Intelligent transport systems - from science to policy and from policy to real world

Air pollution and climate change: opportunities in the transportation sector

Carlos Borrego

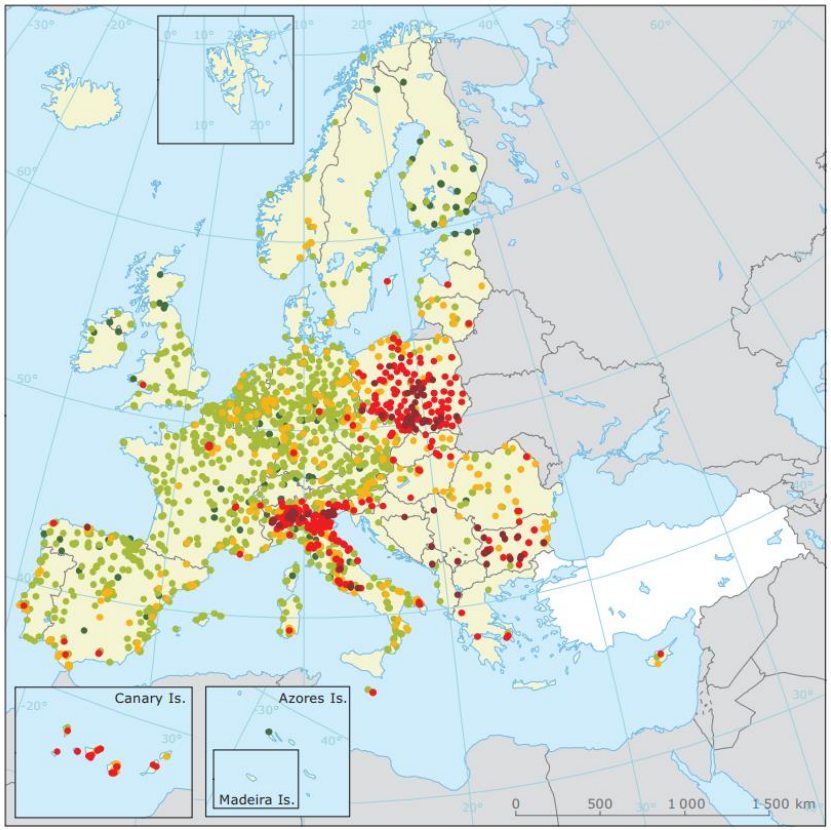
Sandra Rafael, Bruno Vicente & Sílvia Coelho

CISMOB Interreg Europe

7th March 2018

dao

Air Pollution



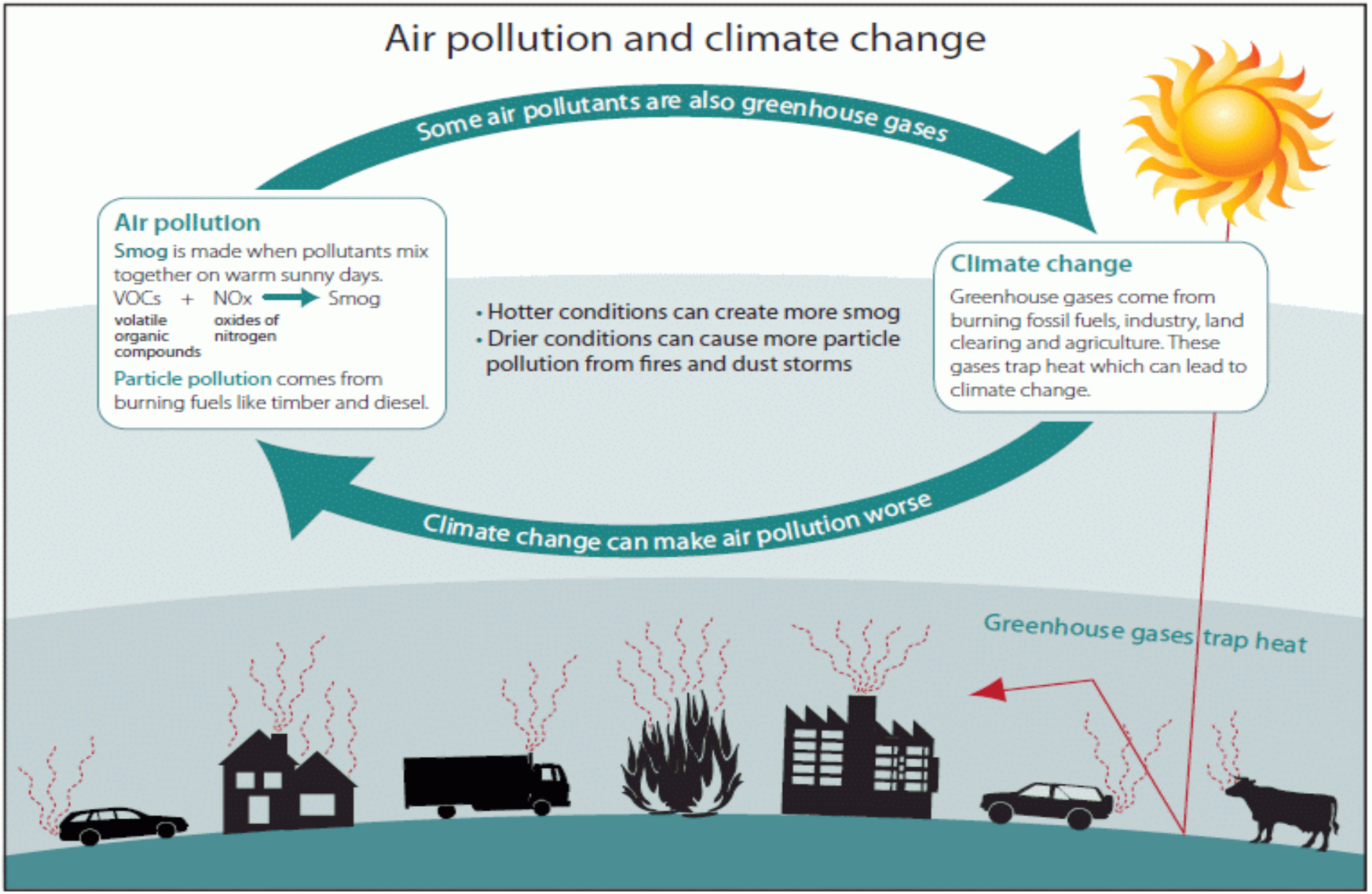
- PM10 concentrations above legislated limit values

