Greenhouse gas emissions impact assessment of an Urban Mobility Plan

30 May 2023

MobiliseYourCity Mastering Mobility Series

EuroMed Transport SUPPORT PROJECT

Mobilise Your City

Training Developed By

Mobilise Your City

Donors:

European Commission

AFD

Federal Ministry for Economic Cooperation and Development

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

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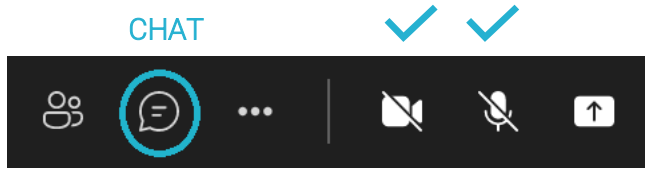
In collaboration with EuroMed Transport SUPPORT PROJECT

Learn more about the MobiliseYourCity Partnership and our replicable training offers: www.mobiliseyourcity.net

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!

Mastering Mobility Series

Mobilise Your City

Learning objectives

- Understand the **importance of quantifying greenhouse gas emissions in urban mobility** to assess the climate mitigation potential of transport transformation.
- Identify the **data needed to calculate GHG emissions from urban mobility** and build forward-looking scenarios
- Understand how to **use the MobiliseYourCity emissions calculator** to harmonise GHG mitigation efforts.

Contents

Mobilise Your City

Speakers

Julien Allaire

Senior Urban Transport NKE

EUROMED-TSP

Emilie Ball

Junior Urban Transport NKE

EUROMED-TSP

Nicolas Cruz Gonzalez

Sustainable Mobility Expert

MobiliseYourCity Secretariat

Mobilise Your City

The MobiliseYourCity Emissions Calculator

GHG emissions as part of MobiliseYourCity Core Indicators

1

Transport-related GHG emissions

Reduction of yearly GHG emissions in a SUMP scenario compared to a BAU scenario

2

Access to public transport

Proportion of the population living within 500 meters of a public transport stop with a minimum average 20-minute service

3

Road safety

Traffic fatalities by all transport accidents (road, rail, etc.), per 100.000 inhabitants, per year

4

Air quality

Mean annual urban air pollution of fine particulate matter (in µg PM 2.5) at road-based monitoring stations

5

Modal share of non-motorised transport and public transport

The proportion of trips travelled with non-motorized modes and public transport as a share of total trips travelled with all modes

6

Affordability of public transport

Percentage, of disposable household income spent on public transport for users part of the second quintile household group

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Indicator 1: Reduction of transport related GHG emissions

Justification MobiliseYourCity contributes to the mitigation of transport-related emissions through planning for better and more sustainable urban mobility. Member cities aim for ambitious GHG reductions by implementing their SUMP and are required to report on projected impact.

United Nations Climate Change

Definition

Reduction of annual GHG emission (in CO_2eq) in a SUMP scenario compared to a business-as-usual scenario

Measuring and reporting format

	Baseline (baseline year)	**BAU** (target year)	**SUM** (target year)	**SUMP vs BAU**
Per capita	… kg CO_{2eq}	… kg CO_{2eq}	… kg CO_{2eq}	…..%
Total emissions	…. Mt CO_{2eq}	…. Mt CO_{2eq}	…. Mt CO_{2eq}	…..%

Aggregation at Partnership level: **Sum** of reduction of annual GHG emissions for milestone years 2030 and 2050

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Our approach: the GHG modelling methodology

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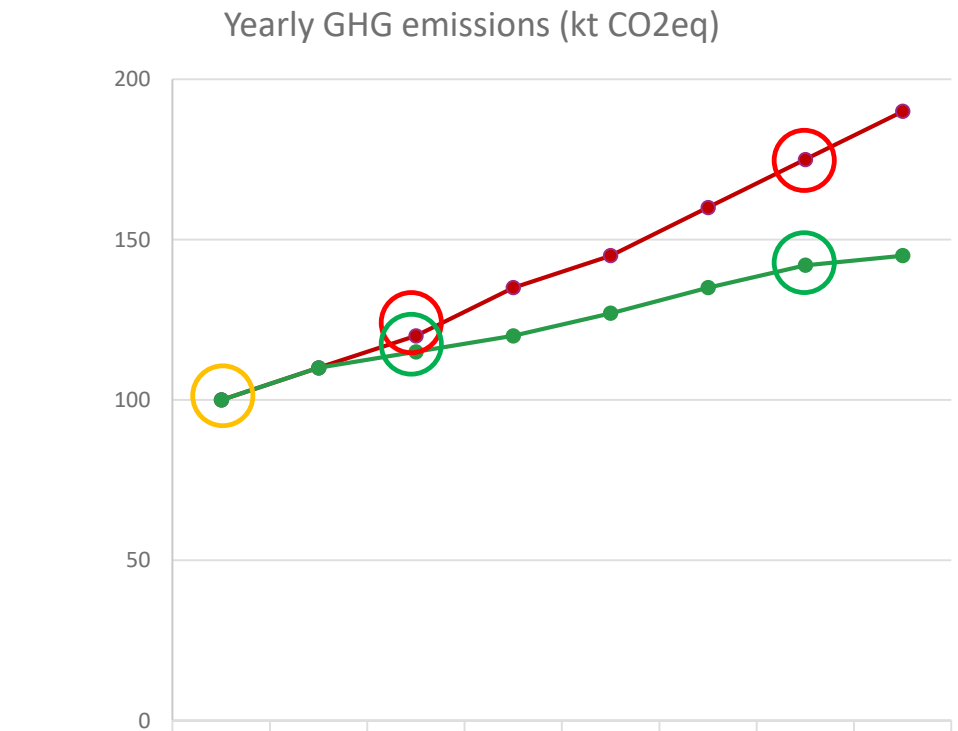
SUMP diagnosis, *ex-ante* and *ex-post* impact assessment

1. SUMP Phase 1: Diagnosis
   - Important to anticipate setting BASELINE for indicators
   - Contribution to the diagnosis

2. SUMP Phases 2 and 3: Vision setting and action-plan
   - Ex-Ante assessment projection of the future impact
   - Comparing scenarios BAU business-as-usual vs SUMP
   - Milestones years: 2030 and 2050

3. SUMP Phase 4: Monitoring implementation
   - Ex-Post assessment monitoring the effects of the plan as they happen
   - Continuous monitoring through mobility observatory



	2015	2020	2025	2030	2035	2040	2045	2050
BAU	100	110	120	135	145	160	175	190
SUMP	100	110	115	120	127	135	142	145

Example from a fictional city

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The avoid, shift and improve approach (ASI)

The MobiliseYourCity Partnership builds on the expertise from all its partners to develop tools and methodologies that are then tested on the ground and consistently improved based on feedback.

We follow the avoid-shift-and improve approach (ASI), which puts people's need for connection and access at the forefront of sustainable mobility planning.

Avoid

- Use of ICT (i.e. home office)
- City planning to encourage short trips
- Regional and local economy
- Future transport infrastructure (based on needs – not traffic inducing)

Shift

- Increase of sustainable transport modes (public transport, cycling, etc)
- Increase of sustainable freight modes (rail, navigation)

Improve

- Improving vehicle use
- Improving vehicles energy efficiency
- Increasing the use of low carbon vehicles i.e. e-mobility, biofuels etc
- Improved traffic control

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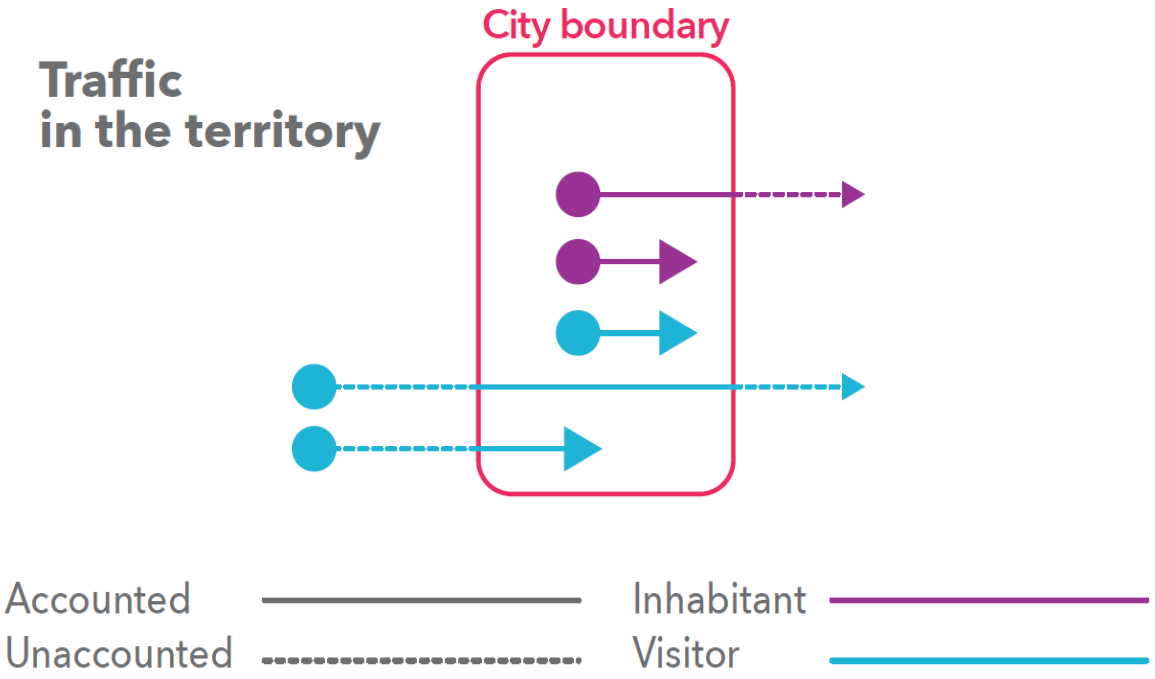
The territorial approach



Our approach considers all the traffic in the territory, both from residents and from visitors.

Trips which start or continue outside of the city are accounted only for the part within the cities' boundaries.

Source: adapted from Dünnebeil et al., 2012

Also followed by:

GREENHOUSE GAS PROTOCOL

Klimaschutz-Planer
Kommunaler Planungsassistent für Energie und Klimaschutz

C40 CITIES

ifeu INSTITUT FÜR ENERGIE- UND UMWELTFORSCHUNG HEIDELBERG

Mobilise Your City

Introducing the MobiliseYourCity Emissions Calculator

Mobilise Your City

The MobiliseYourCity Emissions Calculator: a tool to steer and to evaluate your policies

The MobiliseYourCity Emissions Calculator is intended to help local, regional or national authorities in developing countries calculate GHG emission profiles from transport on an annual basis.

It helps to calculate baseline, business-as-usual (BAU) and ex-ante mitigation scenarios to understand the emission reduction potential of a package of urban transport policies or policies at the national level.

Mobilise Your City

About the MobiliseYourCity Emissions Calculator

Objective of the tool

Calculation of road and rail transport GHG emission at the city or country level in MobiliseYourCity geographies

Generation of 3 GHG emissions models for passenger and freight:

- 1. **Inventory** of a current situation
- 2. **Business-as-usual (BAU)** scenario up to 2050
- 3. GHG emission reduction of a SUMP or NUMP "**climate scenario**"

Notes

- Once data gathering is completed, about 2 to 3 work days are necessary to generate the 3 GHG emissions models (inventory, BAU and climate scenario)
- The use of a transport planning tool to deliver input data is recommended
- Compatible with the IPCC inventory guidelines
- Available in English, French, Spanish

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Data requirements

- Socio-economic factors
- Transport demand
- Fleet energy consumption
- Existing emissions data

Data requirements details are provided in a user manual

Gathering data is the main challenge and takes much longer than using the Calculator!

