



Traffic Emissions
Control and Reduction

Vehicle emissions remote sensing in Spain

The CRETA project and beyond

Javier Buhigas

www.opusrse.com

The problem

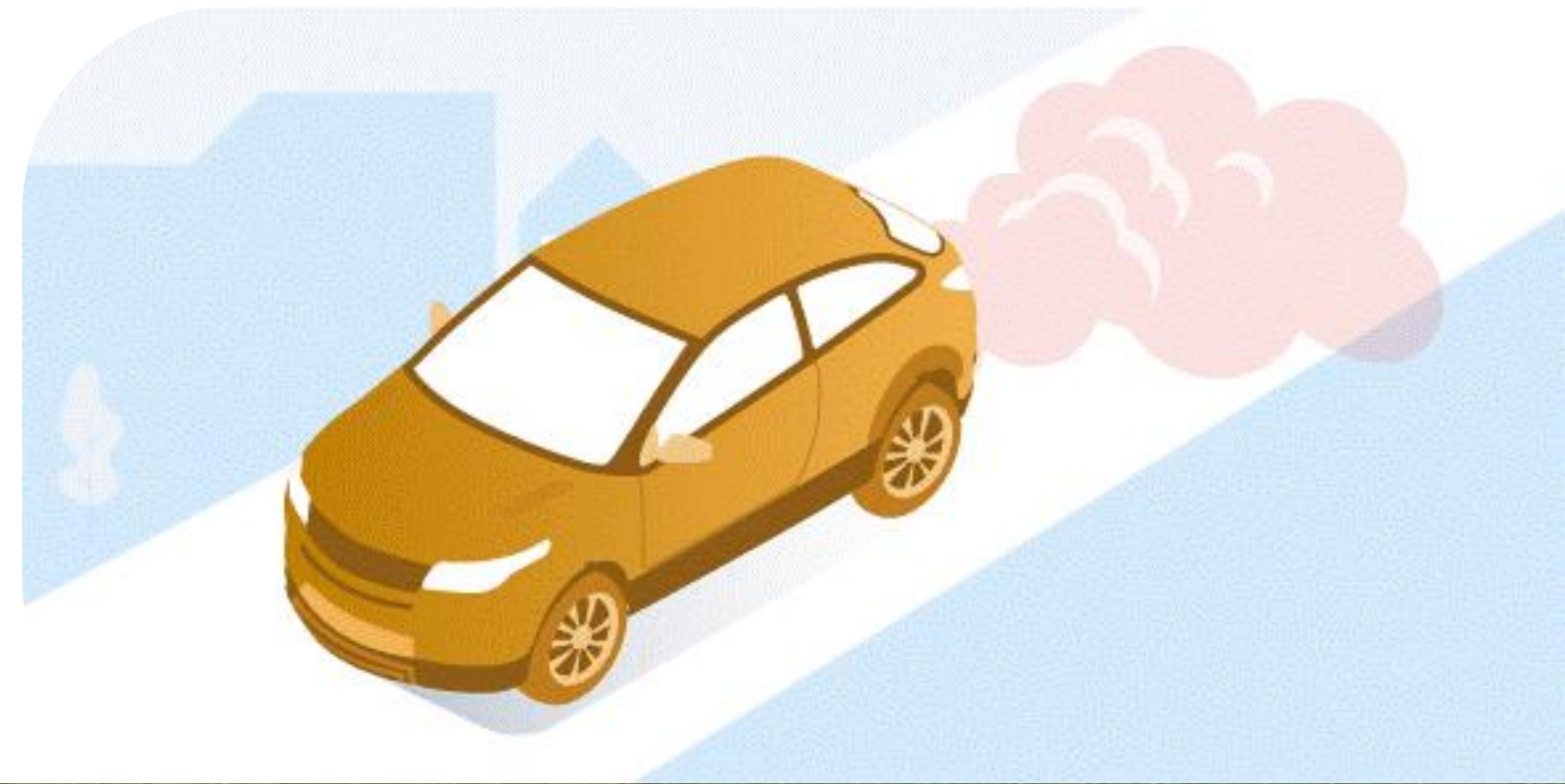
- 1 **Air pollution** is the **fourth leading cause of death** in the world and road transport is one of the main sources of pollution.
- 2 Just **1%** of vehicles are responsible for up to **40%** of total emissions from road transport.
- 3 **There is no control** over these vehicles and **reliable data** on transport emissions **are not used** to design efficient policies. Most policies to reduce transport emissions today are not **effective** neither **fair**.



The solution

To **measure** the **real emissions** of vehicles in real-world conditions, to:

- 1 Make decisions based on empirical data.
- 2 Design targeted policies, acting selectively on every individual vehicle based on their real-world emission levels.