EEA Report | No 13/2017

Air quality in Europe — 2017 report

European Environment Agency

Air Pollution and Climate Change



Adapted from State of the Environment NSW 2000

Health Problems

- Angina
- Lung cancer
- Lung conditions (COPD – Chronic Obstructive Pulmonary Disease)
- Heart attacks
- Strokes
- Heart disease
- Parkinson's and Alzheimer's diseases
- Premature births
- Reduced brain development

Transports
Facts

European Environment Agency

Topics Countries Data and maps Indicators Publications

News EU greenhouse gas emissions ...

EU greenhouse gas emissions from transport increase for the second year in a row

News — Published 01 Jun 2017 — Last modified 01 Jun 2017 — 2 min read

PDF

Topics: Climate change mitigation Energy Transport

Total European Union greenhouse gas emissions increased by 0.5 % in 2015, according to new European Environment Agency (EEA) data published today. Transport was a key reason for that increase: better fuel efficiency in that sector was not enough to counter the effects of an increasing demand for transport.

European Environment Agency

Topics Countries Data and maps Indicators Publications

News EU greenhouse gas emissions ...

Road traffic remains biggest source of noise pollution in Europe

News — Published 24 Apr 2017 — Last modified 24 Apr 2017 — 2 min read

PDF

Topics: Environment and health Policy instruments Transport

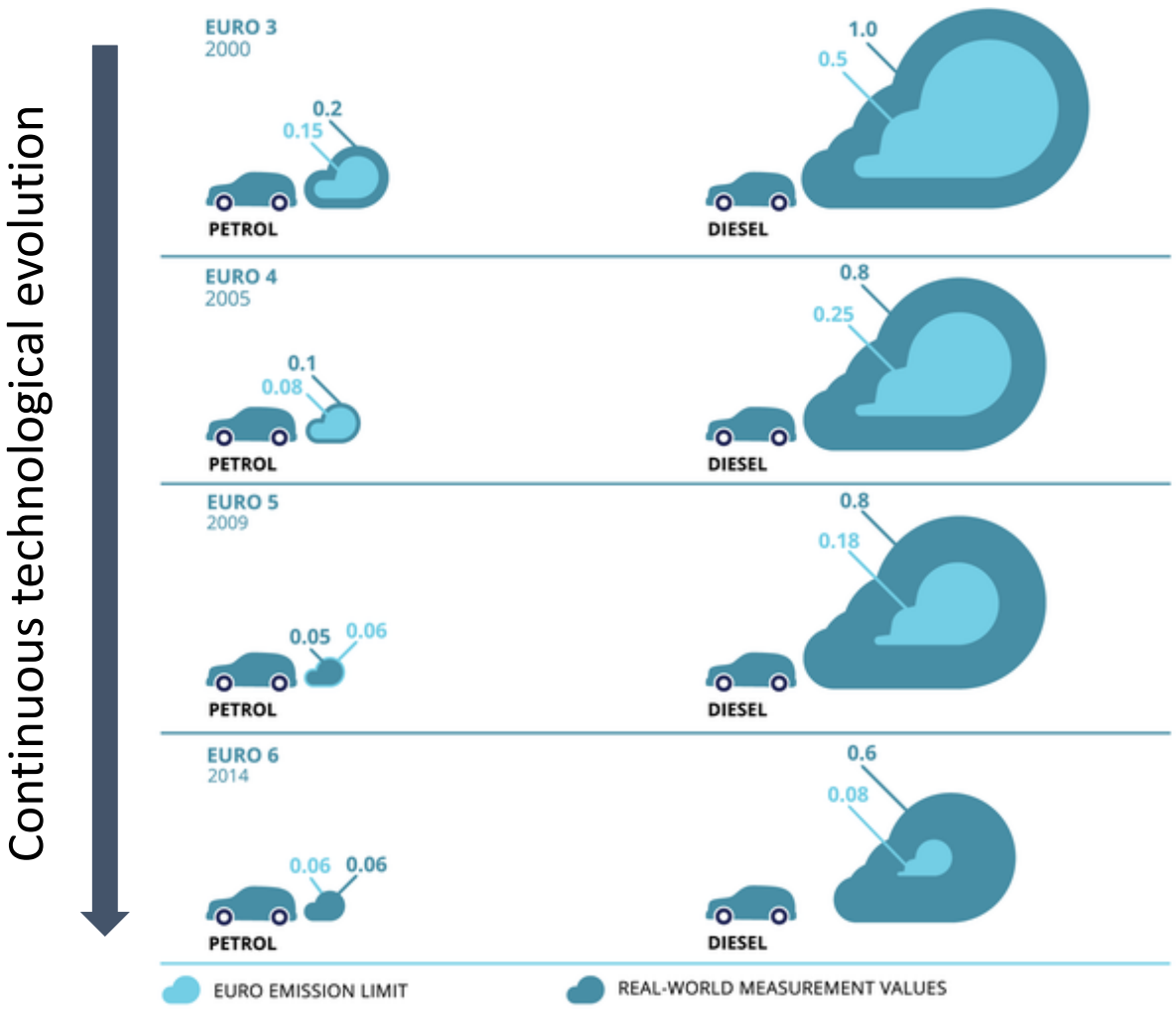
With an estimated 100 million Europeans affected by harmful levels, road traffic is by far the largest source of noise pollution in Europe, according to a new assessment published by the European Environment Agency (EEA) today.

