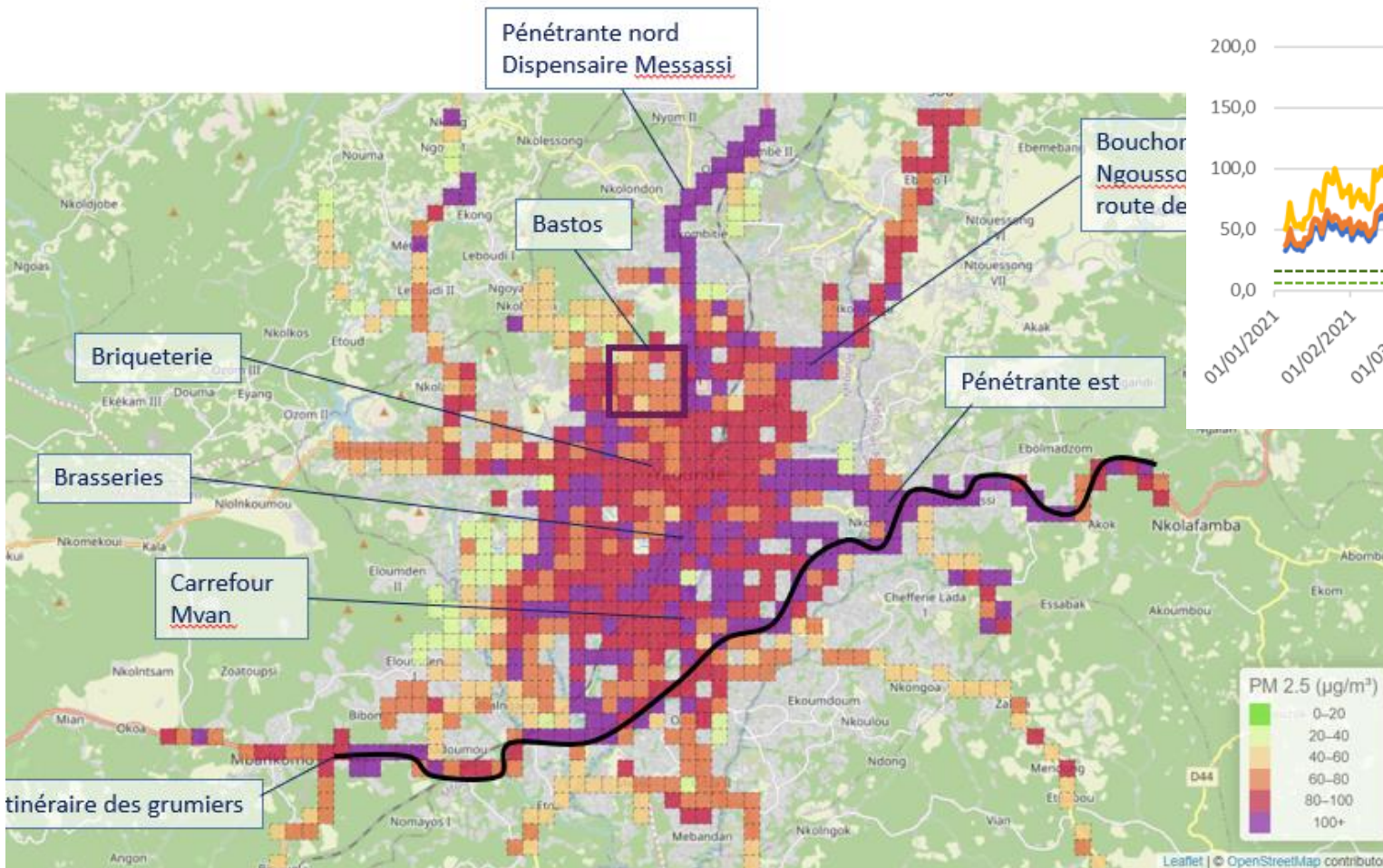
- Automated analysis of traffic videos



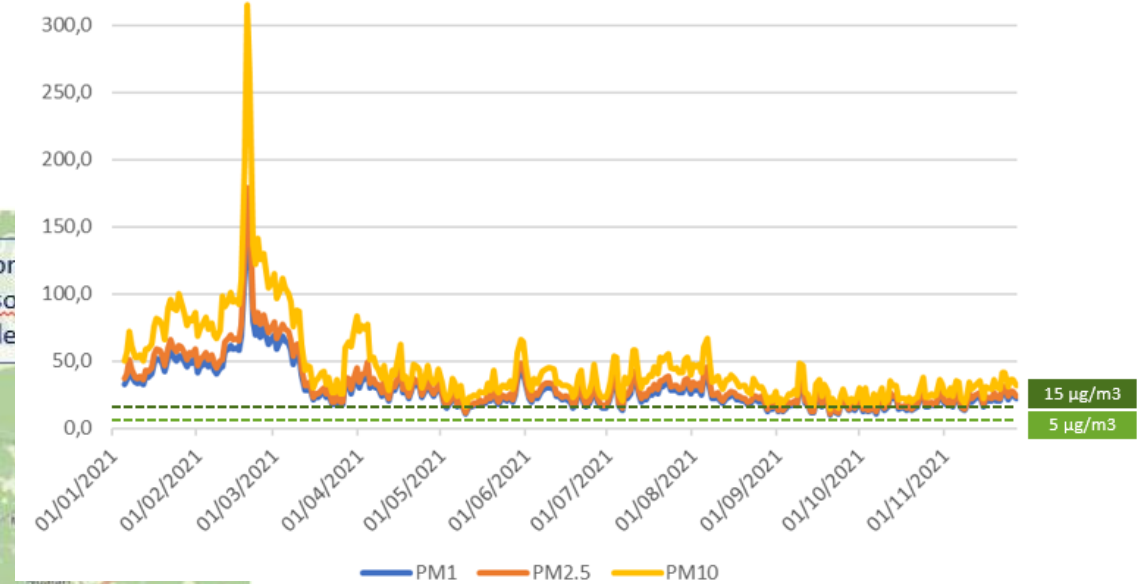
Possible future developments for the Mobility Observatory