INDEX



1 Technology

2 Solutions

3 Remote Sensing in Spain: CRETA and beyond

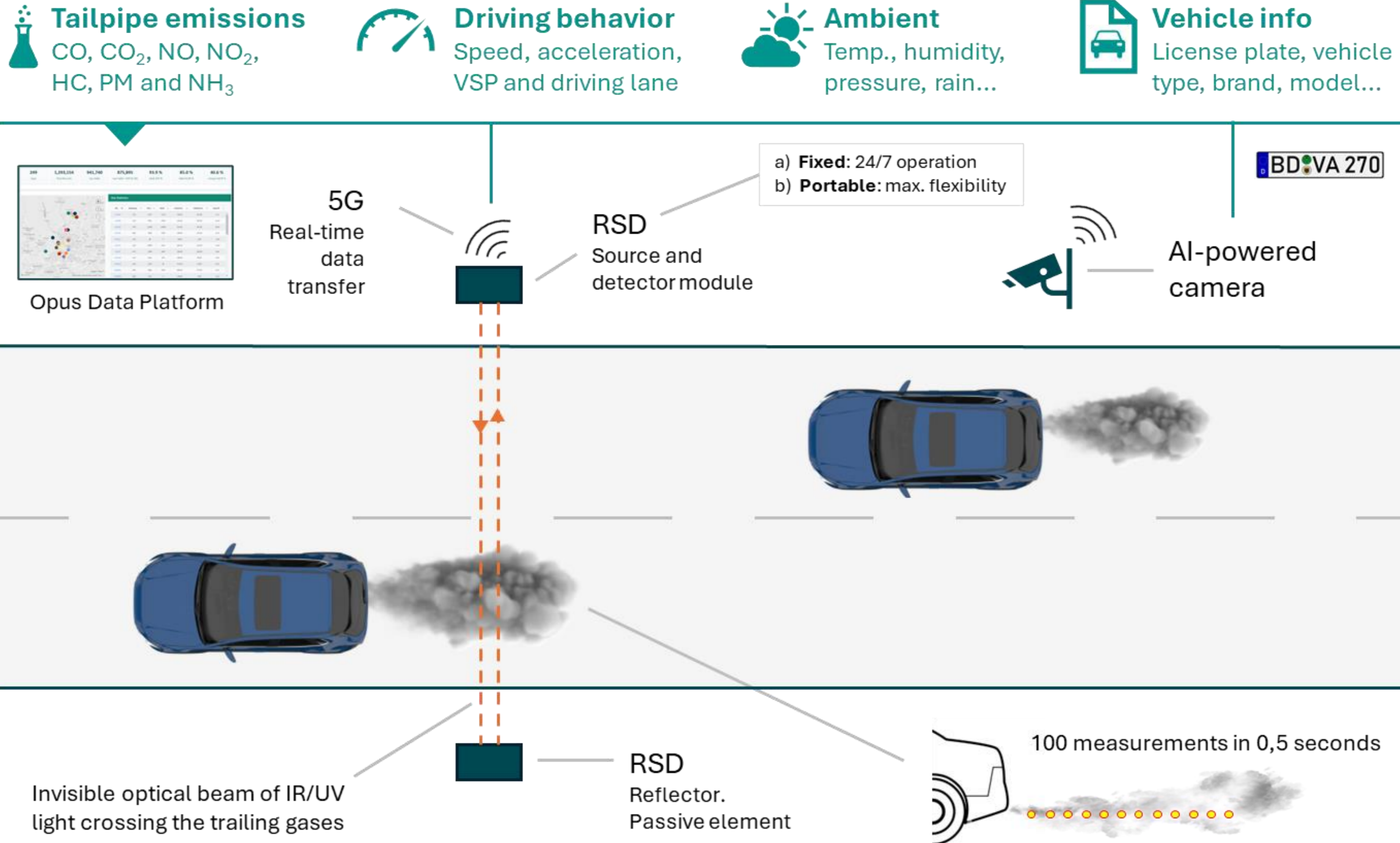
4 Regulation



01

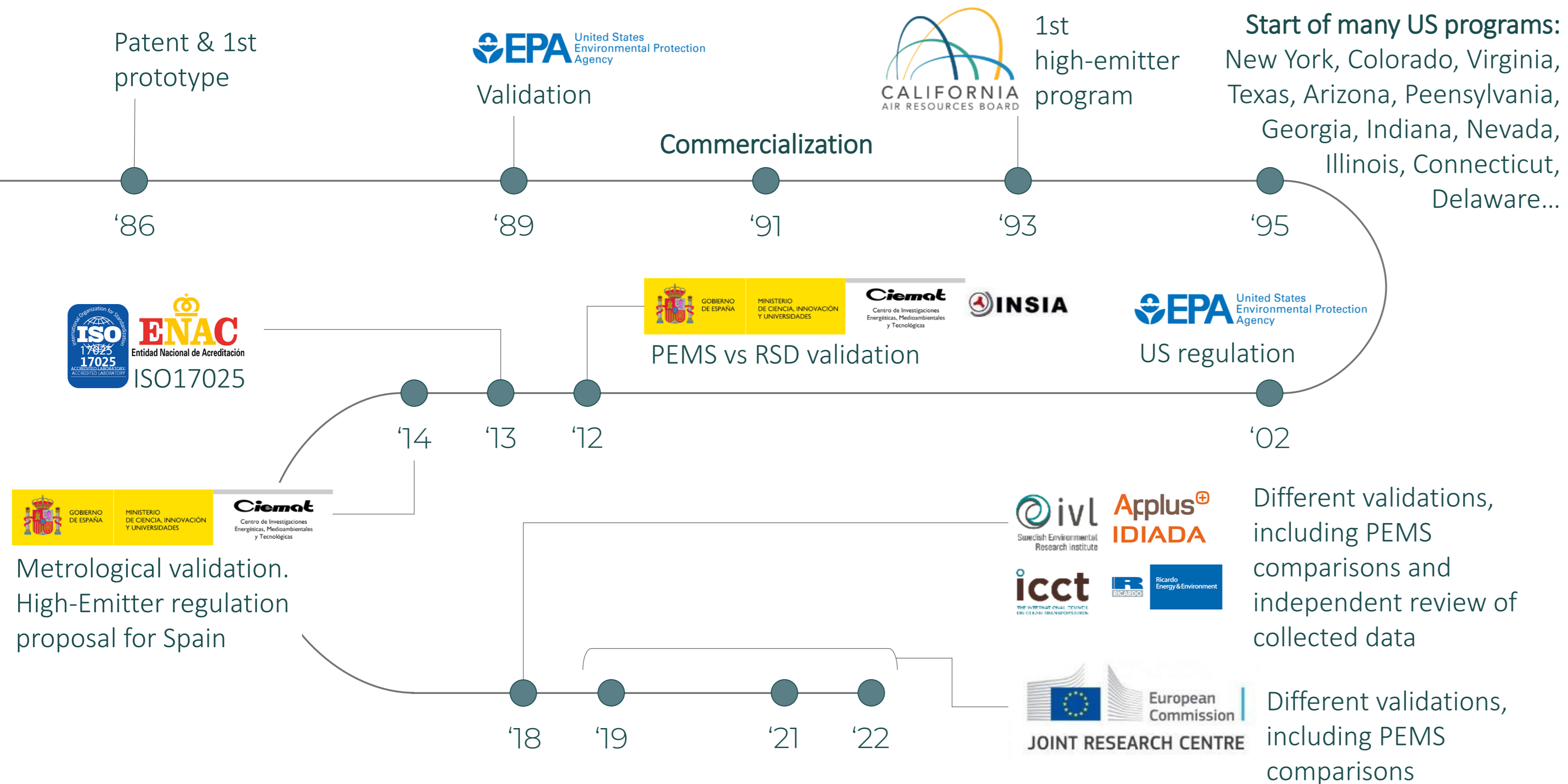
TECHNOLOGY

Vehicle Emissions Remote Sensing



TECHNOLOGY

MATURE TECHNOLOGY, PROVEN FOR +30 YEARS



Validation procedures

Comparison against calibrated mixtures of dry gases.