Image © Thomas Skingley, My City/EEA

CISMOB
Interreg Europe

Transports

Facts | Comparison of NOx standards and emissions for different Euro classes



Adapted from: ICCT, 2014a; Emisia, 2015

Nitrogen oxide (NOx) emissions (in g/km)

NOx emissions from diesel cars have not improved much, meaning reductions have not been as large as planned in legislation. Until the Euro 6 regulations came into force, diesel cars were already permitted to emit three times as much NOx as petrol cars.

Technological measures are not enough

=

We need to think out-of-the-box

CISMOB Interreg Europe dao

Research at the service of society

Links between transport and air quality

- SMARTDECISION (FCT)

  Intelligent Vehicle Routing System for Enhanced Air Quality in Urban Areas: was developed a set of eco-traffic management strategies and eco-routing applications

- @CRUiSE (FCT)

  Advanced Impact Integration Platform for Cooperative Road Use: to integrate road traffic impacts into a single analytical framework for use in advanced traffic management systems (ATMS).

- CLAiR-City (H2020, SC5)

  Citizen-led air pollution reduction in cities: to put city dwellers, their activities, feelings, and short and long-term preoccupations at the centre of air pollution analyses, management and mitigation.

SMARTDECISION

Methodology

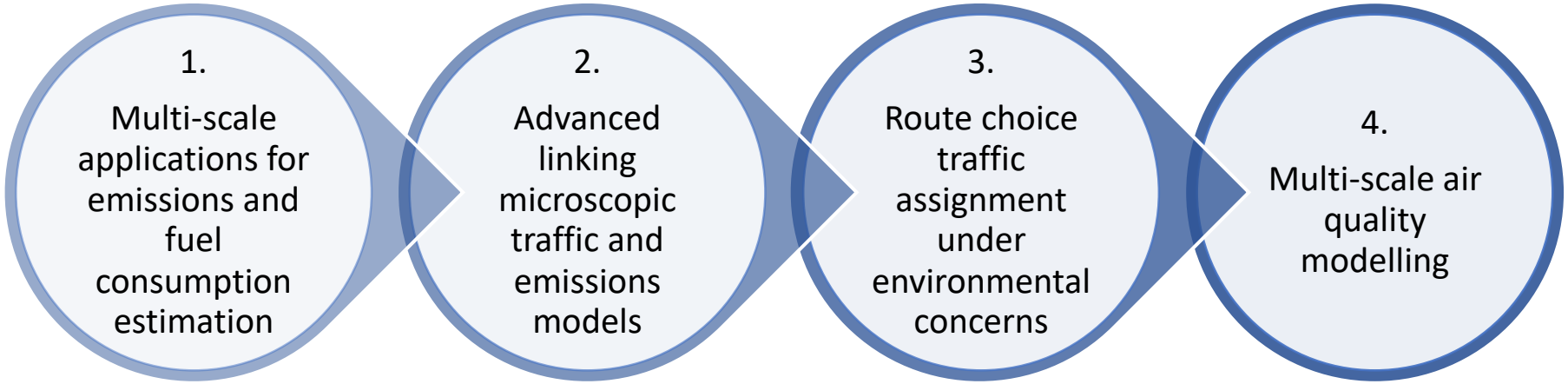
To develop a decision support information system that characterized urban mobility, helping drivers to choose the best route for a certain trip, using different factors:

Time

Traffic congestion

Fuel use

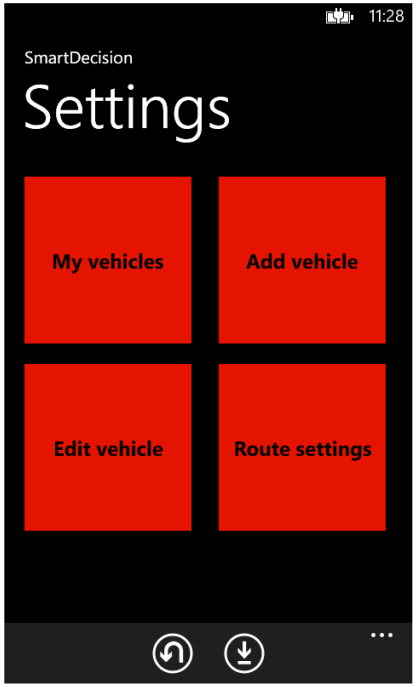
Emissions

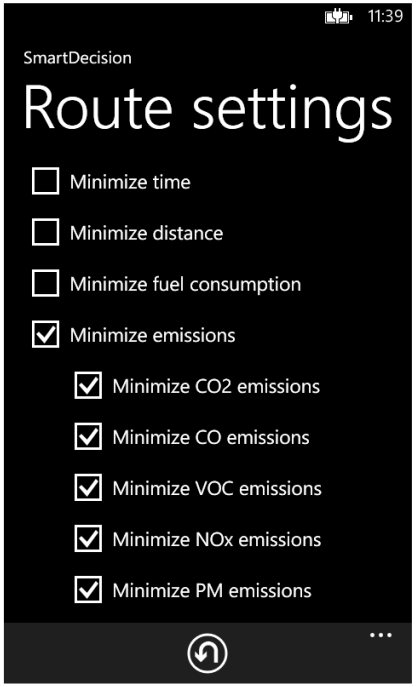


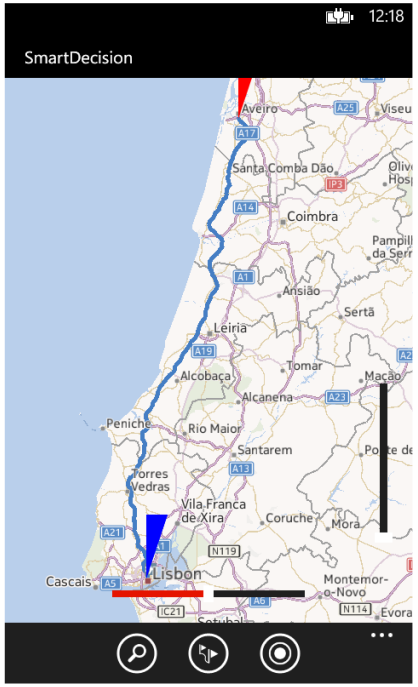
SMARTDECISION

Results

- Tool to help the traffic assignment in a certain corridor more efficiently and environmentally friendly.
- In the route menu it can be chosen: e.g. avoid highways, shortest travel time, fastest route, low-cost route, a lower pollutant emissions or less impact on human health.
- Contribution for implementing intelligent traffic management measures.







CISMOB Interreg Europe

dao

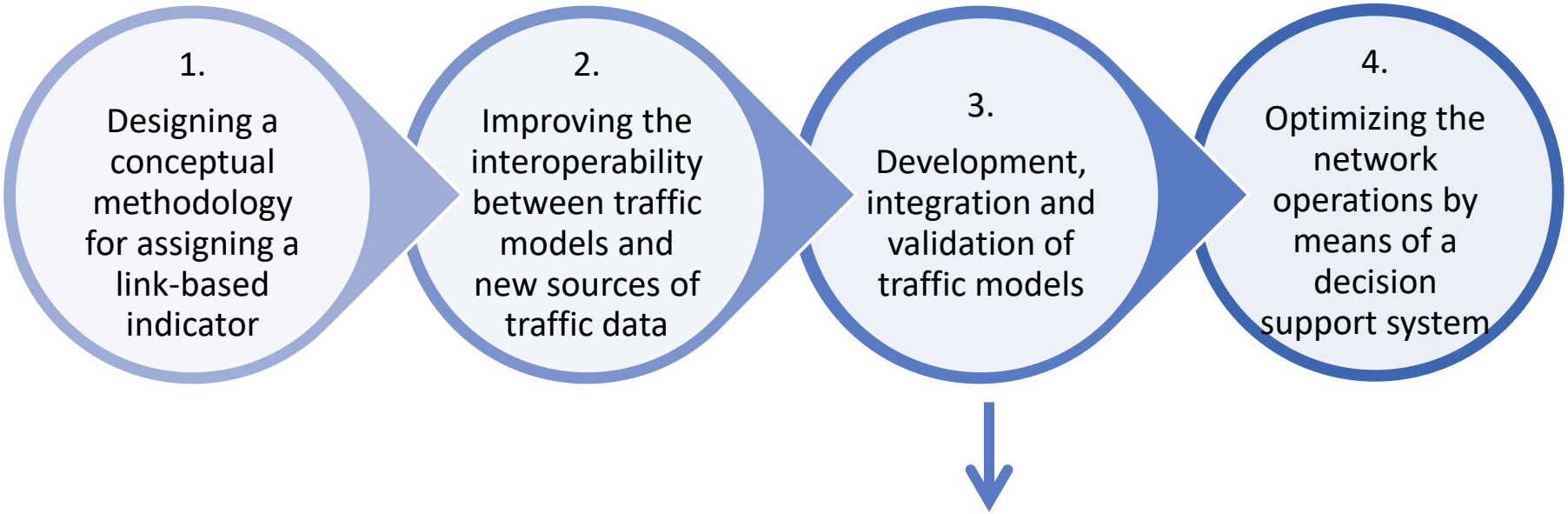
@CRUiSE

Methodology

Designing a conceptual methodology for assigning a link-based indicator to evaluate different traffic-related externalities, adjusted to local contexts of vulnerability.