Category/Parameter	Data required for	Sensitivity	Data source	Scope	Data source
			National level		City level
Socio-economic data					
1) Population - Number of inhabitants	Inventory	/	National authority, Surveys	City data	City authority, Surveys
Population growth rate	BAU, Climate scenario	/	National authority, assumptions	City data	City authority, assumptions
Gross domestic product (GDP) or Gross market product (GMP) for cities	Inventory	/	National authority	(City data)	City Authority if data available
GDP growth rate or Gross market product (GMP) for cities	BAU, Climate scenario	/	National authority, assumptions	(City data)	City authority, assumptions if data available
Transport demand					
3a) Vkt approach					
Total annual vehicle kilometers travelled per vehicle category	Inventory	+++	Transport model, surveys	City data	Transport model, surveys
Annual Vkt growth rate per vehicle category	BAU, Climate scenario	+++	Transport model, assumptions	City data	Transport model, assumptions
Average Vkt share by fuel type	Inventory	++	Statistics, Surveys, default values	National data	Statistics, Surveys, default values
Average Vkt share by fuel type in future years	BAU, Climate scenario	++	Surveys, default values	National data	Surveys, default values
3b) Fleet approach					
Vehicle stock (total number of vehicles) per vehicle category	Inventory	+++	Statistics, Surveys	City data	Statistics, Surveys
Average annual mileage per vehicle category	Inventory	+++	Statistics, Surveys, default values	City data	Statistics, Surveys, default values
Annual Vkt growth rate per vehicle category	BAU, Climate scenario	+++	Surveys, assumptions	City data	Surveys, assumptions
Average Vkt share by fuel type	Inventory	++	National authority, surveys, default values	National data	City authority, surveys, default values
Average Vkt share by fuel type in future years	BAU, Climate scenario	++	Literature, assumptions	National data	Literature, assumptions
Average occupancy/load per vehicle category	Inventory, BAU, Climate scenario	++	National authority, surveys, default values	National (or regional data)	City authority, surveys, default values
Average trip length per vehicle category	Inventory, BAU, Climate scenario	++	National authority, surveys, default values	National data (or regional data)	National authority, surveys, default values

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Content of the current Emissions Calculator

Inventory

Inputs:
- **Road**: kilometers per vehicle type & fuel, vehicle fuel consumption; occupancy rate; load
- **Rail:** total kilometer, total fuel consumption, occupancy rate and load

BAU scenario

Inputs:
- **Road & Rail**: Growth rate of kilometers per vehicle type; growth rate of fuel consumption, Population;

Climate scenario

Inputs:
- **Passenger**: share of avoid, shift and improve compared to BAU
- **Goods:** total kilometer, total fuel consumption, occupancy rate and load per train

Outputs

- Transport performances (p/tkm)
- Total mileage (km)
- Modal split (%)
- GHG emissions (CO2eq)

Emission savings BAU vs climate scenario (base year;2020;2025;2030;2040;2050)

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Emissions Calculator used in 20 cities and 7 countries worldwide … that we know of

3 supported cities

- Ambato, Ecuador
- Antofagasta, Chile
- Guadalajara, Mexico

7 supported countries

- Chile
- Colombia
- Costa Rica
- Dominican Rep.
- Mexico
- Paraguay
- Uruguay

1 other city

- Tirana, Albania

6 supported cities

- Bouaké, Ivory Coast
- Dakar, Sénégal
- Dire Dawa, Ethiopia
- Kumasi, Ghana
- Maputo, Mozambique
- Sousse, Tunisia

5 supported cities

- Abbottabad, Pakistan
- Mandalay, Myanmar
- Medan, Indonesia
- Mingora, Pakistan
- Peshawar, Pakistan
- Tbilisi, Georgia

6 other cities

- Can Tho, Vietnam
- Da Nang, Vietnam
- Haiphong, Vietnam
- Hanoi, Vietnam
- Ho Chi Minh City, Vietnam
- Irbid, Jordan

Mobilise Your City

Download the MobiliseYourCity Emissions Calculator Suite on mobiliseyourcity.net

Emissions Calculator

6,021 downloads

MRV

Tool 24 Apr 2020

MobiliseYourCity Emissions Calculator

EN ♡0 💬0

User Manual

MRV

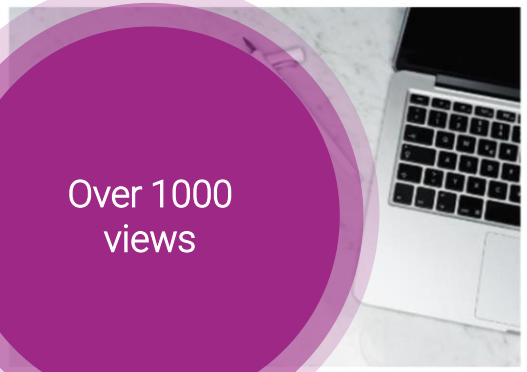
Guidelines / Manual 24 Apr 2020

User Manual for the MobiliseYourCity Emissions Calculator

EN ♡0 💬0

Video Tutorial

Over 1000 views



SUMP MRV

Tool 15 May 2020

Video tutorials for the MobiliseYourCity Emissions Calculator

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Methodological Approach

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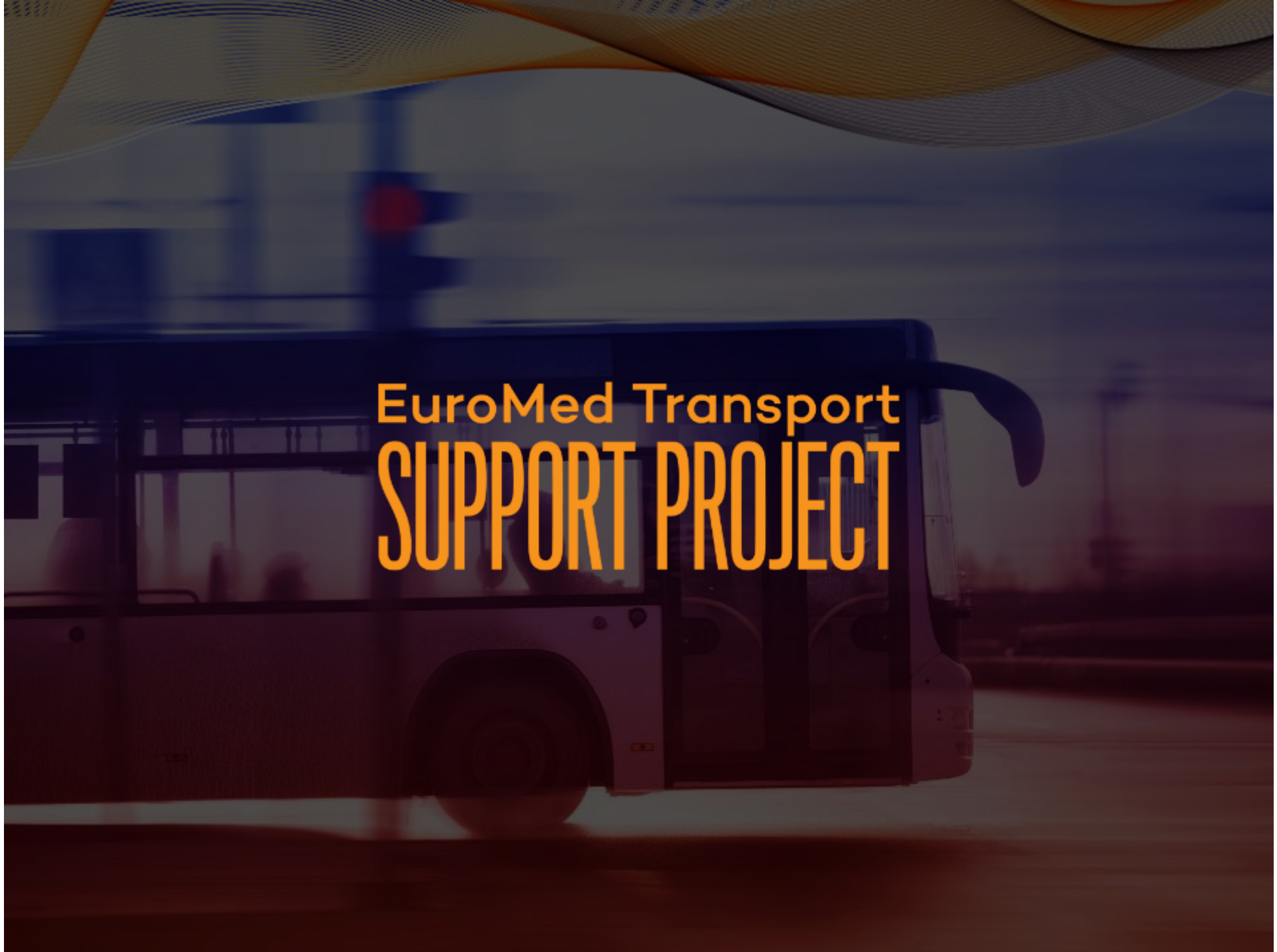
EuroMed Transport
SUPPORT PROJECT

Project funded by the European Union

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EuroMed Transport SUPPORT PROJECT

MobiliseYourCity Mastering Mobility

30th May 2023, 11:00 – 12:30 (CEST)

Greenhouse gas emissions impact assessment of an Urban Mobility Plan

Julien ALLAIRE
Senior Urban Transport NKE

Emilie BALL
Junior Urban Transport NKE

EuroMed Transport Support Project and context of technical assistance

Introductory and background

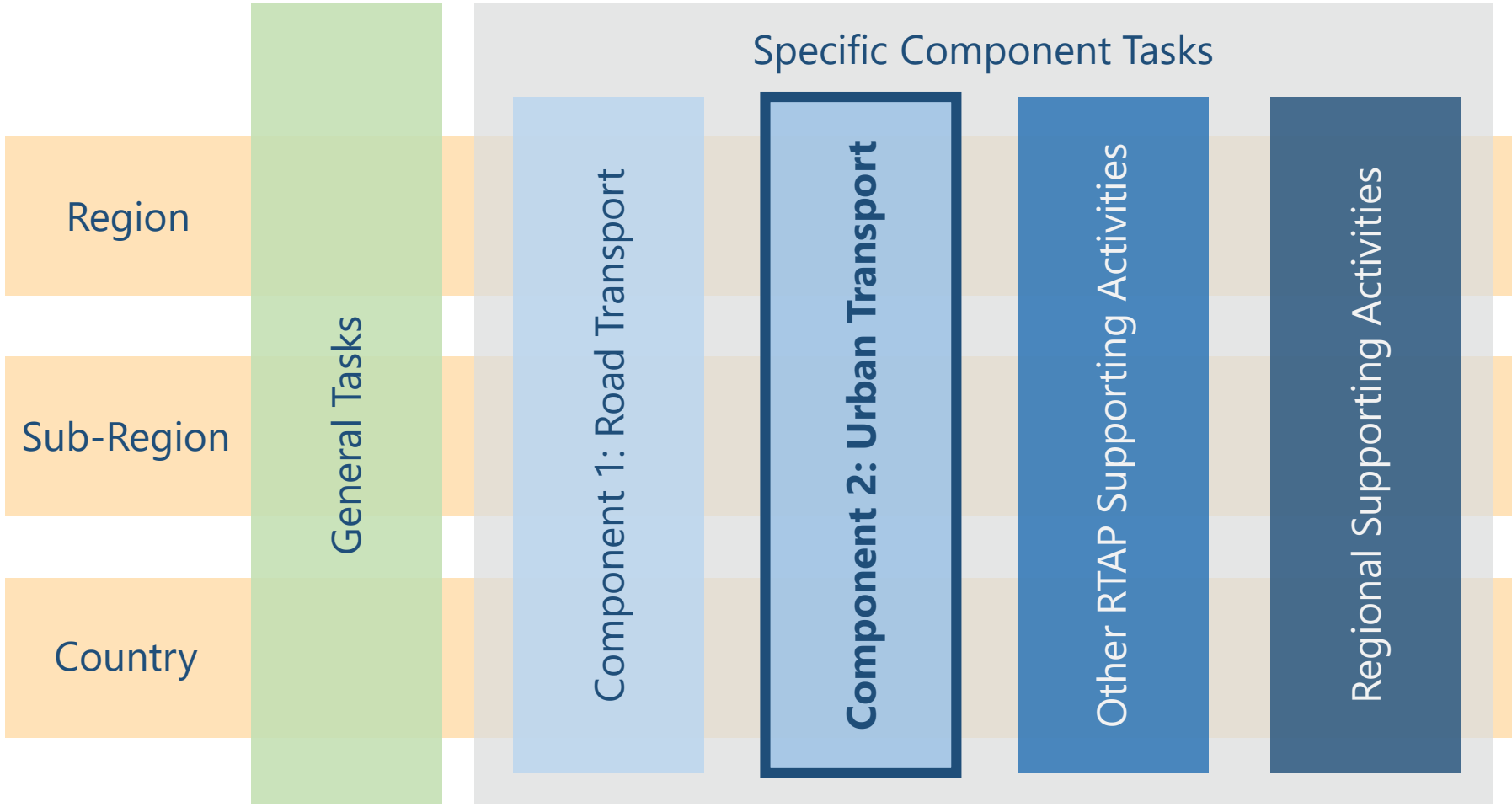
- **Political framework:** support Euro-Mediterranean transport cooperation, through Regional Transport Action Plans (RTAPs)

- **Aim of EuroMed Transport Support Project (EuroMed TSP) 2017 – 2023:** increase the sustainability and performance of transport operations in the Mediterranean Region

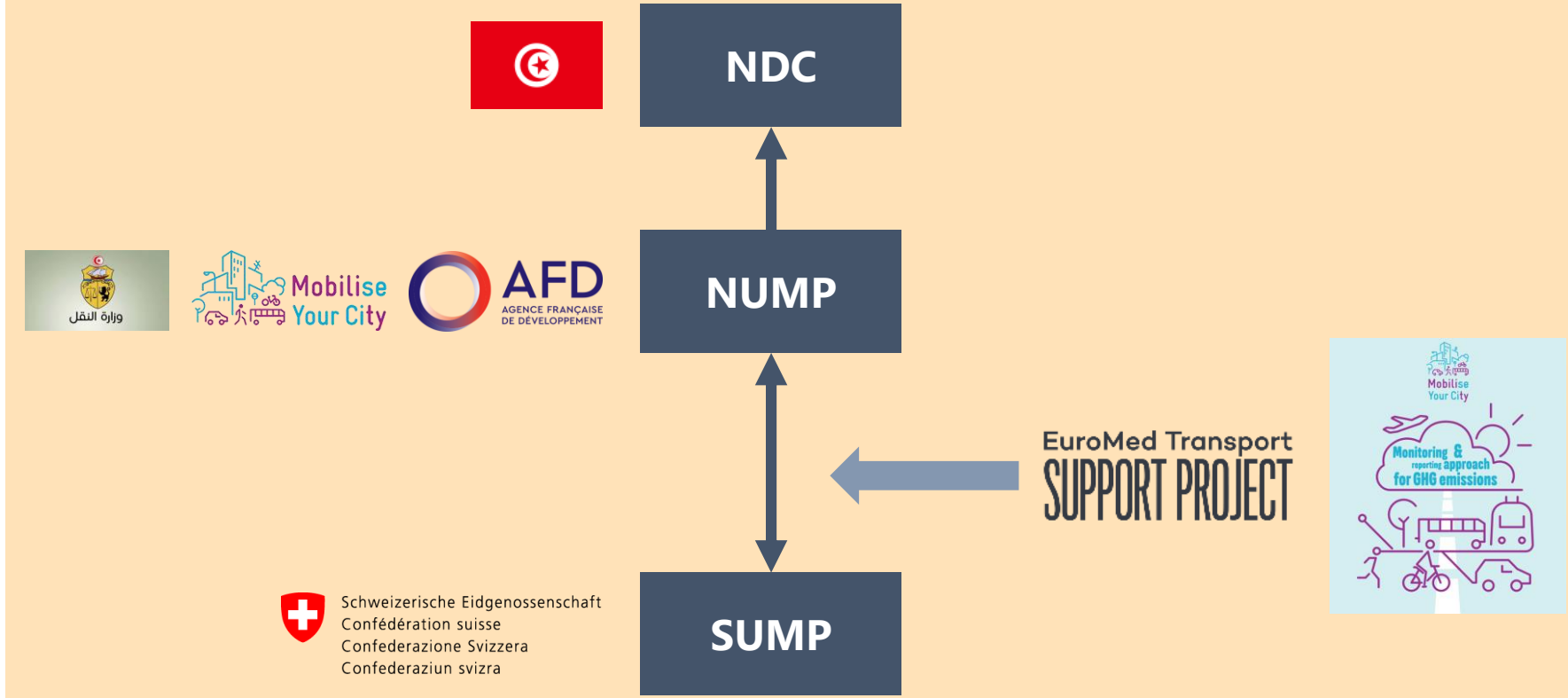
- **Objectives of technical assistance:**
  - increased safety in transport operations
  - increased efficiency / lower costs of transport
  - lower environmental impact of transport
  - regional economic integration, economic well-being and job creation

- **Partner countries:** Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, State of Palestine, and Tunisia.