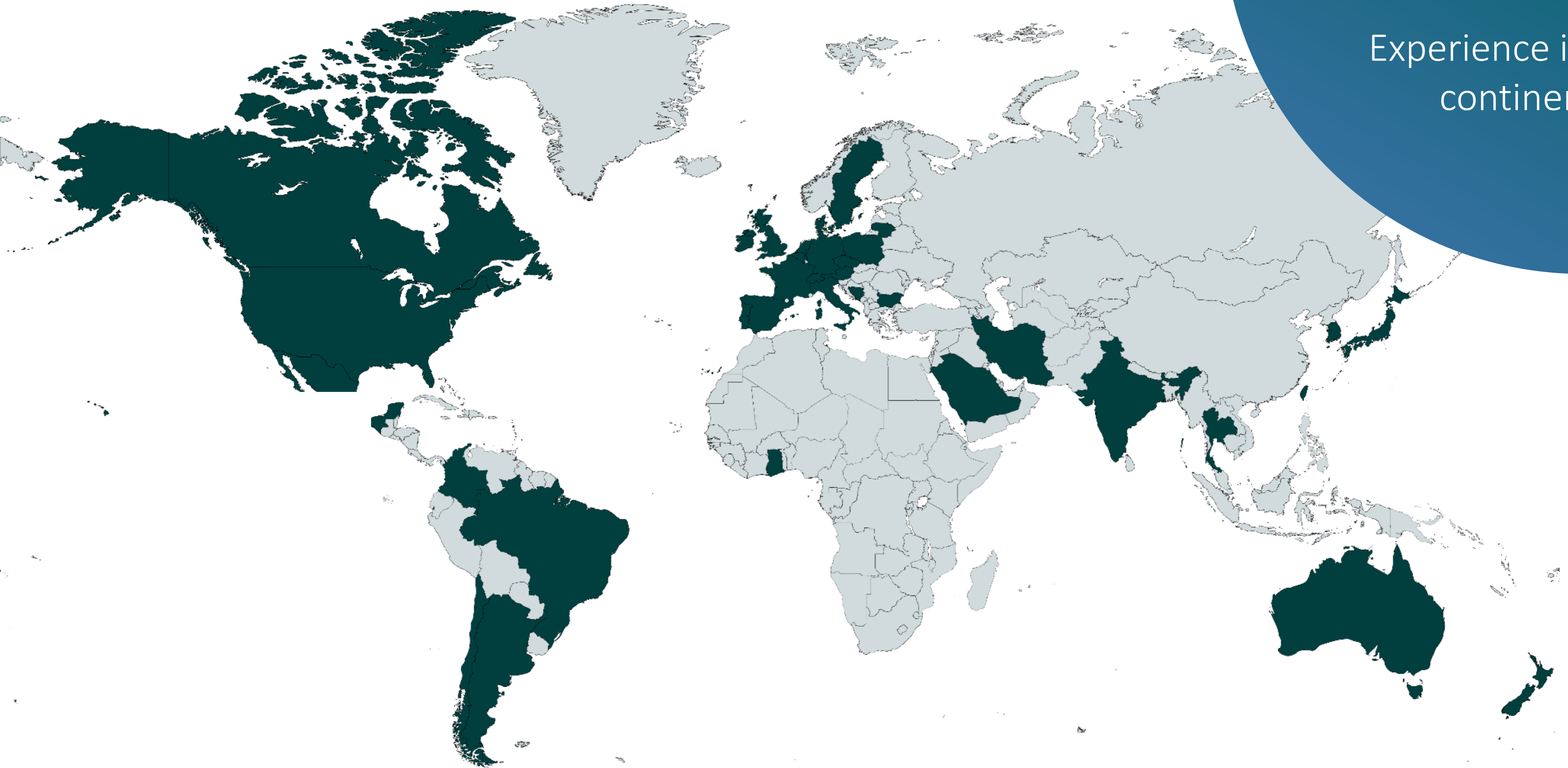
Intercomparison: i.e. RSD vs PEMS



GLOBAL EXPERIENCE

Millions of vehicles
analyzed every year

Experience in the 5
continents



PORTABLE

For flexible & itinerant monitoring.

Quick & easy setup.

Deployed & calibrated in 20 minutes.



FIXED

24/7 monitoring at key locations.

Integration with other sensors and systems.

It can monitor more than 1 lane.



02

SOLUTIONS

Real data, real solutions

REMOTE SENSING SOLUTIONS

1



Real-world emissions characterization

Real data, smart decisions

2



High & Clean screening

Identification and control of individual extremely polluting vehicles or rewarding the cleanest vehicles in the fleet