To integrate road traffic impacts into a single analytical framework for use in advanced traffic management systems (ATMS)

- Economic
- Environment (also noise)



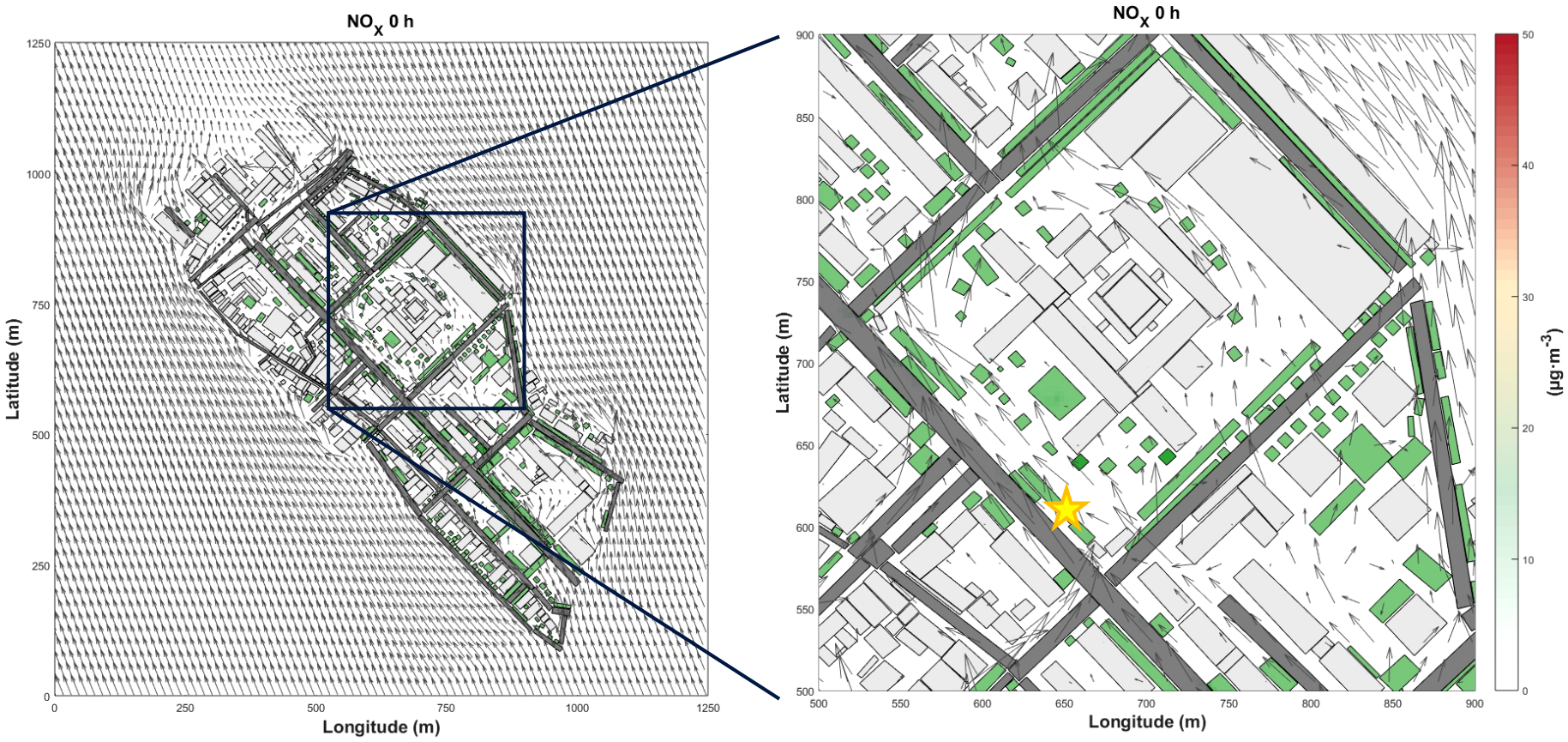
Air Quality models at local scale + artificial neural networks

CISMOB Interreg Europe dao

@CRUiSE

Results | NOx concentration

Case study | Aveiro Local Scale



Air Quality Monitoring Station

CISMOB Interreg Europe

dao

The step forward

CLAiR-City

Goal

Improve air quality, reduce carbon emissions, improve public health outcomes and greater citizen awareness

↓

Integrate and quantify citizens' behaviour and activities to enrich city, national and EU level policy-making