EuroMed TSP approach & workplan structure



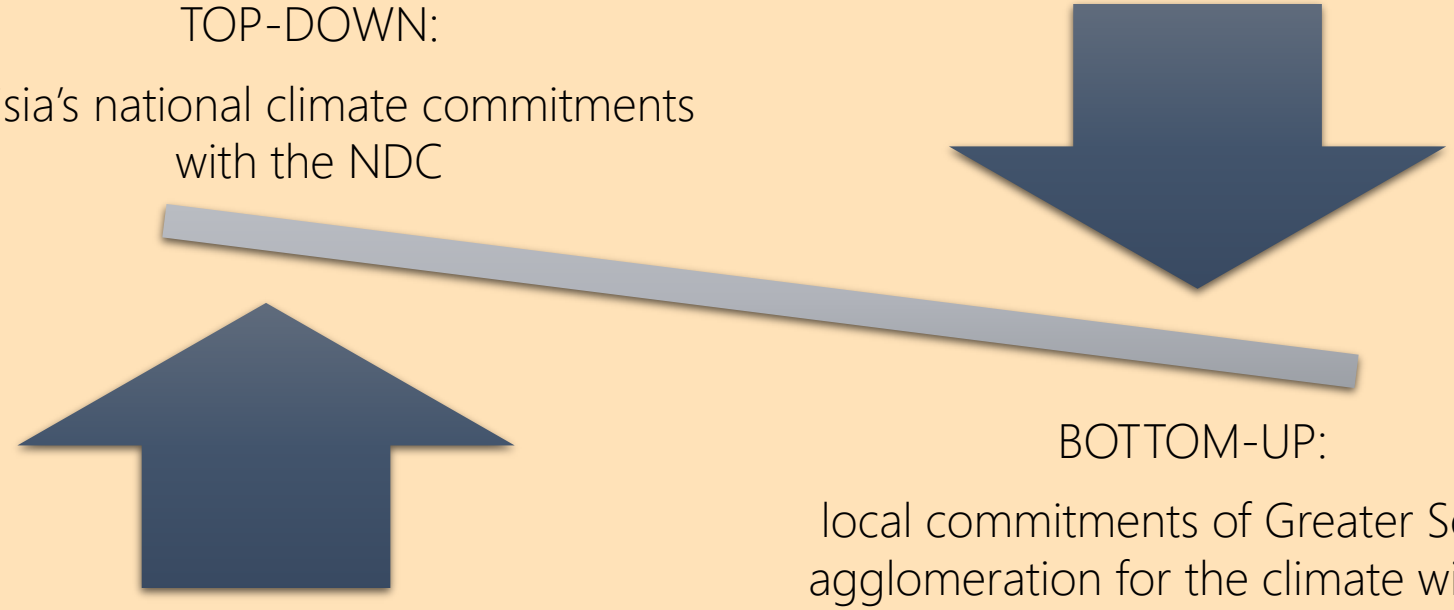
TA objectives & motivation



Two approaches to reconcile

TOP-DOWN:

Tunisia's national climate commitments with the NDC



BOTTOM-UP:

local commitments of Greater Sousse agglomeration for the climate with the implementation of its SUMP

How can local commitments be linked to national commitments? And with what funding could the Greater Sousse agglomeration contribute to Tunisia's national climate commitments?

TA final workshop

A workshop organized in partnership with the Ministry of Transport and the Municipality of Sousse was held on 25 January 2023 in Sousse to:

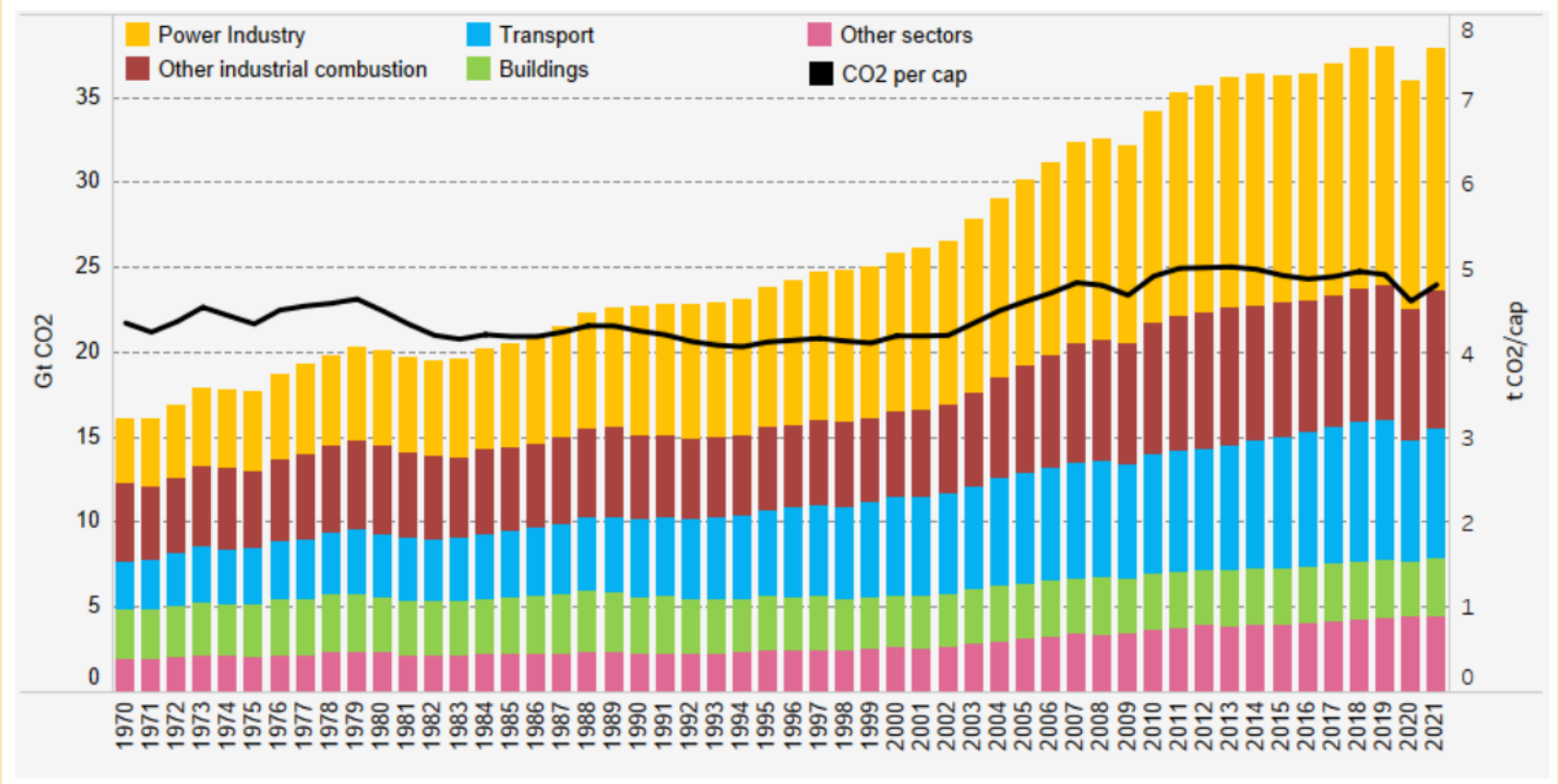
- raise awareness regarding climate issues related to urban mobility;
- promote the link between public policies and national commitments;
- present the results of the analyses conducted with MobiliseYourCity calculation tool;
- identify GHG emissions reduction perspectives;
- familiarize participants with the use of MobiliseYourCity calculation tool to harmonize GHG mitigation efforts.

Greater Sousse SUMP

General context : climate issues and Tunisian NUMP

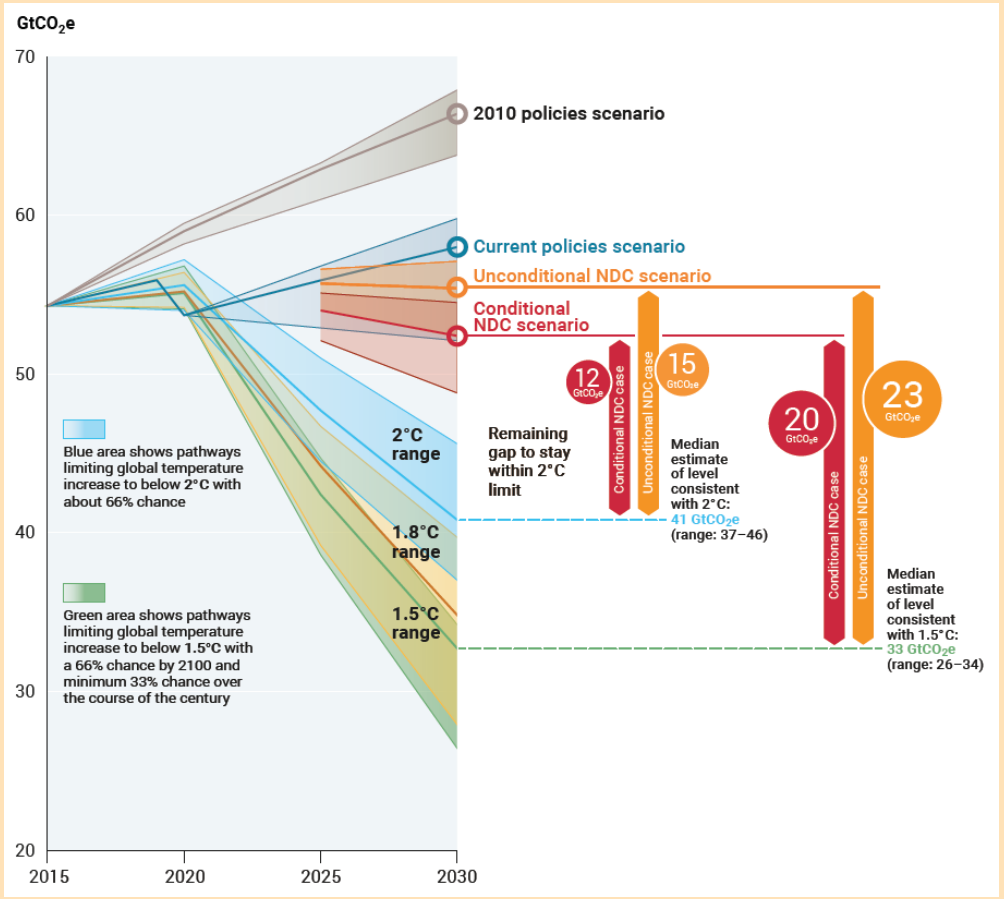
Climate issues and global CO2 emissions

After a drop in 2020 with the pandemic… global CO2 emissions return to pre-crisis levels



Global CO2 emissions from fossil carbon by sector over the period 1970-2021 (Source: JRC 2022)