3



Roadside inspections

Real-time police enforcement on illegally manipulated vehicles

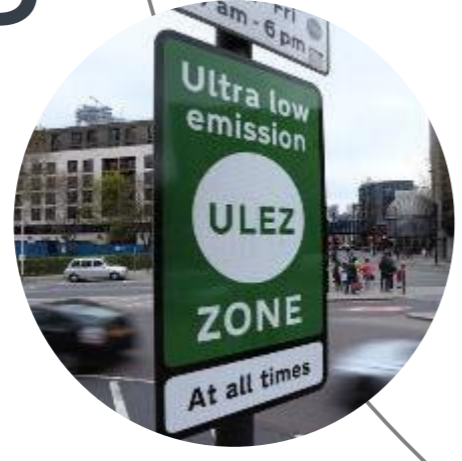
4



Fleet control

Monitoring of specific fleets

5



LEZ and smart tolling

Fair and efficient traffic regulation

6



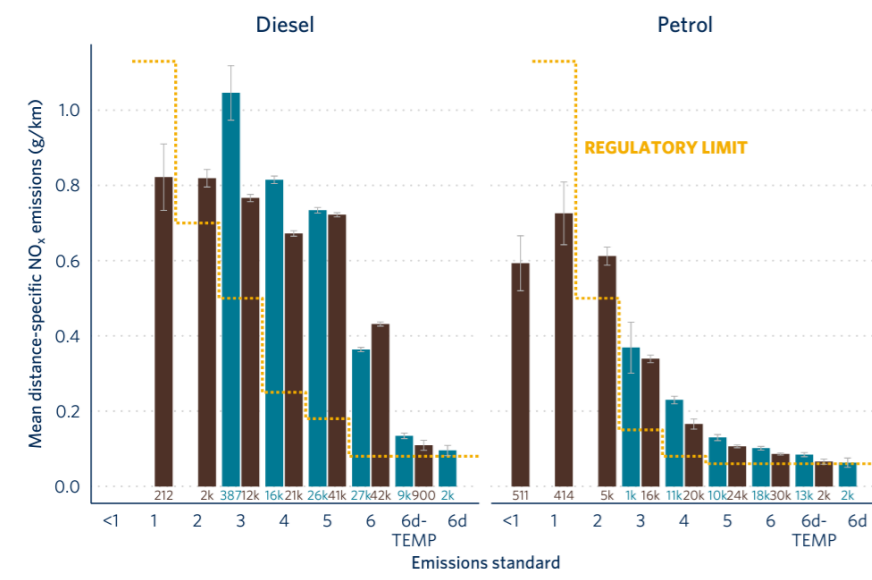
Smart City Solutions

Digitalization and connectivity

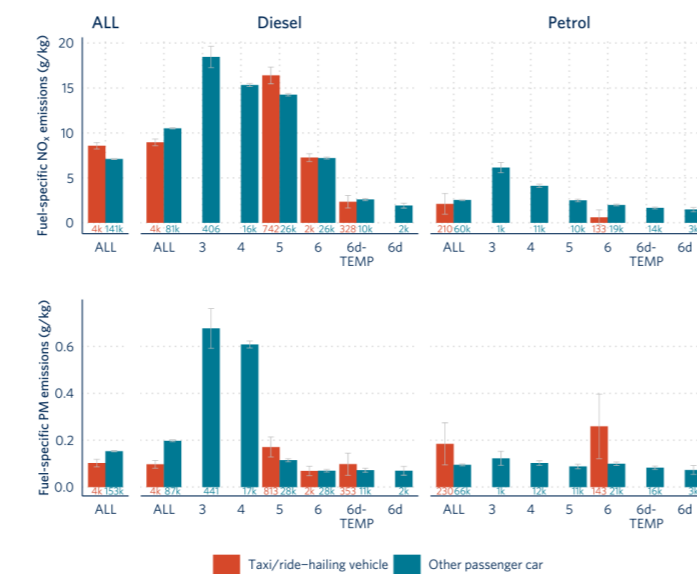
SOLUTION #1

REAL-WORLD EMISSIONS CHARACTERIZATION

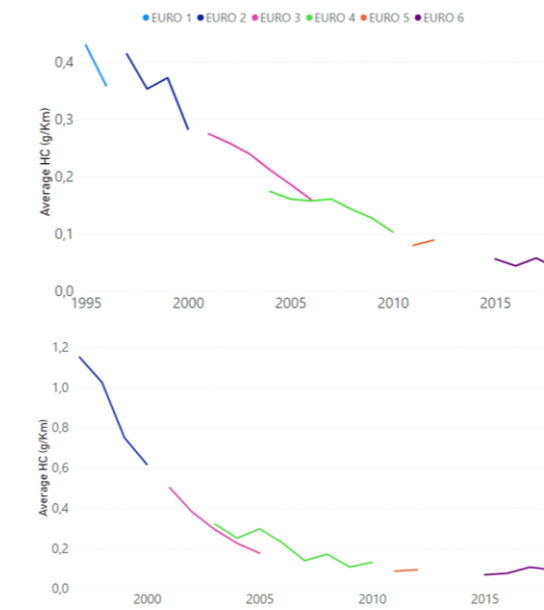
Measurement and analysis of actual traffic emissions in a territory to make better decisions