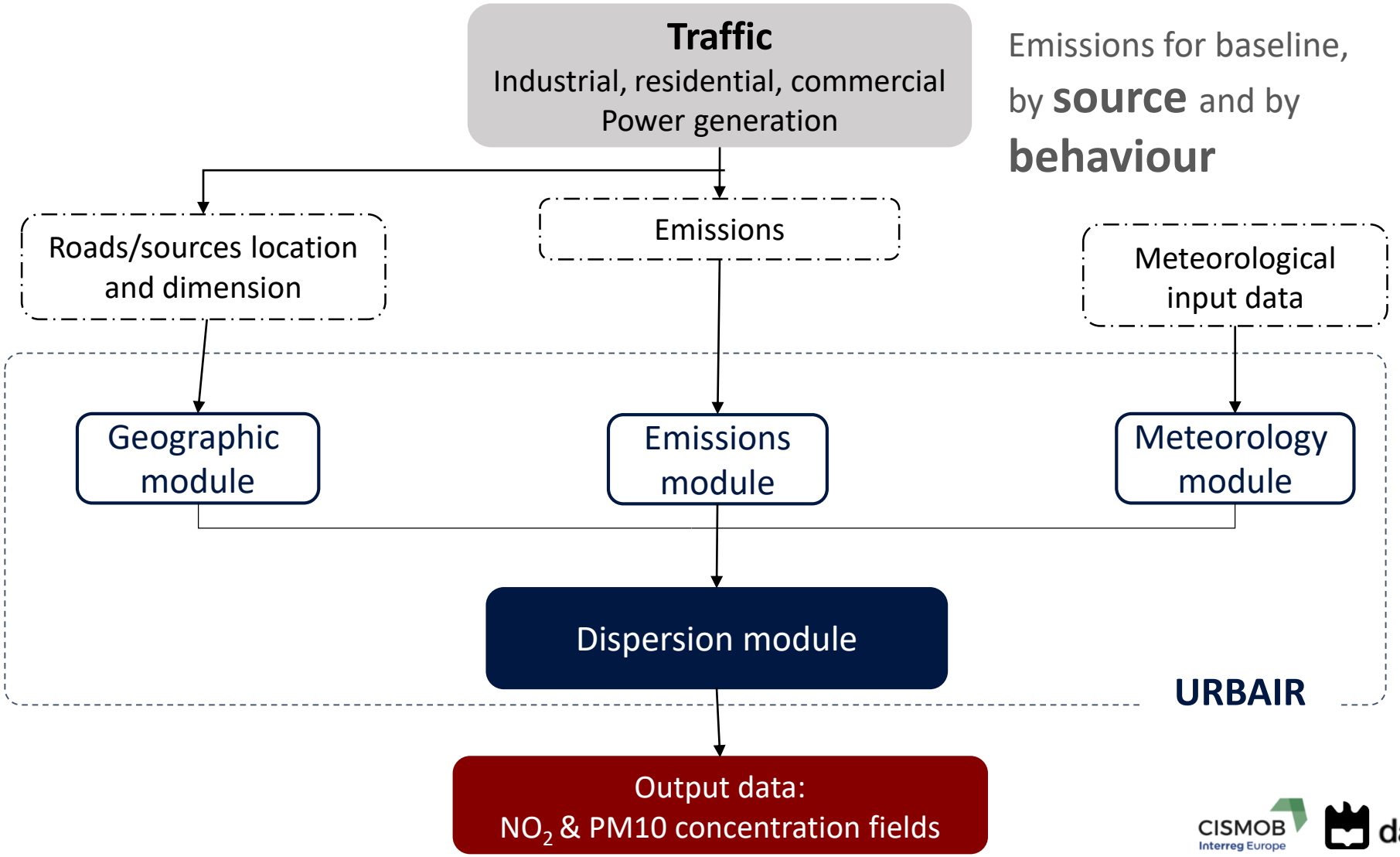
a. Putting citizens behaviour and practices at the heart of the debate
b. Develop a suite of innovative toolkits for enhanced quantification, engagement and impact evaluation
c. Integrate citizens behaviours in city policies now and in the future
d. Raise awareness of environmental changes and their solutions