Climate issues: International commitments

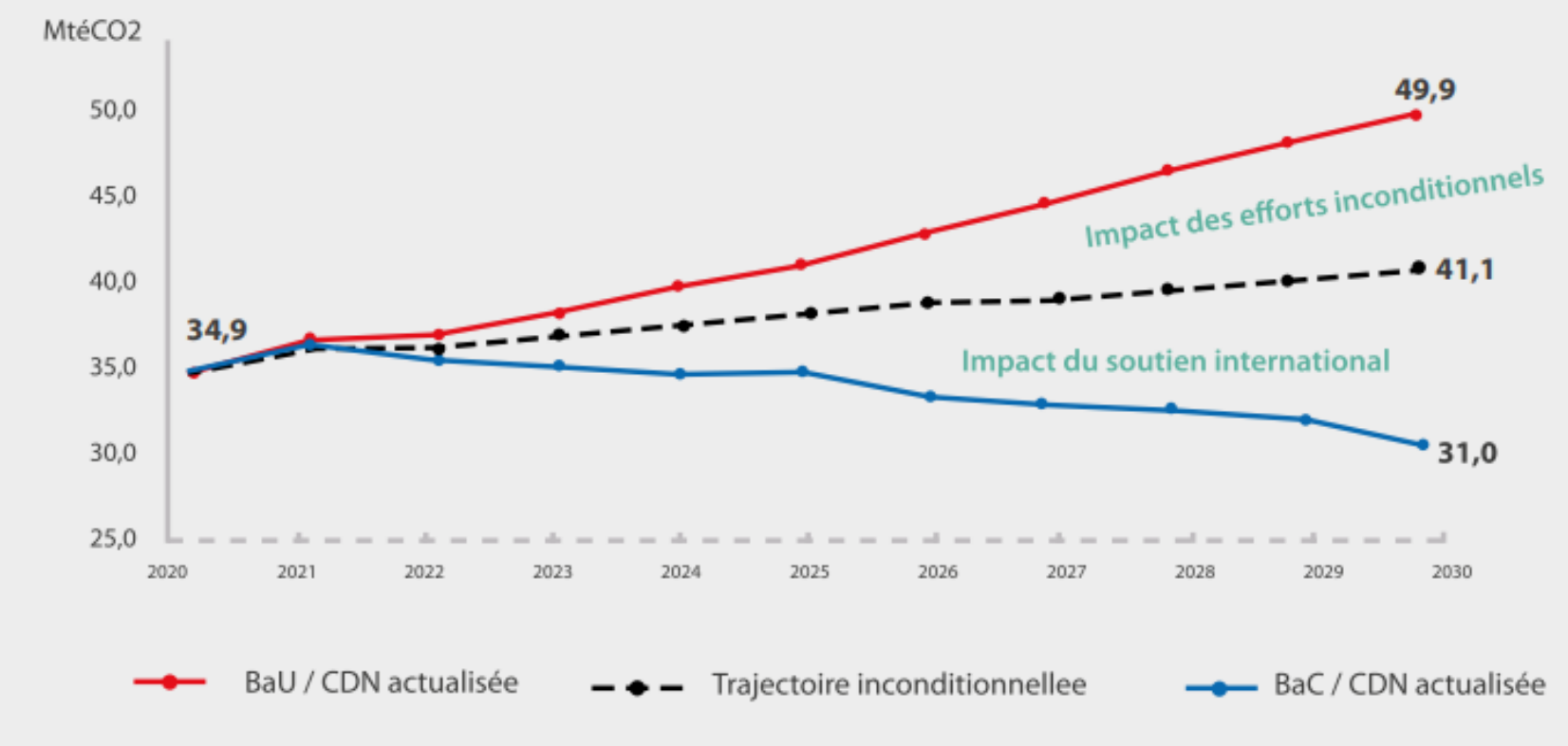


Global GHG emissions under different scenarios and gaps to 2030 (Source: https://www.unep.org/emissions-gap-report-2022)

The gap between the commitments made and the pathways to limiting global temperature increase to below 2°C is still too wide

Climate issues: Tunisian commitments

Strengthening resilience by 2030



GHG emission trajectories under BAU, unconditional NDC and conditional NDC scenarios
(Source: https://unfccc.int/sites/default/files/NDC/2022-06/Tunisia%20Update%20NDC-french.pdf)

National Urban Mobility Policies in Tunisia

It is estimated that **at least 50% of GHG emissions are generated within urban areas**, through industrial and building activities, but also through urban transport, but **no explicit link is made with NDC commitments**.

What is the role of Tunisian Cities/Municipalities?

Tunisian NUMP aims to build a **vision for sustainable urban mobility through the EASI** (Enable-Avoid-Shift-Improve) approach. This vision has been translated into strategic measures to be implemented in the short and medium term and specifically the **elaboration and adoption of SUMPs for urban areas with more than 150 000 inhabitants**.

These actions should help to **reduce GHG emissions in the urban passenger and freight transport sector**, **promote the development of inclusive, high-quality of life and economically competitive cities**, and **improve transport networks to reduce the impact of climate change, poverty and social inequalities**.

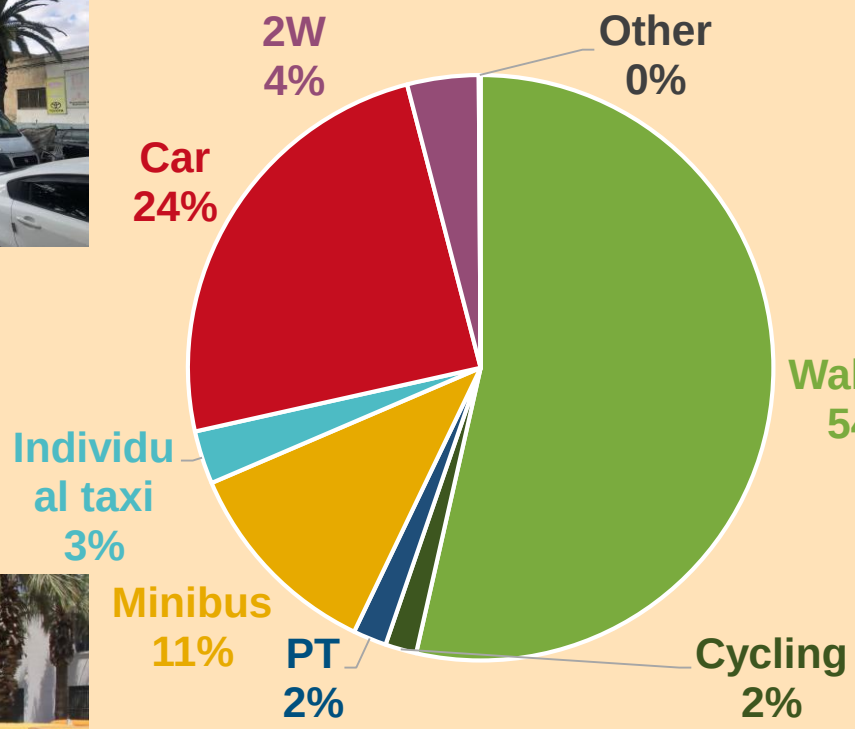
Greater Sousse SUMP

Greater Sousse 2030: Metropolis of proximities

Context and objectives

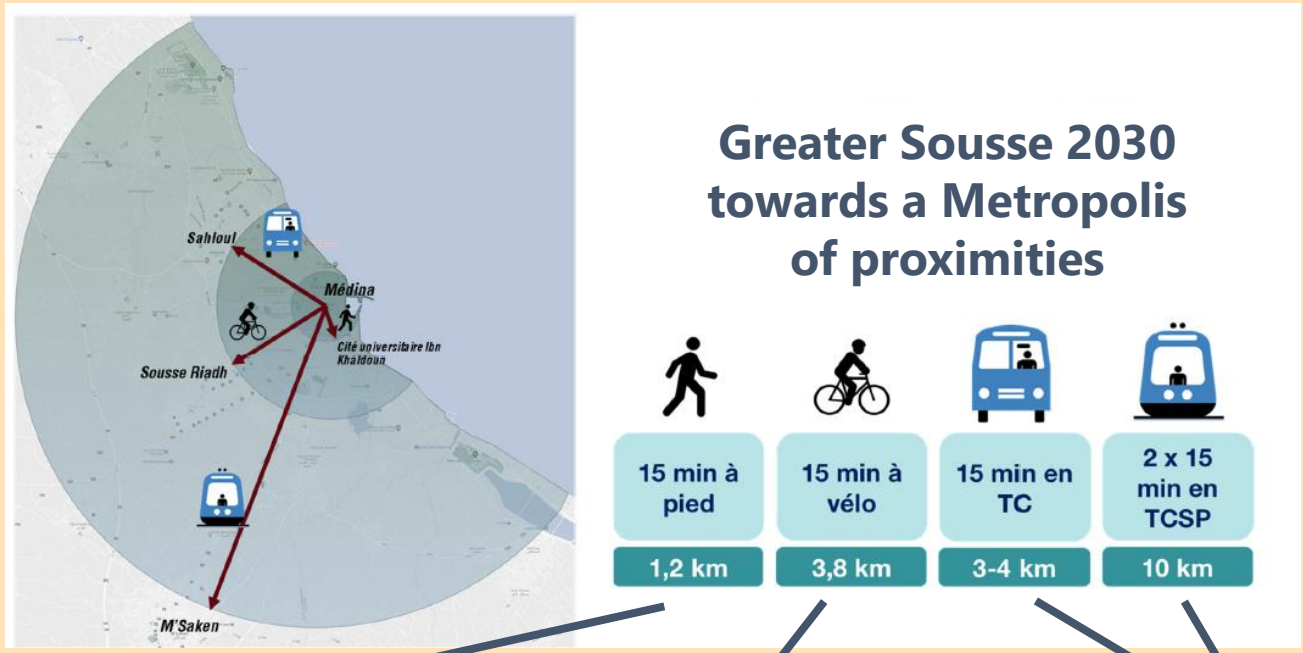
- **Population:** approx. 585 000 inhabitants, spread over 11 municipalities
- **Population growth:** +2.6% per year (among the highest of the large Tunisian conurbations)
- **Main urban transport issues:** (i) inefficient urban mobility system with institutional transport under strain; (ii) poorly performing radial bus network; (iii) low frequency of service; (iv) very limited intermodality; (v) paratransit in full expansion since the 2000s,…
  - ➔ **Transport system does not satisfy the mobility needs of the inhabitants while more than one million daily trips are expected to be made in the area by 2030**
- **Objectives:** define a new trajectory for urban mobility to improve the **quality of life** of the inhabitants, strengthen **tourist attractiveness** and ensure the **economic prosperity** of Greater Sousse.

Mobility schemes in Greater Sousse



Modal share in Greater Sousse (Source: Rapport de l'Enquête Ménages Déplacements du PDU du Grand Sousse, Municipalité de Sousse, Octobre 2021)

SUMP vision: towards a Metropolis of proximities



Maintain modal share of walking, by making it easier, more pleasant and safer, especially for the most vulnerable users

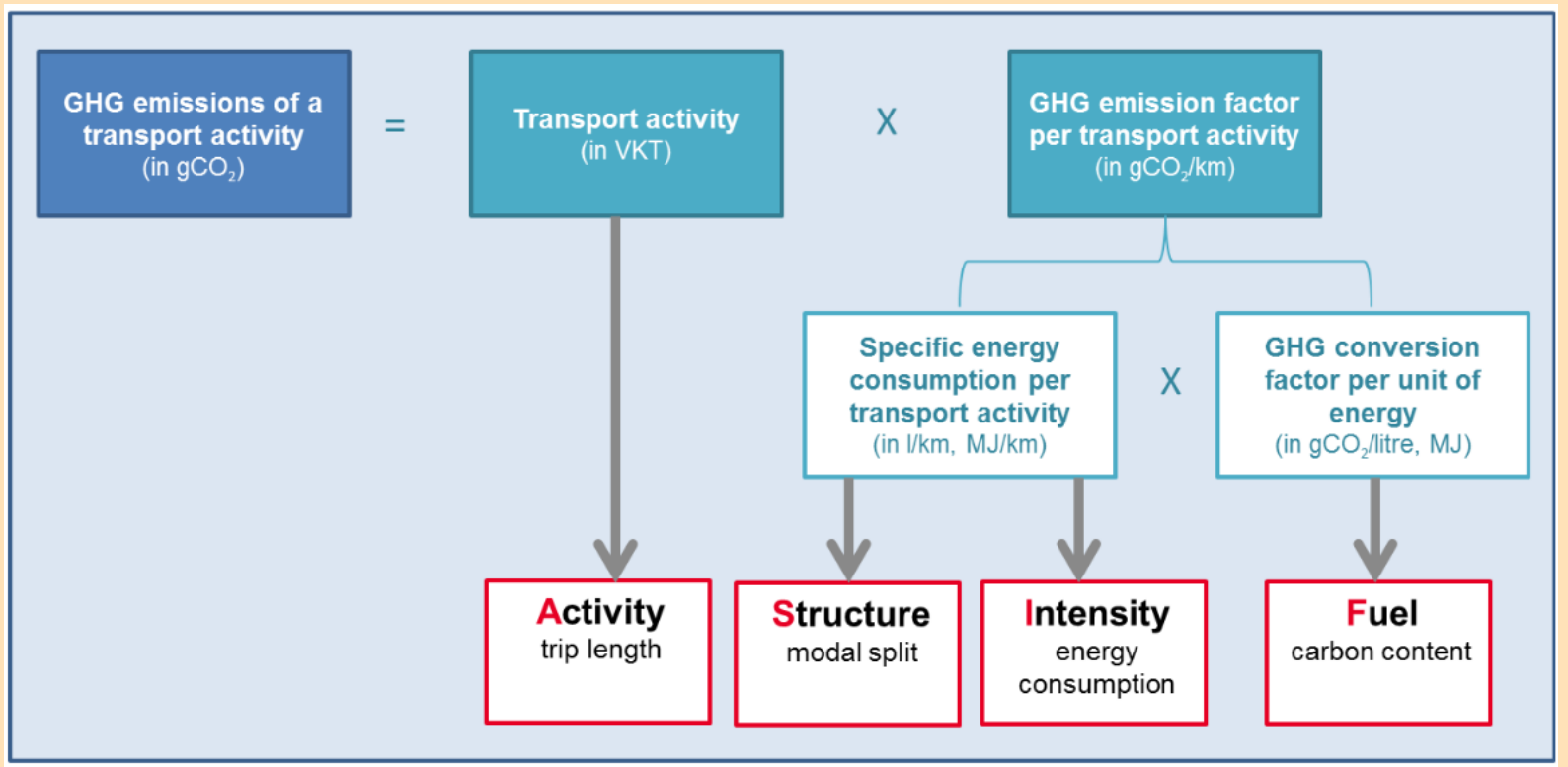
Develop a metropolitan cycle network providing links between central areas