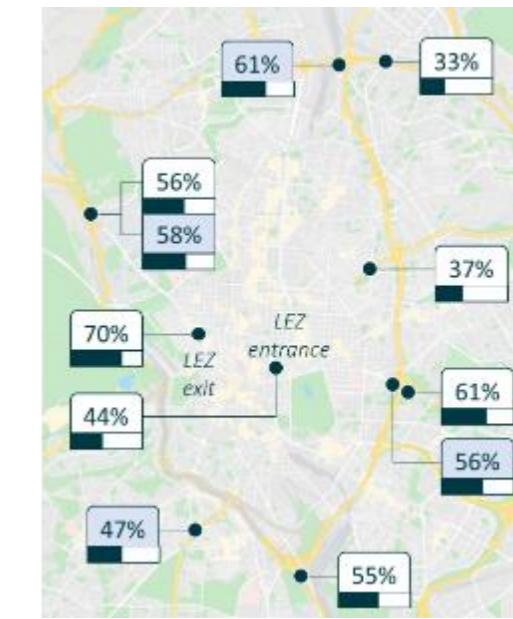
Market Surveillance



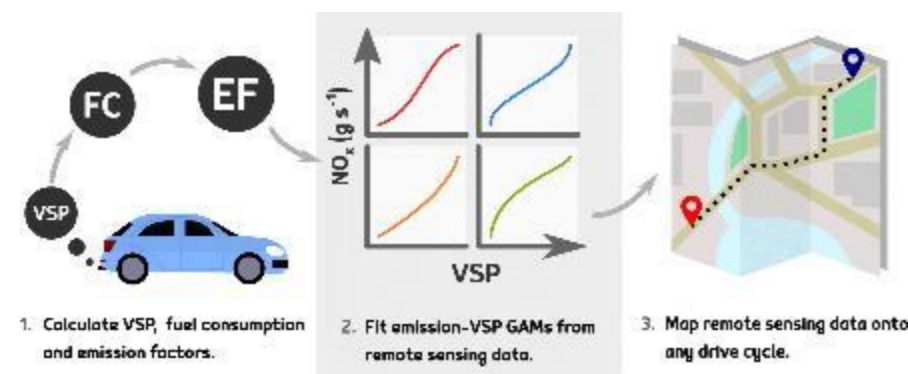
Vehicle groups studies



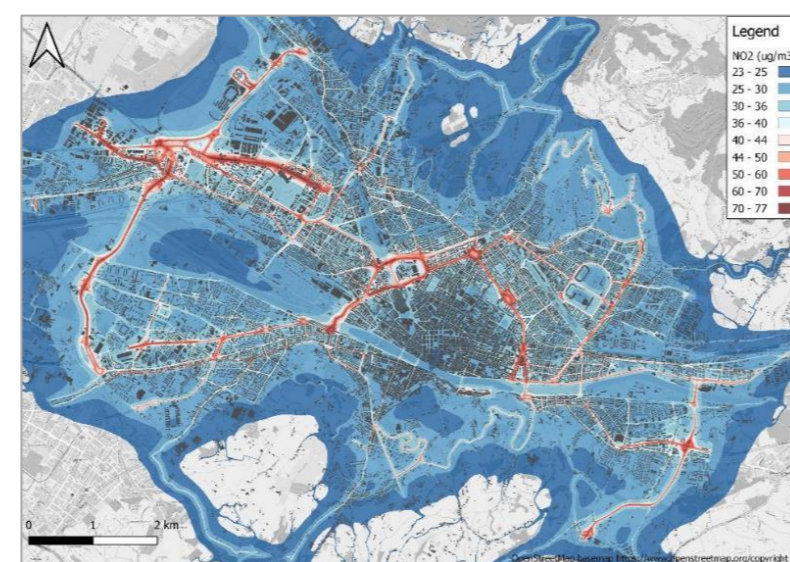
Deterioration & tampering



Hybrids performance



Update Em. Factors



Improve AQM

Simulate scenarios

Krakow announces Low Emissions Zone in region first, supported by TRUE real world emissions testing

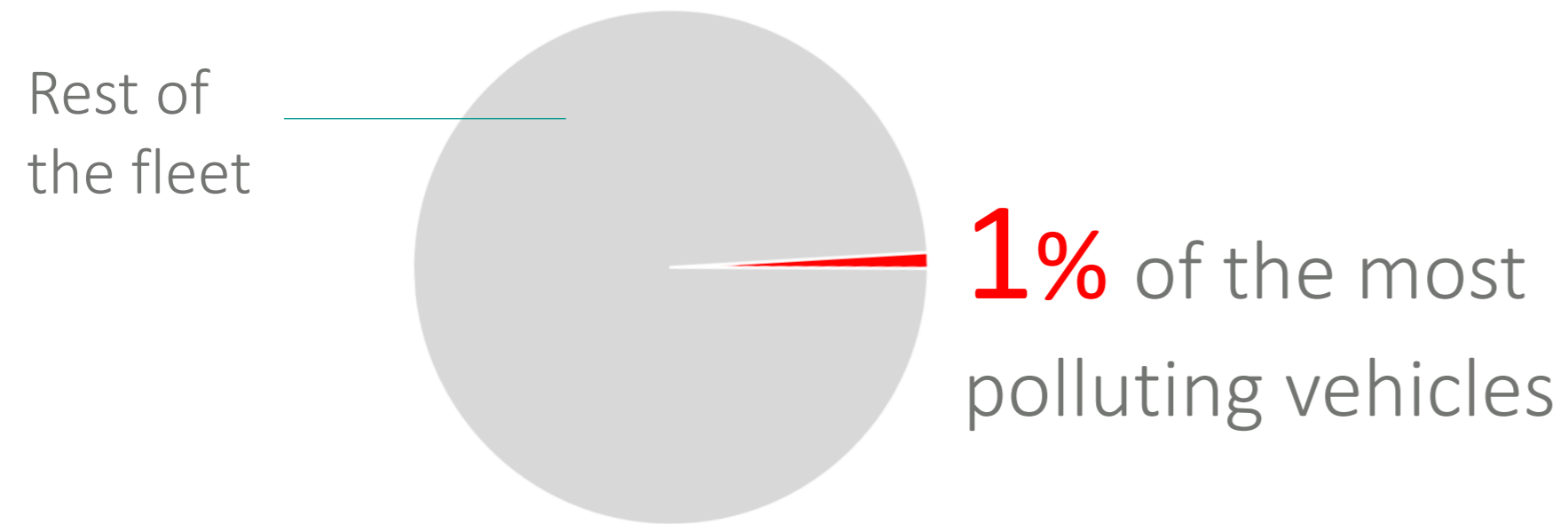
November 30, 2022 by TRUE Initiative
Categories: Air Quality, Fuel Efficiency | Tags: Low Emission Zones