CISMOB Interreg Europe dao

CLAiR-City

Approach – Air quality modelling

concentrations to feed into the app to simulate future scenarios

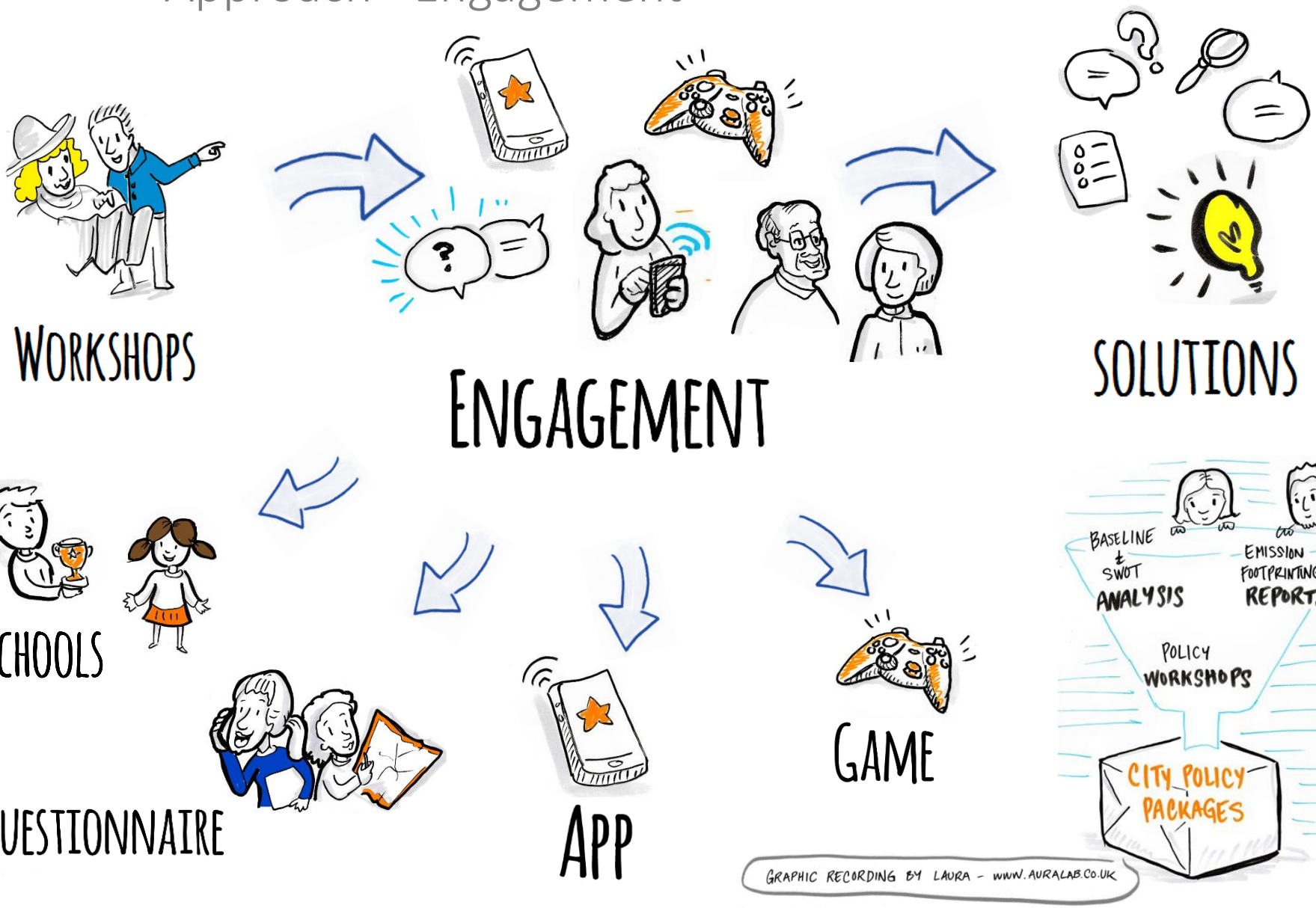


CISMOB Interreg Europe

dao

CLAiR-City

Approach - Engagement

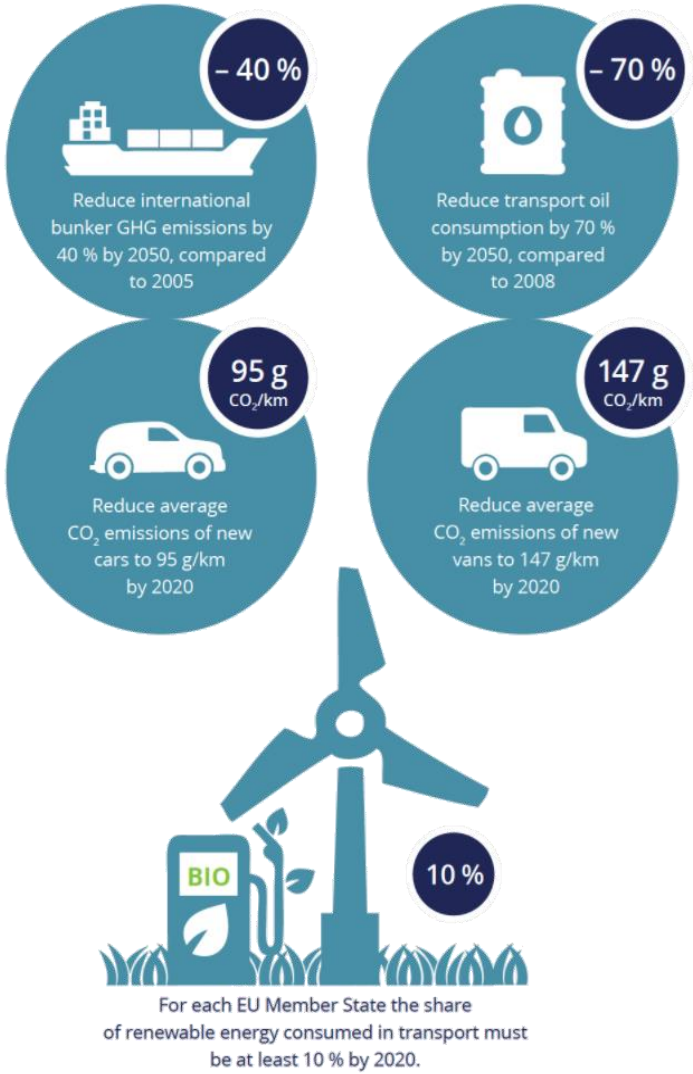


Opportunities

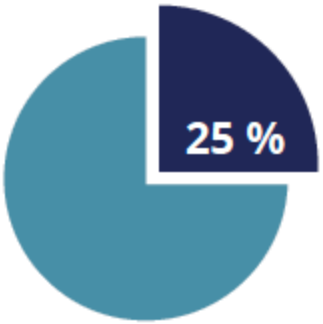
EU targets to reduce GHG

Key targets to be reached by 2050:

Reduce transport (excluding international maritime) greenhouse gas (GHG) emissions by 60 % compared to 1990 levels and reduce international maritime transport emissions by 40 %, compared to 2005.



Transport's total share of EU GHG emissions in 2014



CISMOB Interreg Europe

dao

Opportunities

Three Revolutions in Urban Transportation

Business-as-Usual Scenario

20th Century Technology

Through 2050, we continue to use vehicles with internal combustion engines at an increased rate, and use transit and shared vehicles at the current rate, as population and income grow over time.