Implement a BRT system and restructure the public transport network to enhance performance and offer a better hierarchy of services

GHG emissions assessment of Greater Sousse SUMP

Assumptions and current GHG emissions

ASIF approach



Source: "MobiliseYourCity Monitoring & Reporting Approach for GHG Emissions", September 2020

TTW and WTW emissions

Tank-to-Wheel

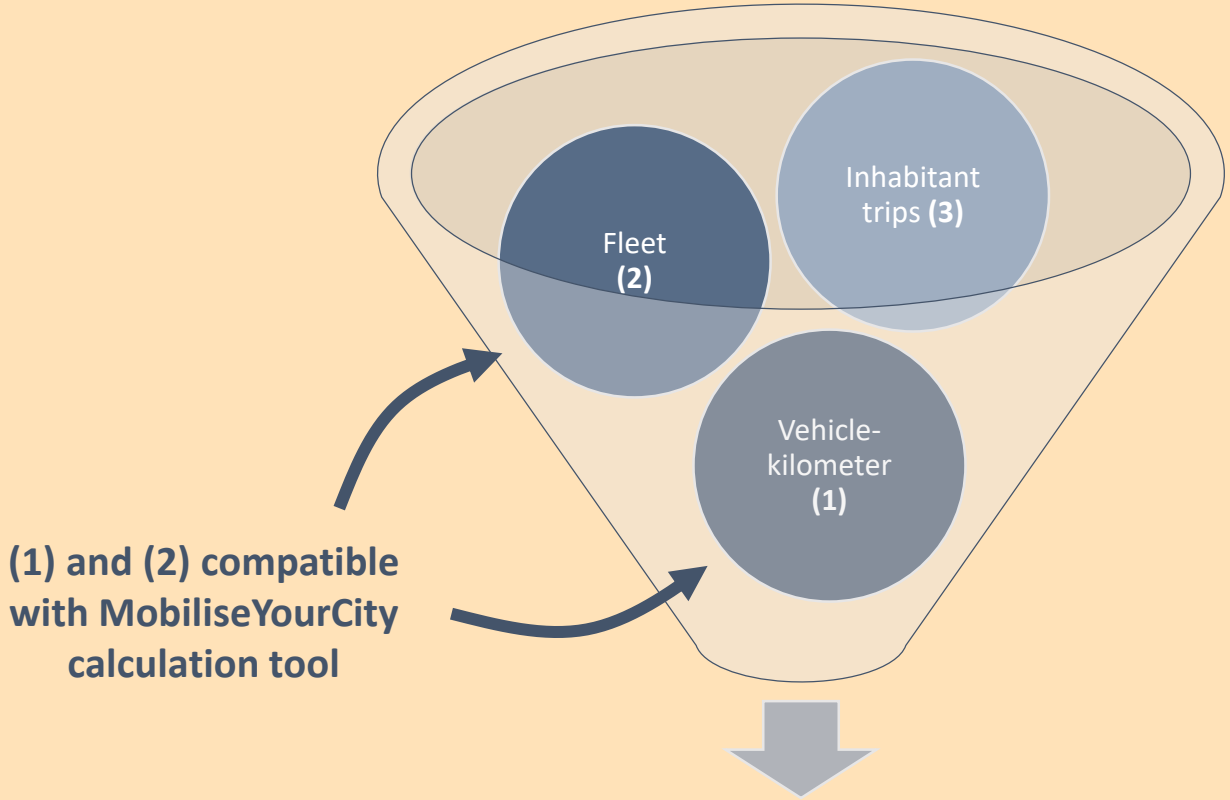
GHG emissions produced during operation

Well-to-Wheel

GHG emissions produced during a fuel's entire lifecycle

Evaluation chosen for the quantification exercise

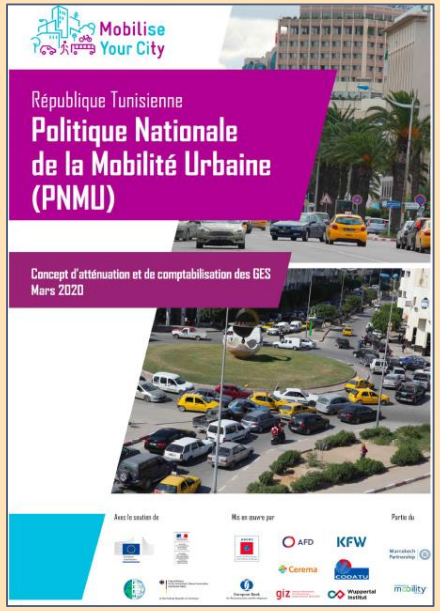
Calculation methods and approaches



Source : "MobiliseYourCity Monitoring & Reporting Approach for GHG Emissions", September 2020

Available studies and data

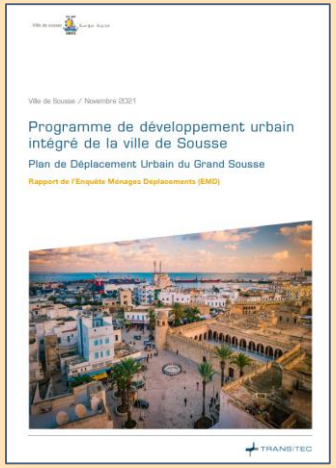
2020



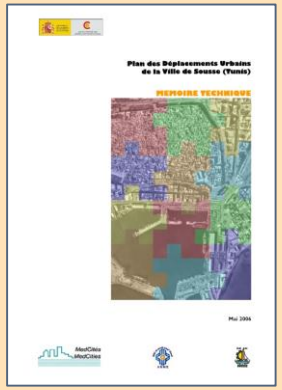
2018

2022

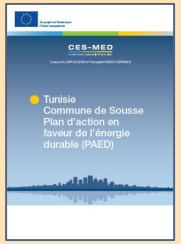
2020



2006



2012

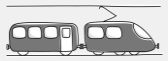


2022

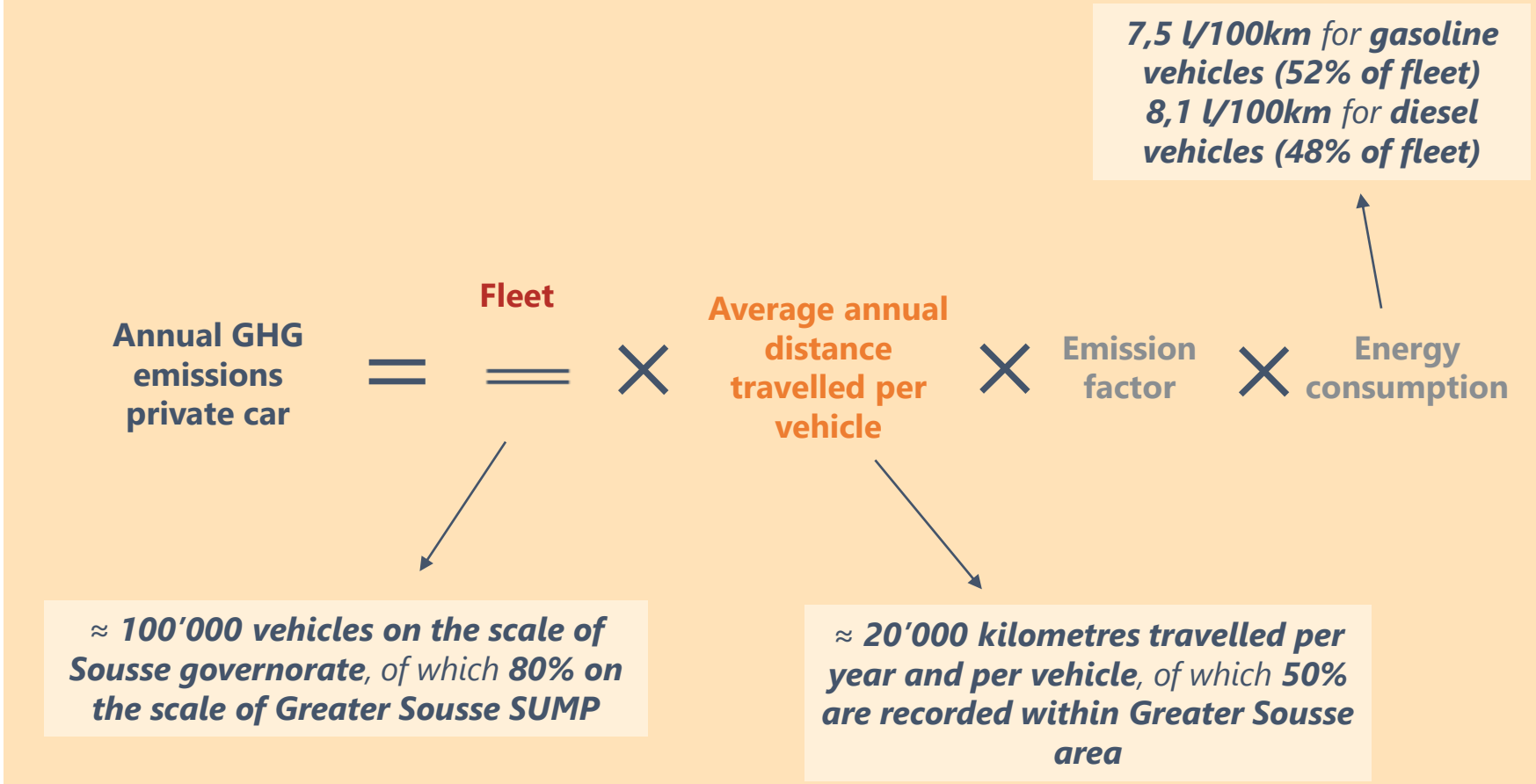
TUNISIA | SOUSSE-MONASTIR-MADHIA GOVERNORATE | GREATER SOUSSE* 2020 | GREATER SOUSSE* 2005 | SOUSSE MUNICIPALITY

**Different household survey perimeters*

Inputs overview

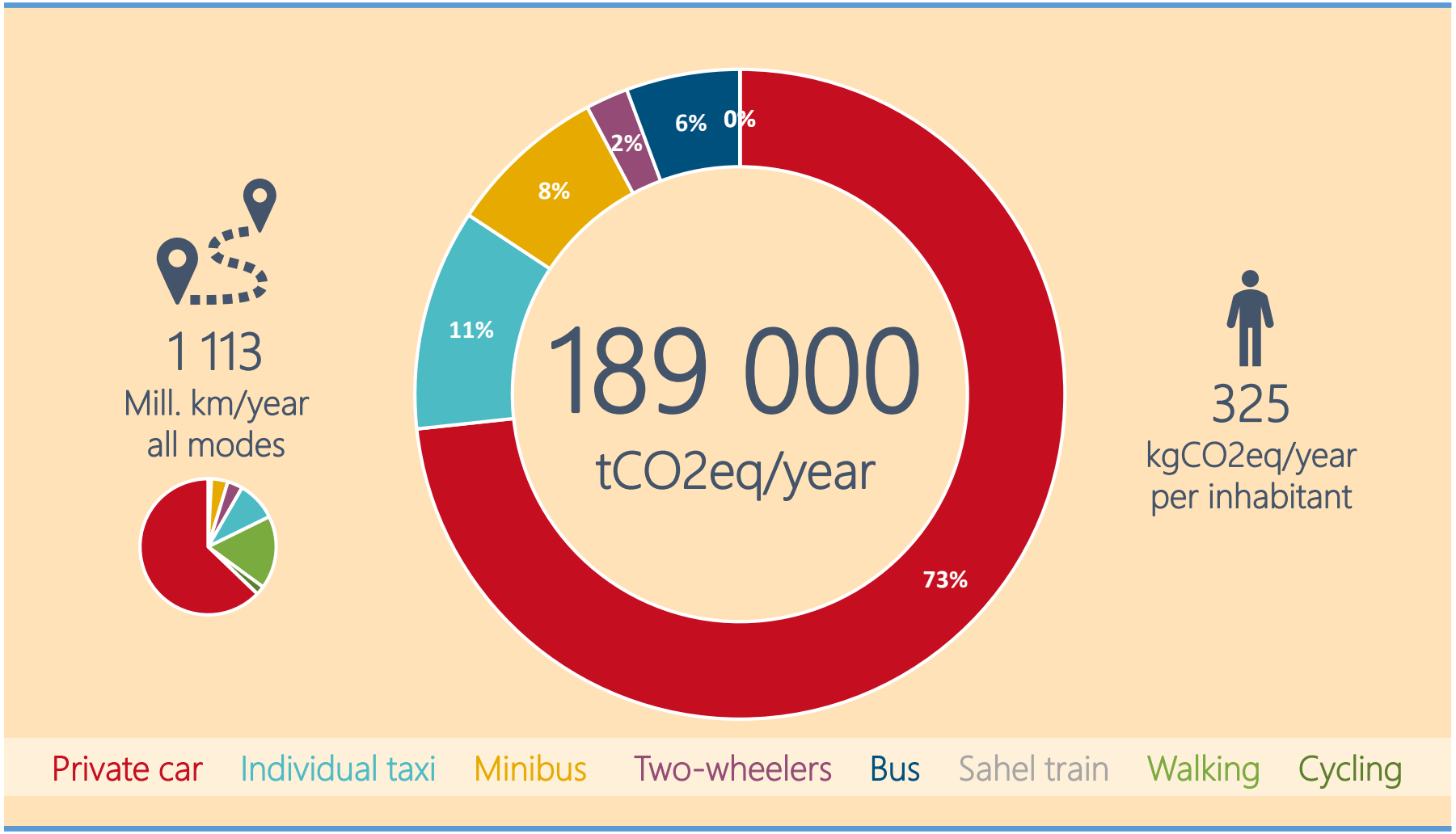
	Vehicle-kilometer	Fleet	Source
Private car 	✗	~	ATTT data 2021 + GIZ-NUMP study 2020
Two-wheelers 	✗	~	ATTT data 2021 + GIZ-NUMP study 2020
Individual taxi 	✗	✓	TNRP study 2018
Minibus 	✗	✓	TNRP study 2018
Bus 	✓	✓	STS data 2022
Sahel train 	✓	✓	SNCFT 2017 in GIZ-NUMP study 2020