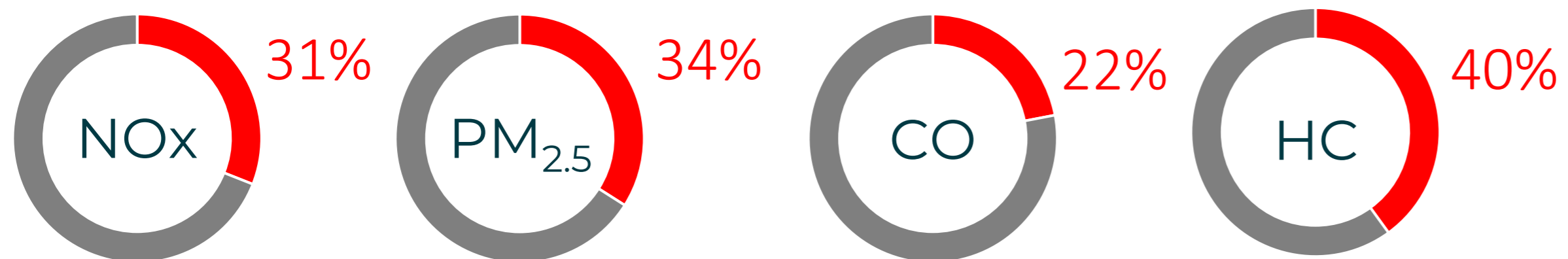
Design new policies

SOLUTION #2

HIGH-EMITTER IDENTIFICATION



Are responsible for up to **40%** of all emissions produced by road transport:



Find high-emitters



Reduce up to 40% of transport emissions

- ✓ Countries like China, South Korea and USA include **remote vehicle emissions inspection**. Vehicle emissions are screen in public roads, not only at PTIs. High-emitters found by RSDs are automatically sanctioned or sent to urgent physical inspections. The cleanest vehicles get a “clean certificate” – owners can skip their next programmed PTI.
- ✓ Different studies have shown the **effectiveness** of detecting both dirty and clean vehicles.
- ✓ Recent cost-analysis studies have shown that the **benefits** of these programs **outweigh the costs** of the program plus the costs of repairing the vehicles.

SOLUTION #3

ROADSIDE INSPECTIONS

Example: Port of Antwerp



Police success rate in finding tampered vehicles

Blind inspection = **2%**

RSD alert = **52%**

Using Opus RSD as a warning system increases the probability of finding an illegally tampered truck by **25x times** compared to a blind inspection