2 Revolutions (2R) Scenario

Electrification + Automation

We embrace more technology. Electric vehicles become common by 2030, and automated electric vehicles become dominant by 2040. However, we continue our current embrace of single-occupancy vehicles, with even more car travel than in the BAU.

3 Revolutions (3R) Scenario

Electrification + Automation + Sharing

We take the embrace of technology in the 2R scenario and then maximize the use of shared vehicle trips. By 2030, there is widespread ride sharing, increased transit performance—with on-demand availability—and strengthened infrastructure for walking and cycling, allowing maximum energy efficiency.

Number of Vehicles on the Road by 2050 = 250 million vehicles

CO2 Emissions by 2050 = 500 megatonnes of CO2

CISMOB Interreg Europe

dao

Opportunities

What we can expect?

In the city, the future **intelligent routing systems** will integrate GIS and information on air quality willing to promote **lower exposure of urban citizens** to air pollutants

Final remarks

Bring together cities, companies and citizens to improve urban environmental and economic functioning.

Research linking road traffic with autonomous vehicles and air quality will lead to:

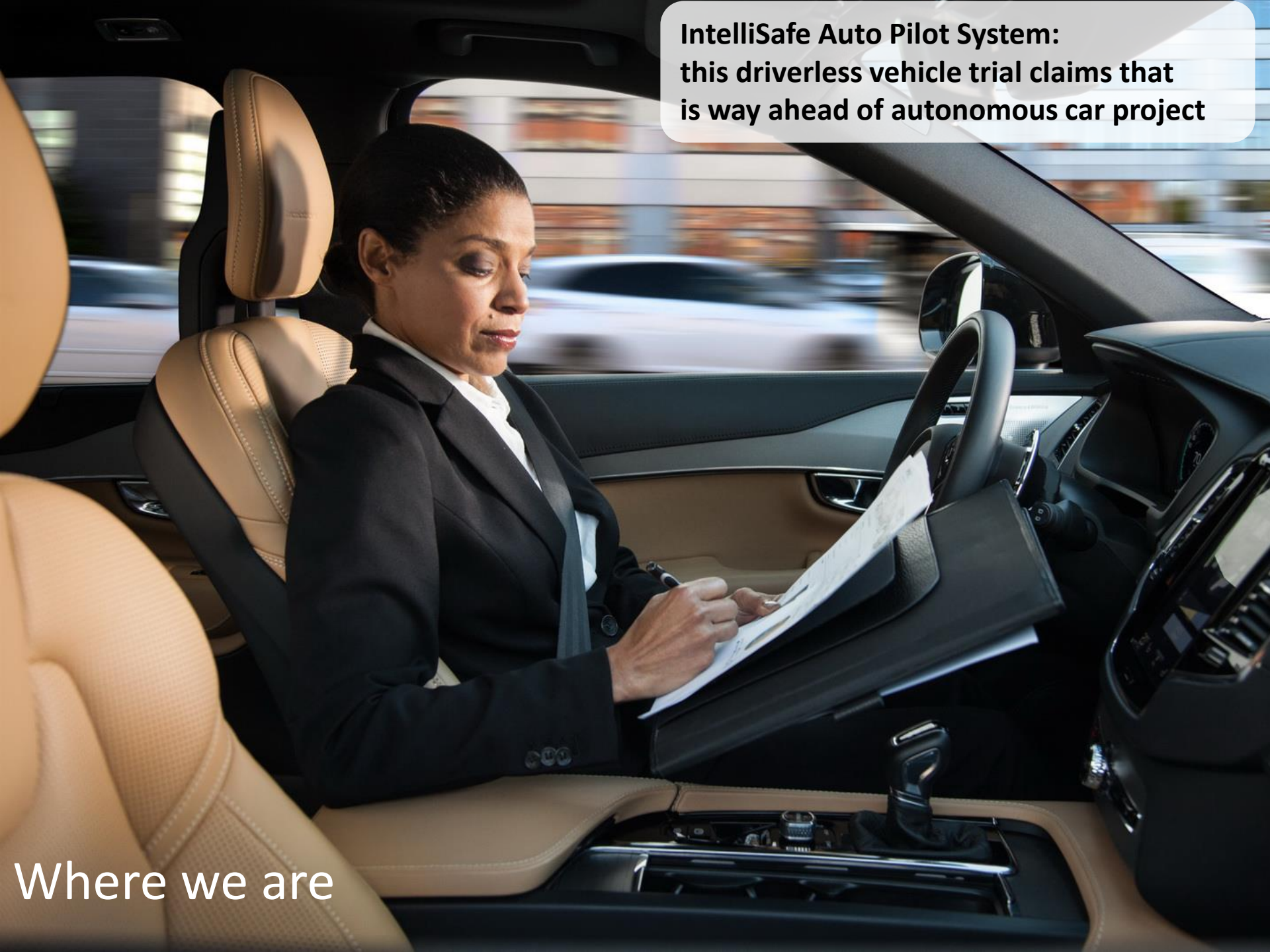
A decrease of traffic congestion

A decrease of air pollution & exposure

A decrease of vehicle accidents

Promote an efficient road traffic management

The automotive companies have to look to the EU recommendations and citizens desire, as opportunities to support Green Marketing



IntelliSafe Auto Pilot System:
this driverless vehicle trial claims that is way ahead of autonomous car project

Where we are


Freedom on wheels…
Where are we going?

Thank you!

Carlos Borrego

CISMOB
Interreg Europe

7th March 2018

dao