■ Spatial analysis of air quality

Janvier 2021



Evolutions des concentrations en PM1, PM2.5 et PM10 en moyenne journalière, pour tous les capteurs fixes (en $\mu\text{g}/\text{m}^3$)



Possible future developments for the Mobility Observatory

- Online household surveys



OPINION: Online and non-face-to-face Origin-Destination Research, Recife has

Published: March 4, 2021

Conducting an Origin-Destination survey integrated into the city's routine, in an online and non-face-to-face format, was the challenge that the city of Recife set out to overcome in 2015, in an innovative experience that changed the landscape of data availability for planning. mobility in the fourth largest capital in the country.

To overcome the challenges posed by the cost and difficulty of carrying out an origin-destination survey using the traditional method, a new methodology was developed by technicians from the municipality's urban planning body, Instituto da Cidade Pelópidas Silveira, and in 2016 the fourth Recife OD Survey, being the first edition using the new methodology.

In that edition, as a test, more than 86 thousand people were surveyed in the municipality. The successful application of the methodology led the State of Pernambuco to support the initiative and the survey was expanded to the 15 cities in the Metropolitan Region of Recife in the second application of the methodology in 2018, when more than 200,000 people were surveyed.

OD RECIFE É DIFERENTE

Possible future developments for the Mobility Observatory

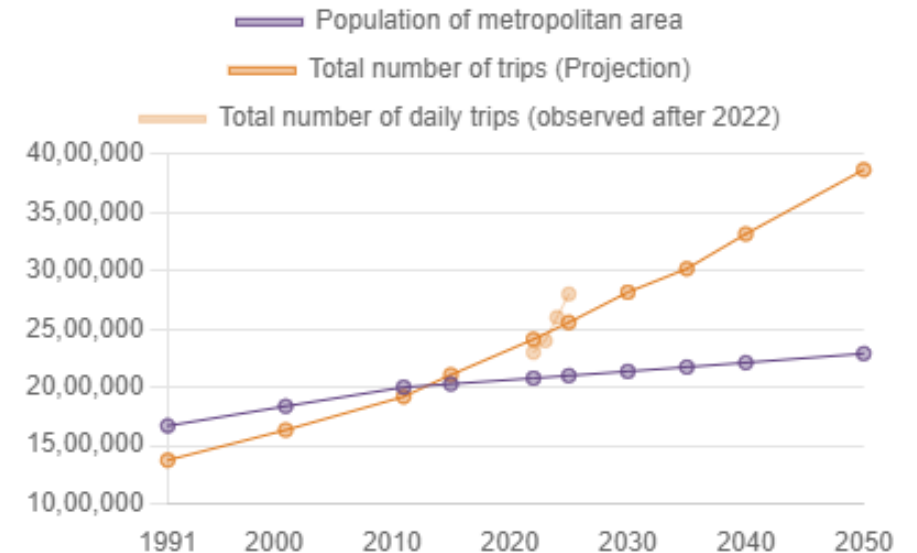
■ Additional data

In future developments of the Mobility Observatory, it could be interesting to:

■ Add new data on the **GIS database**:

- Desire lines, coming from Household or OD surveys
- Air quality data per zone
- Motorisation level per zone
- Traffic fatalities per zone

■ Add new data to the **SAS database**: one idea is to differentiate the observed data and the projected data coming from SUMP (and 2022 projections). It will allow to offer a comparison between what was projected in 2022 and the data actually observed after 2022.



Thank you

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Questions, Feedback and Farewell?



Q&A

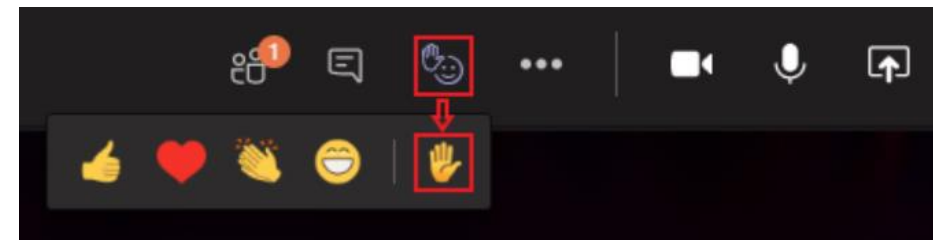
Chat

- Post your questions in the chat and we will include them in the Q&A



Speak

- Select “Show reactions” in the meeting controls, and then choose “Raise your hand”. Everyone in the meeting will see that you've got your hand up.



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2nd session – 15 June

Thank you for your attention

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