Calculation methodology: example of the private car



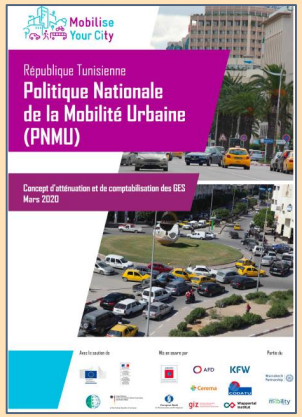
Source: vehicle fleet under 25 years old based on ATTT census data 2021 and expert assumptions

GHG emissions balance of current situation



Some comparisons

TUNISIA



➔ 2010: 700kgCO2eq/inhab. (passenger + freight)

➔ 2016: 825kgCO2eq/inhab. (passenger + freight)

GREATER SFAX

➔ 2015: 335kgCO2/inhab. (passenger)

SOUSSE MUNICIPALITY

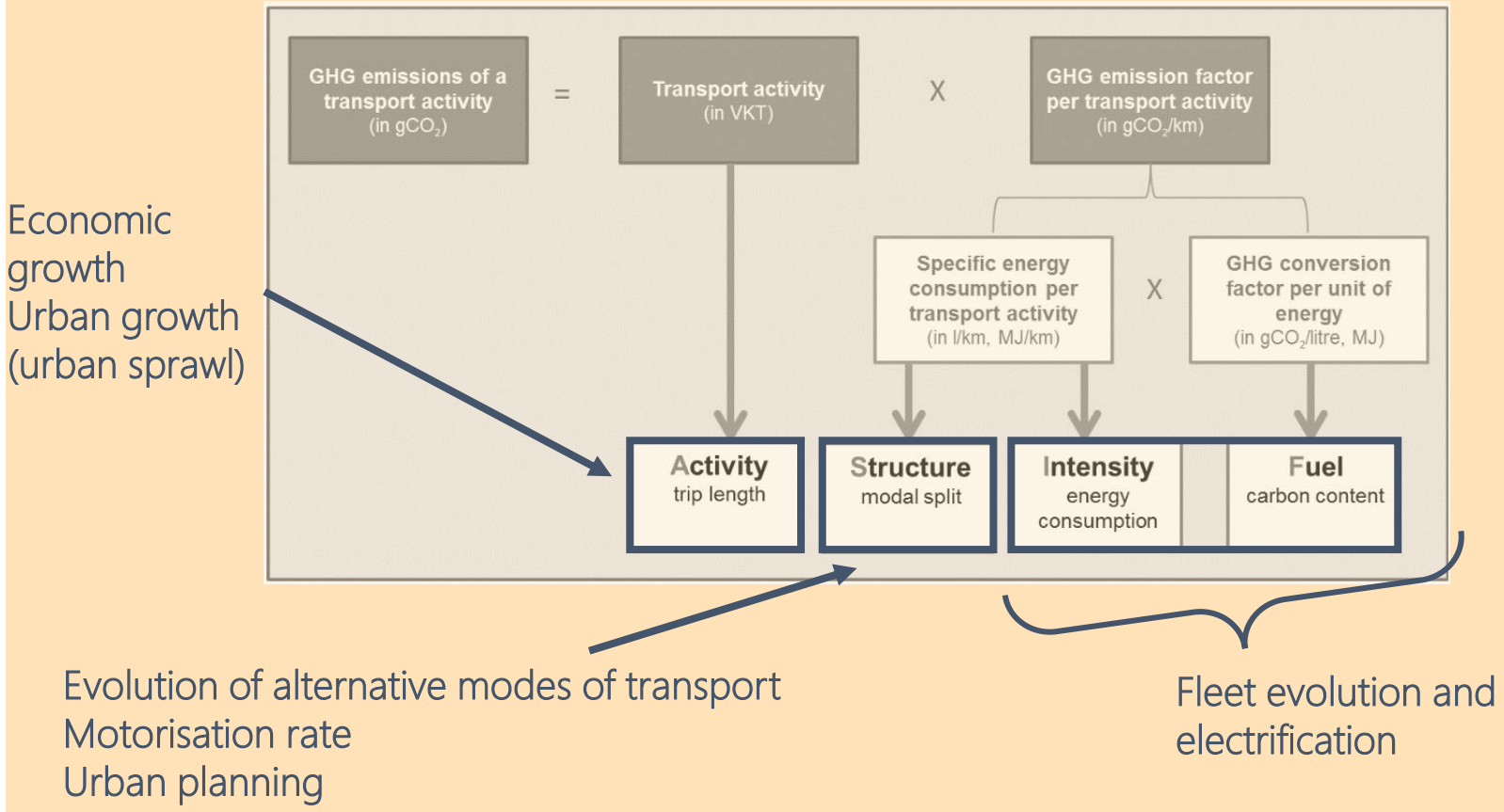
➔ 2010: 805kgCO2/inhab. (passenger + freight)

➔ 2018: 450kgCO2/inhab. (passenger)

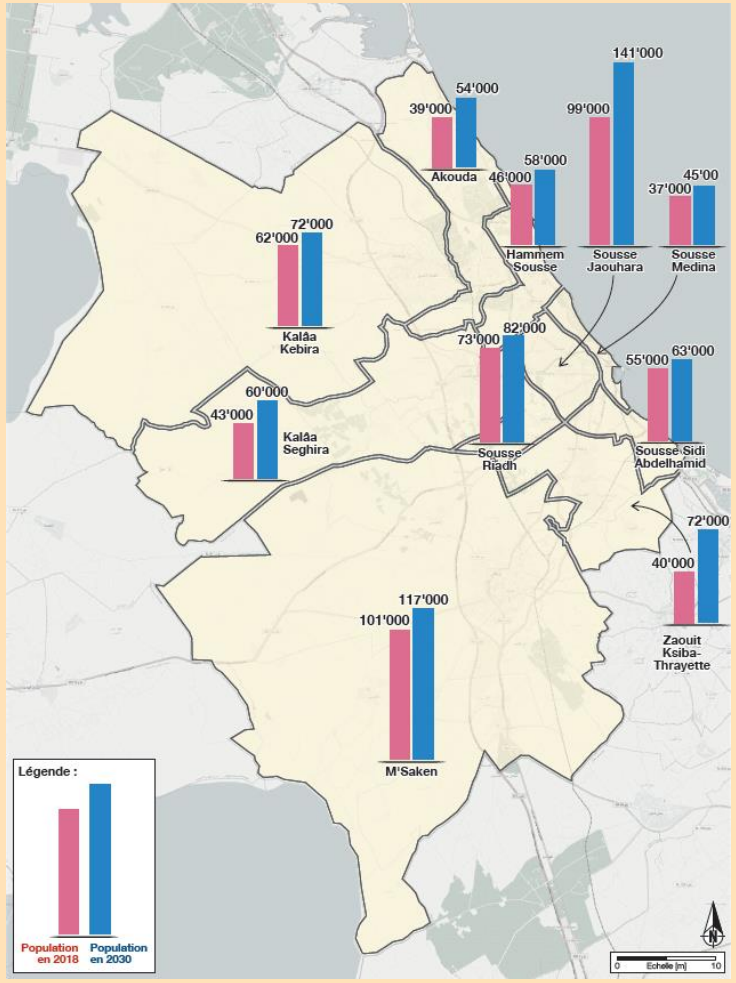
GHG emissions assessment of Greater Sousse SUMP

Assessment of BAU and SUMP 2030 scenarios

What are the projections for 2030?



A strong demographic growth...

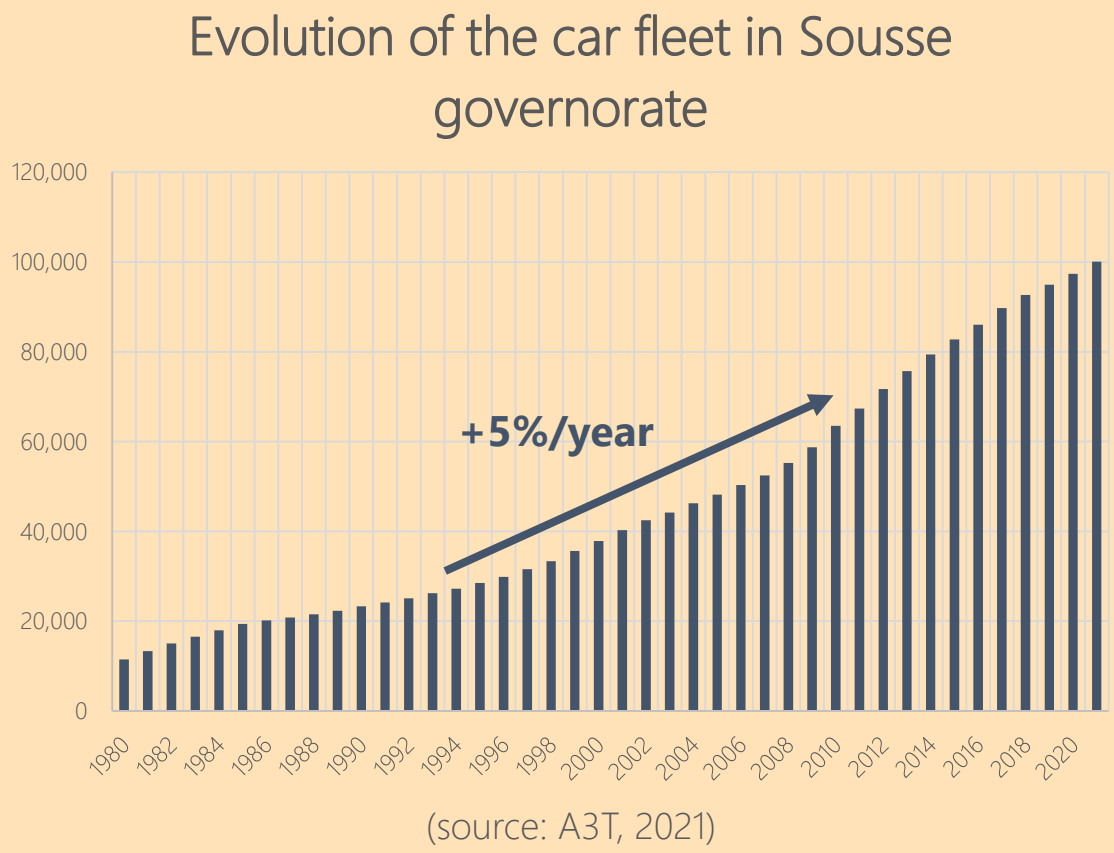


2020: 585 000 inhabitants.

2030 (implementation of the SUMP): 765 000 inhabitants, i.e. an annual increase of 2.7%.

Evolution of the population of Greater Sousse between 2018 and 2030
Source: Report « Elaboration d'une vision globale pour la mobilité durable dans le Grand Sousse », Transitec, August 2021

… and a growing motorisation rate

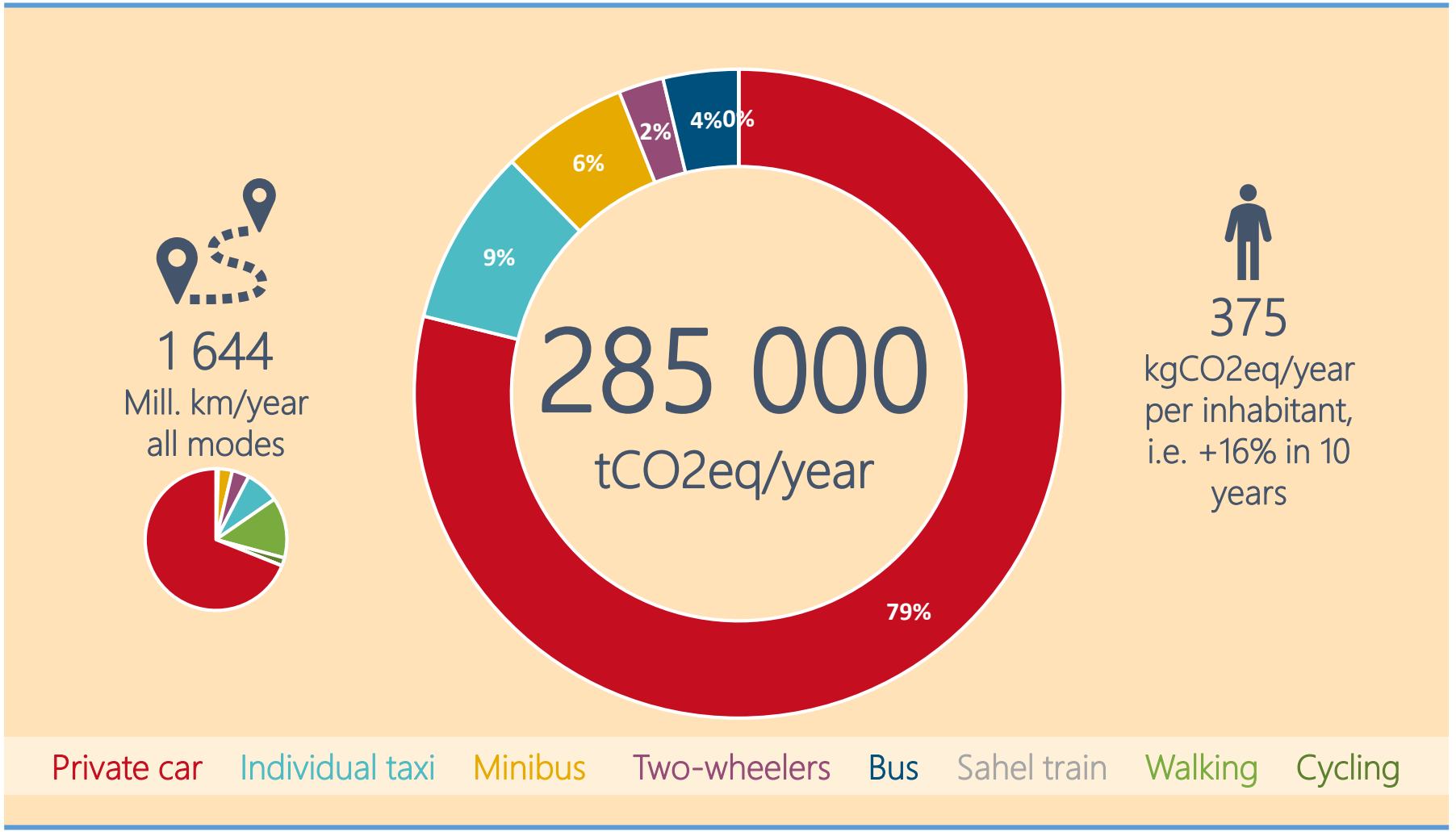


(source: A3T, 2021)

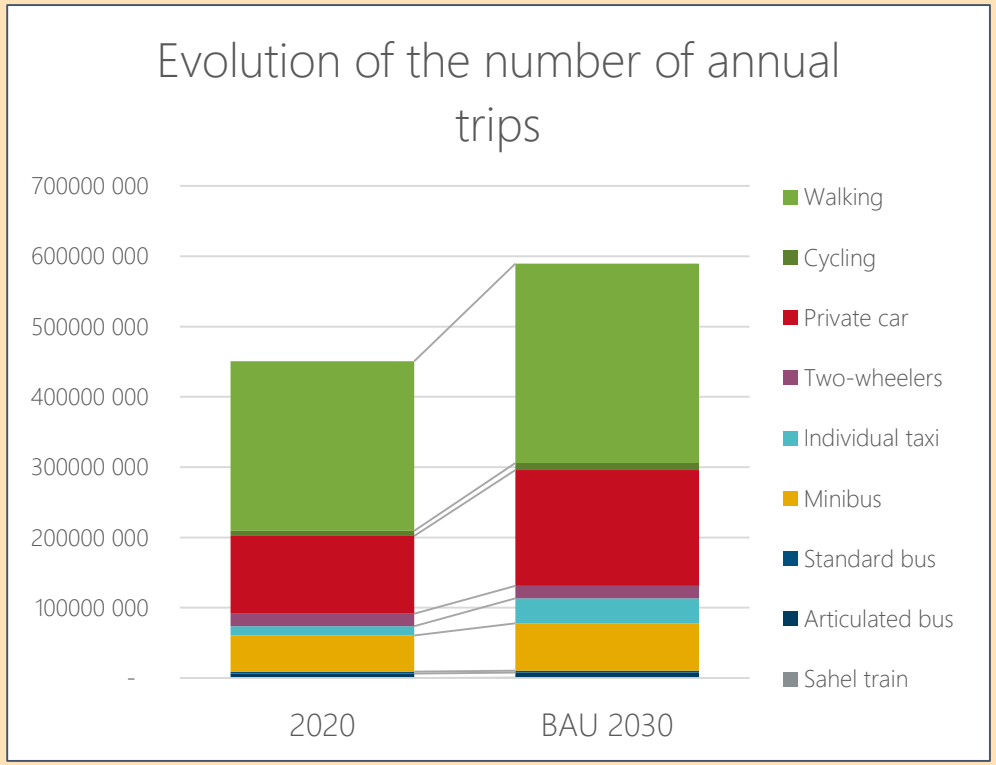
Comparable annual growth for motorised two-wheelers, but lower for individual taxis and minibuses, at around +2%/year

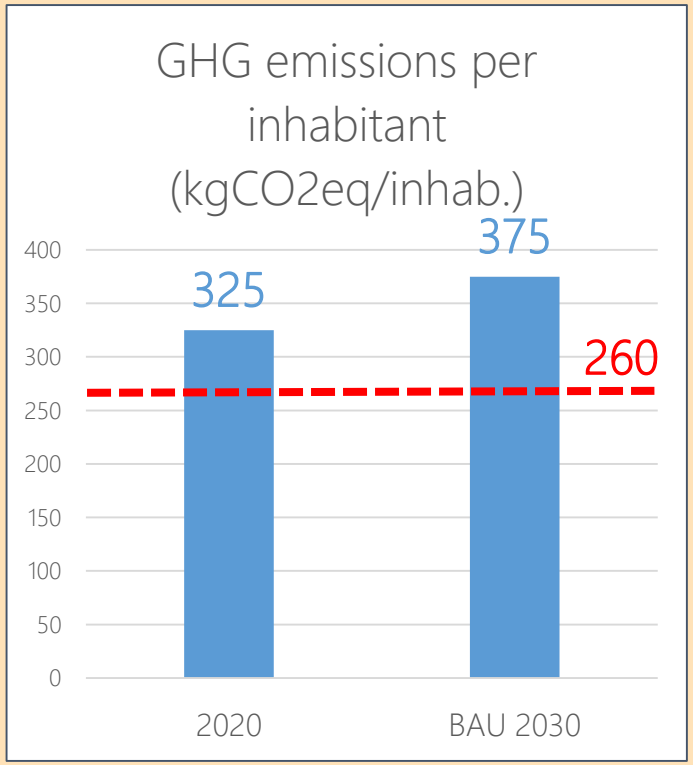
NB: the fleet in year N correspond to the number of vehicle in circulation after removing end-of-life vehicles (vehicles over 25 years old)

GHG emissions balance of BAU scenario



Comparison current situation / BAU 2030

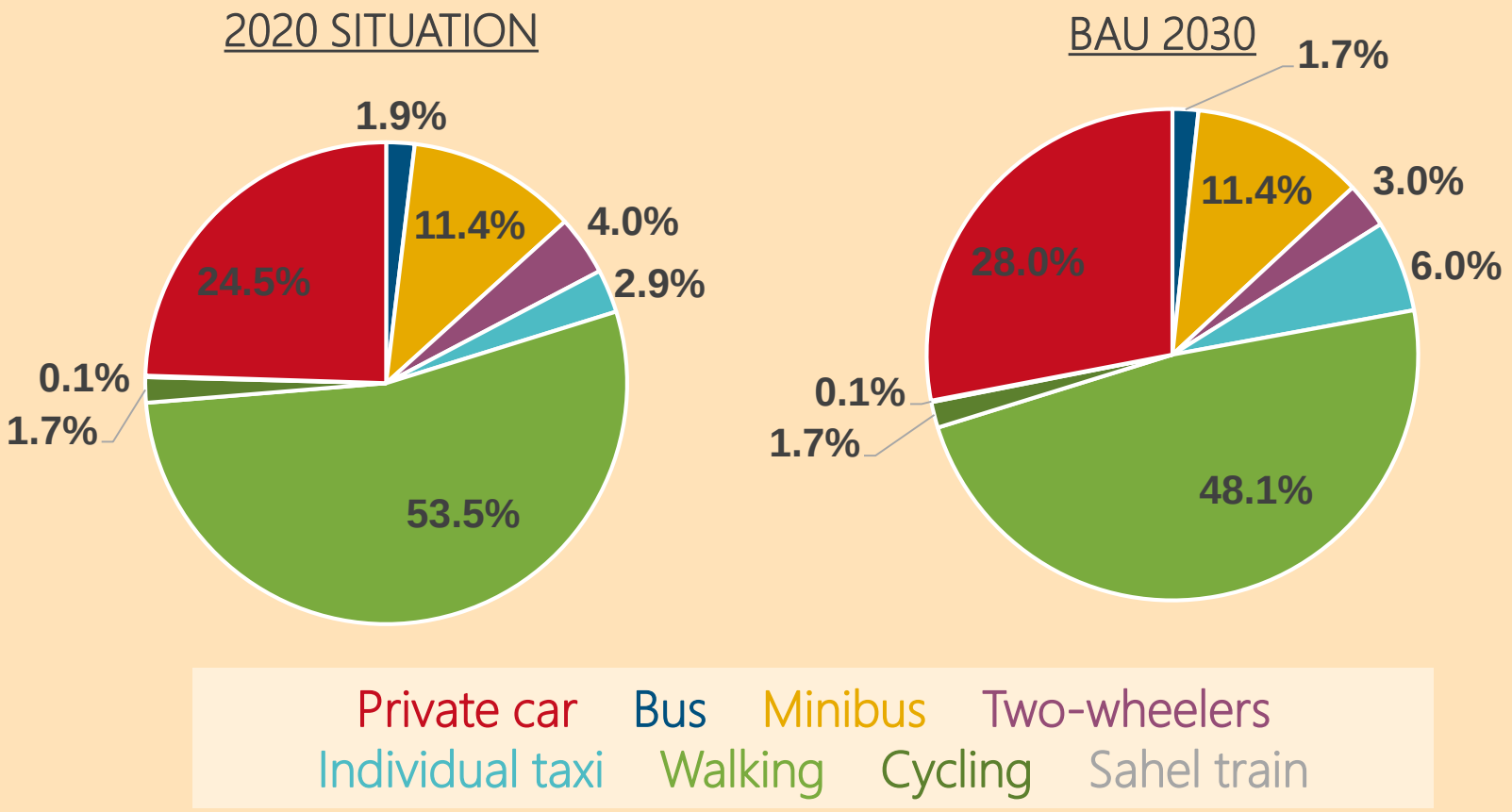




GHG emissions from the transport sector increase by +15% between 2020 and 2030, whereas they should be reduced by -17% by 2030 compared to 2010 in order to meet the commitments of the Tunisian NDC regarding transport

threshold to meet the commitments

Comparison current situation / BAU 2030

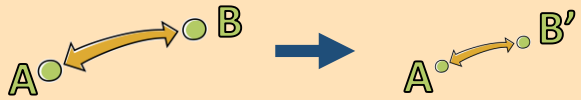


Levers for GHG emissions reduction in urban mobility

1. **Substitution effect:** reduction in the number of trips

2. **Mode effect:** modal shift to public transport or active modes

3. **Distance effect:** decrease in travel length

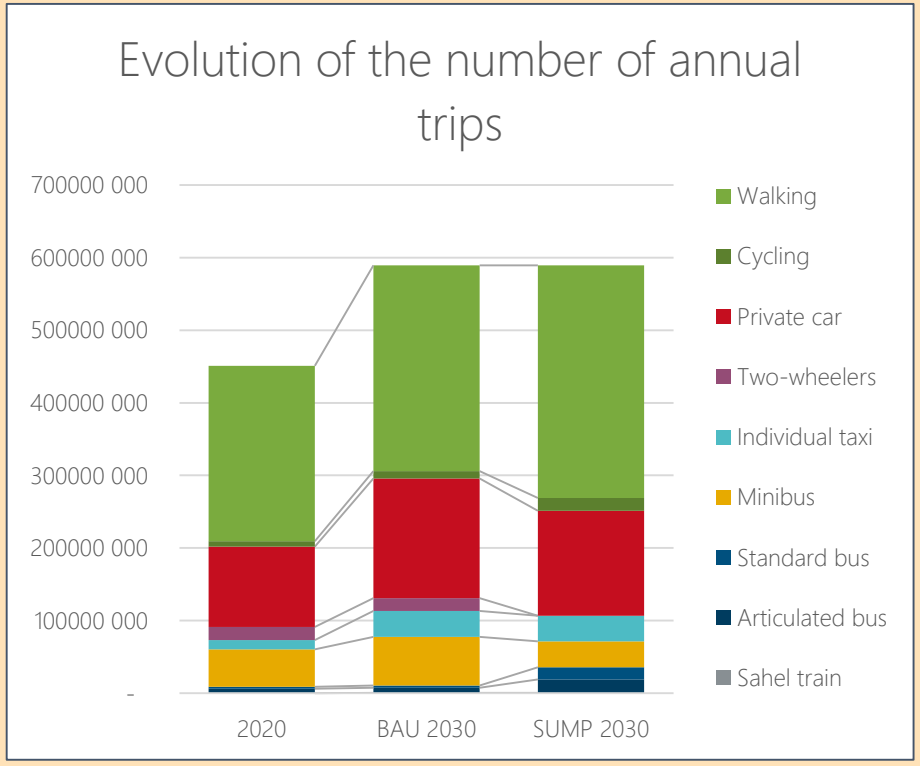


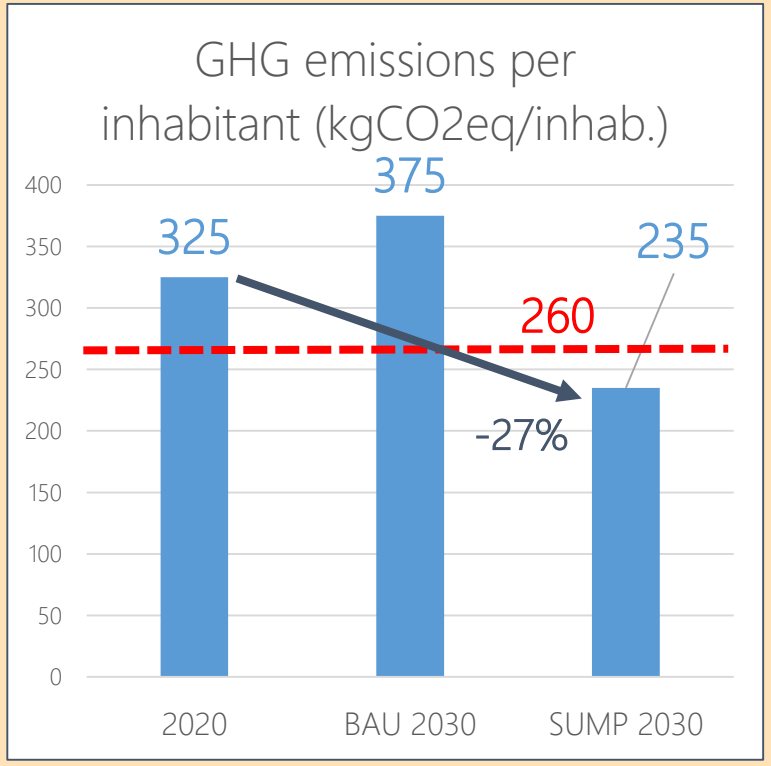
4. **Loading effect:** increase in vehicle load rate

5. **Energy performance effect:** reduction in energy consumption

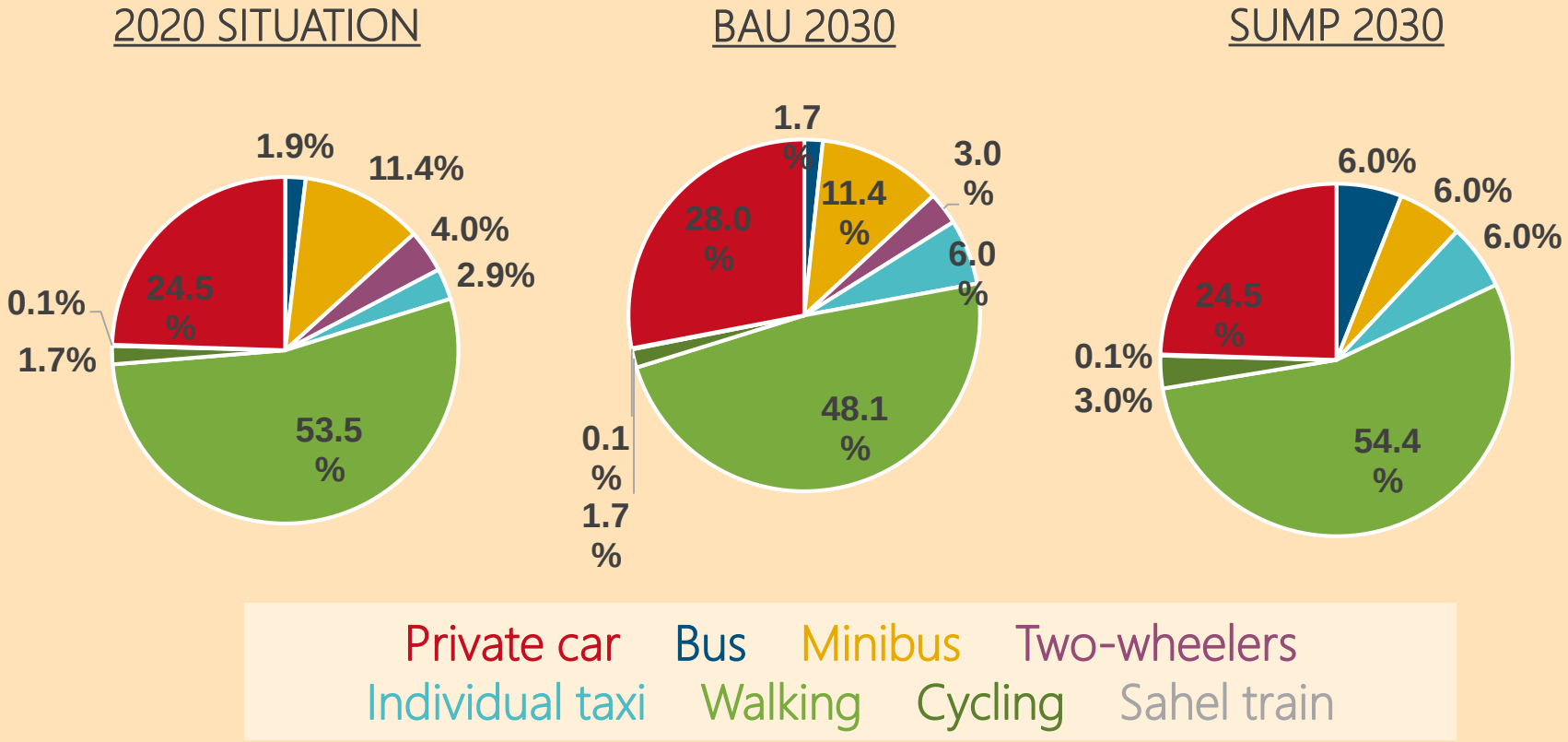
With the implementation of the SUMP, what does it look like?

The same number of trips, but lower emissions between BAU 2030 and SUMP 2030 scenarios!





With the implementation of the SUMP, what does it look like?



GHG emissions assessment of Greater Sousse SUMP

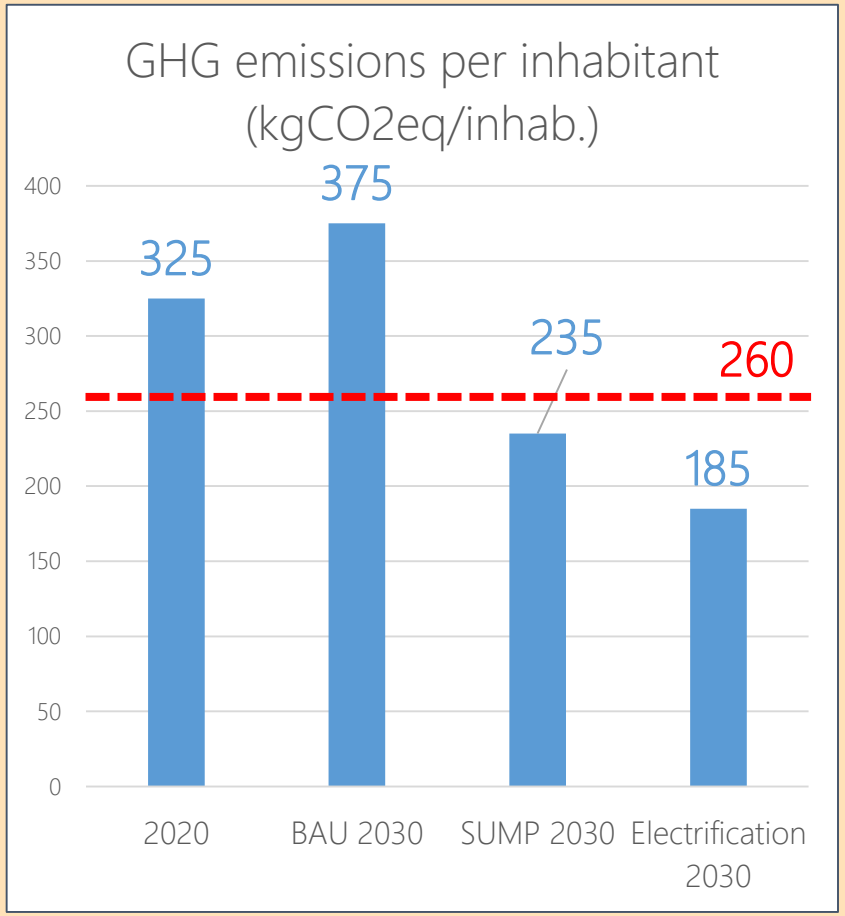
Conclusion

Towards an implementation of the SUMP

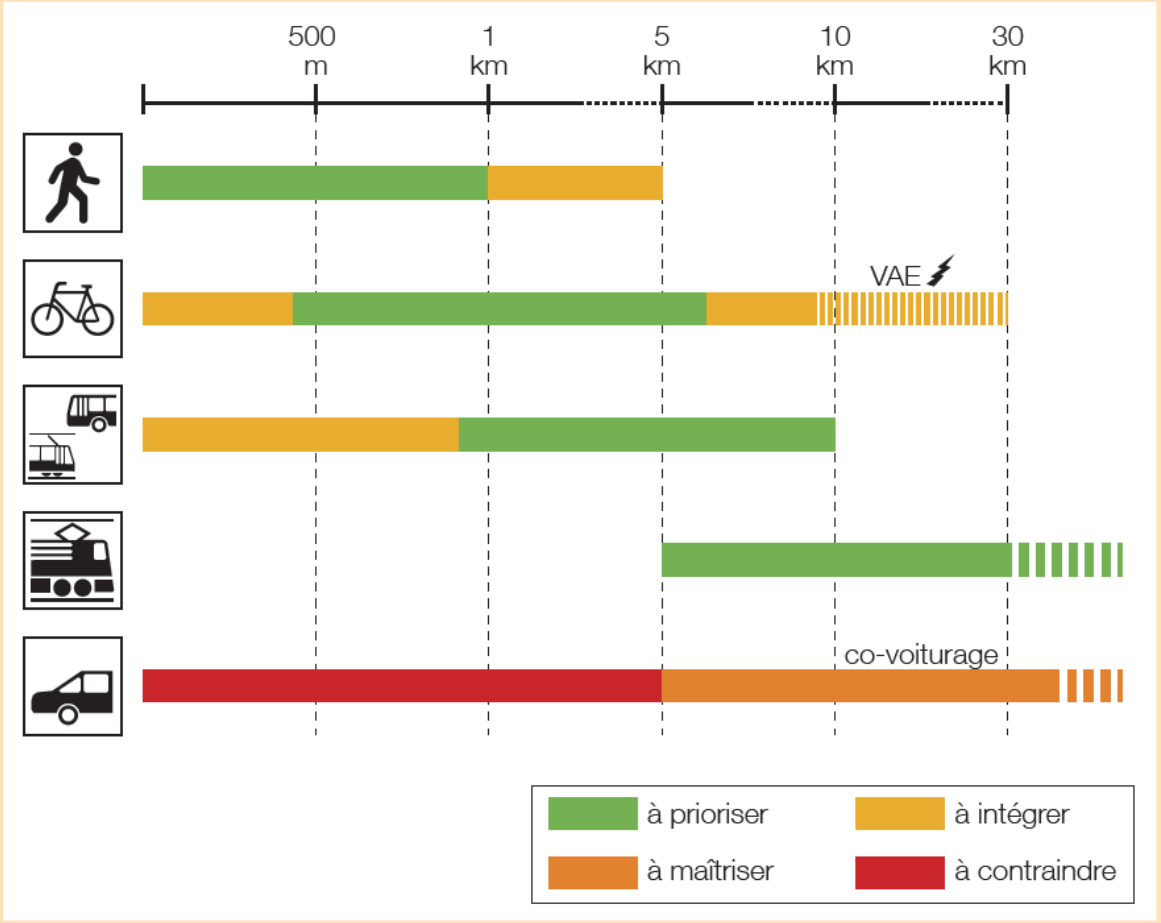
The reduction of GHG emissions can be achieved through:

- The implementation of the SUMP action plan;
- Rapid development of an efficient public transport network;
- Moderation of car traffic flows;
- Promotion of active modes of transport, particularly walking;
- Electrification of the fleet (but with decarbonization of electricity production!)

Assumptions for electrification scenario 2030: 100% electric BRT, 100% electric individual taxi, 10% electric private car



A necessary evolution of mode relevance!



Source: Transitec

Key learnings

- Sustainable urban mobility is a **major political challenge** (strong link between urban mobility policies and national NDC commitments)
- The **quantification and monitoring of GHG emissions from urban mobility policies is essential** in order to assess the impact of their implementation and to benefit from external funding
- Implementation of the **Greater Sousse action plan offers excellent opportunities to reduce GHG emissions** and meet Tunisia's national commitments
- **Assessment methodology has some limitations**: perimeter issue (especially for exchange and transit flows), no account taken of tourism-related flows, lack of data on freight transport
- **Harmonisation of GHG mitigation efforts is needed** to address the methodological gap in the assessment of GHG emissions at local and national levels: **MobiliseYourCity calculation tool is a lever to achieve it!**
- **Importance of setting up a mobility observatory** to facilitate: data collection, the inventory process and monitoring of GHG emissions at local and/or national level, the development of a governance structure bringing together all urban mobility stakeholders

Thank you

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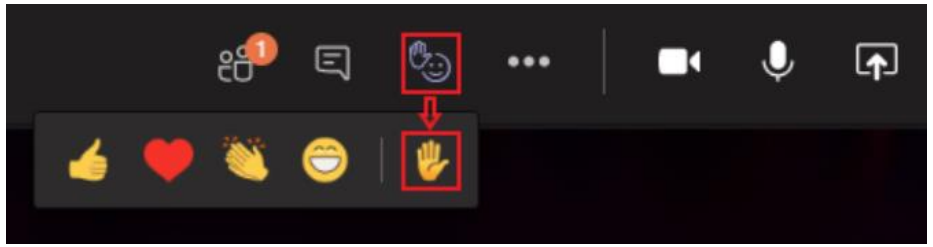
Q&A

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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