SOLUTION #4

FLEET CONTROL



Continuous monitoring of a group of controlled vehicles



Identification of high-emitters for selective repair / substitution



Quantification of the total emissions of the fleet



Calculation of an “Emission Score” of the fleet



Info to reduce emissions → reduce fuel consumption

Urban delivery vans



Employees' cars

GRUPO **MAS** MOVIL

Trucks

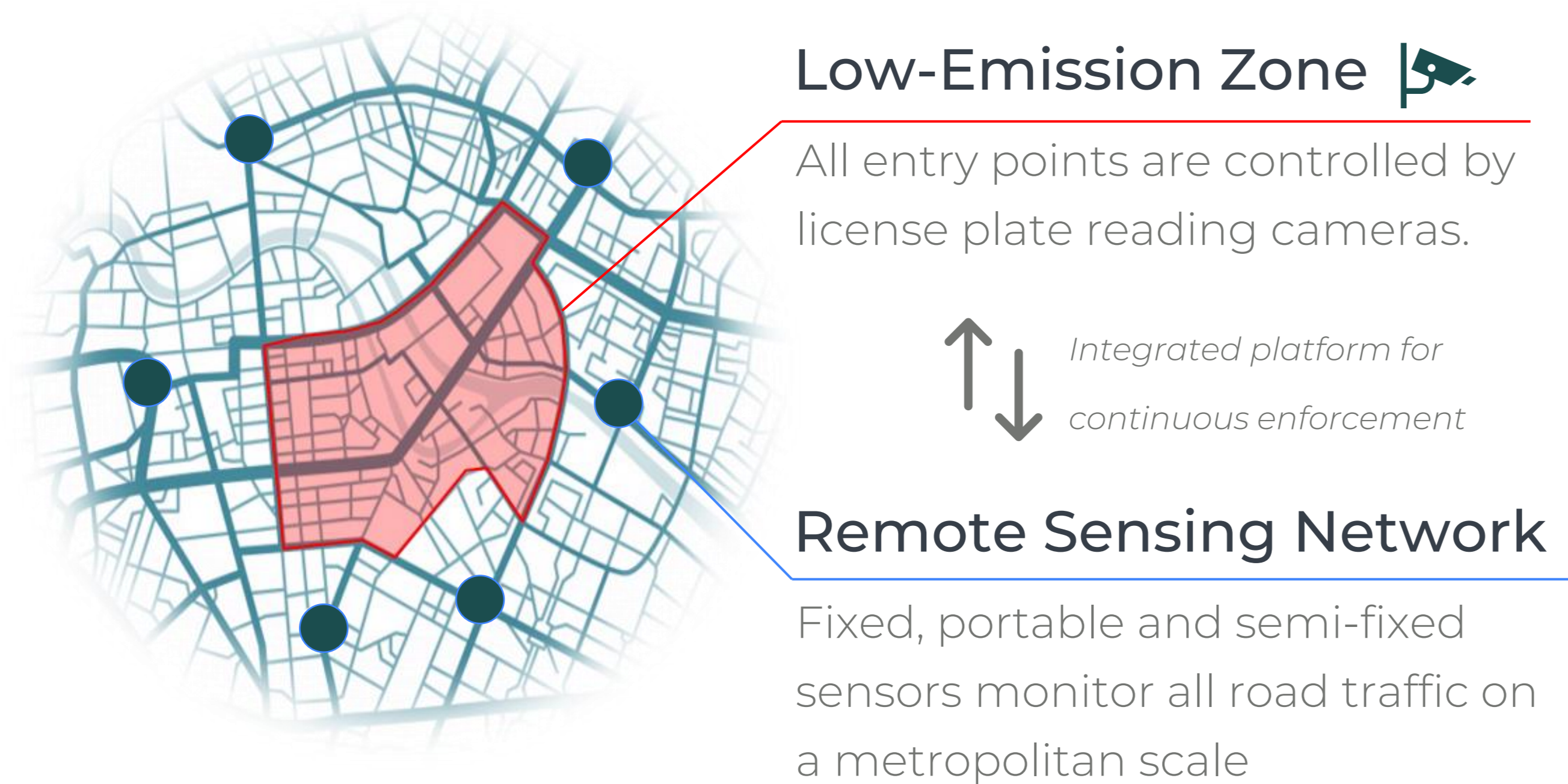


Public buses



SOLUTION #5

LEZ & SMART TOLLING



High-Emitter

Restricting entry, parking or increasing access fees



Low-Emitter

Positive actions, such as allowing temporary access or reducing access or parking fees

Access restrictions

A) By vehicle type and age

If the vehicle is very old, it is considered to be too polluting, and its access to city center is restricted.

B) By real-driving emissions

Alternatively, and even complementary to the previous method, empirical measurement by the RSD can be used to fine-tune access policy: fairer and more effective restrictions.

Charging methods

An urban toll can also be implemented to charge the entrance to the city. The emission levels of each vehicle can be a factor in increasing or decreasing the fee.

SMART CITY SOLUTIONS

Integration with other sensors

Combined measurement of noise and emissions for each vehicle

Combination with DAVAO: emissions per passenger

Integration with ALPR camera network



Real-time information

To check the status of each RSD and analyse the data in real time

Personalised messages to the driver's smartphone or to vehicle's OBU

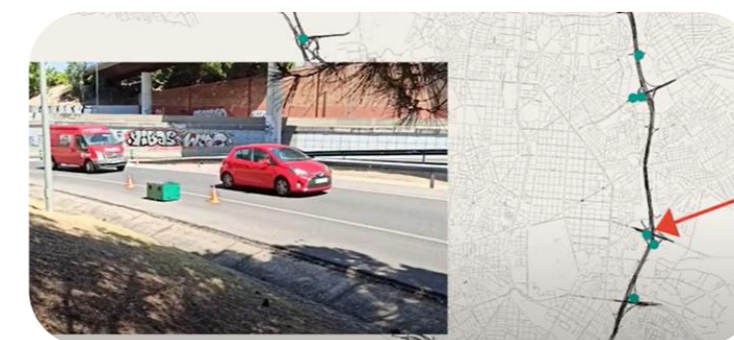
Variable message board signs within metres of the RSD



Integration with Traffic Modelling & Management

Modelling and simulation of traffic emissions from real-world emissions data

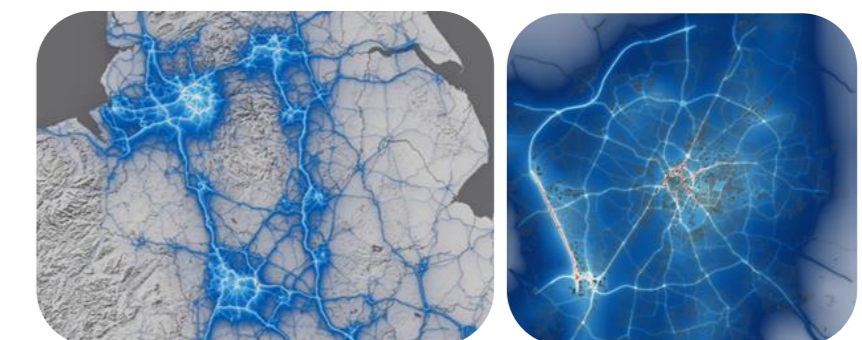
Integration with traffic centre or integrated management platforms



Integration with Air Quality Modelling

Realistic and very detailed emission factors for each vehicle group

RSD-enhanced dispersion models for better prediction and modelling of air quality





REMOTE SENSING IN CRETA AND BEYOND

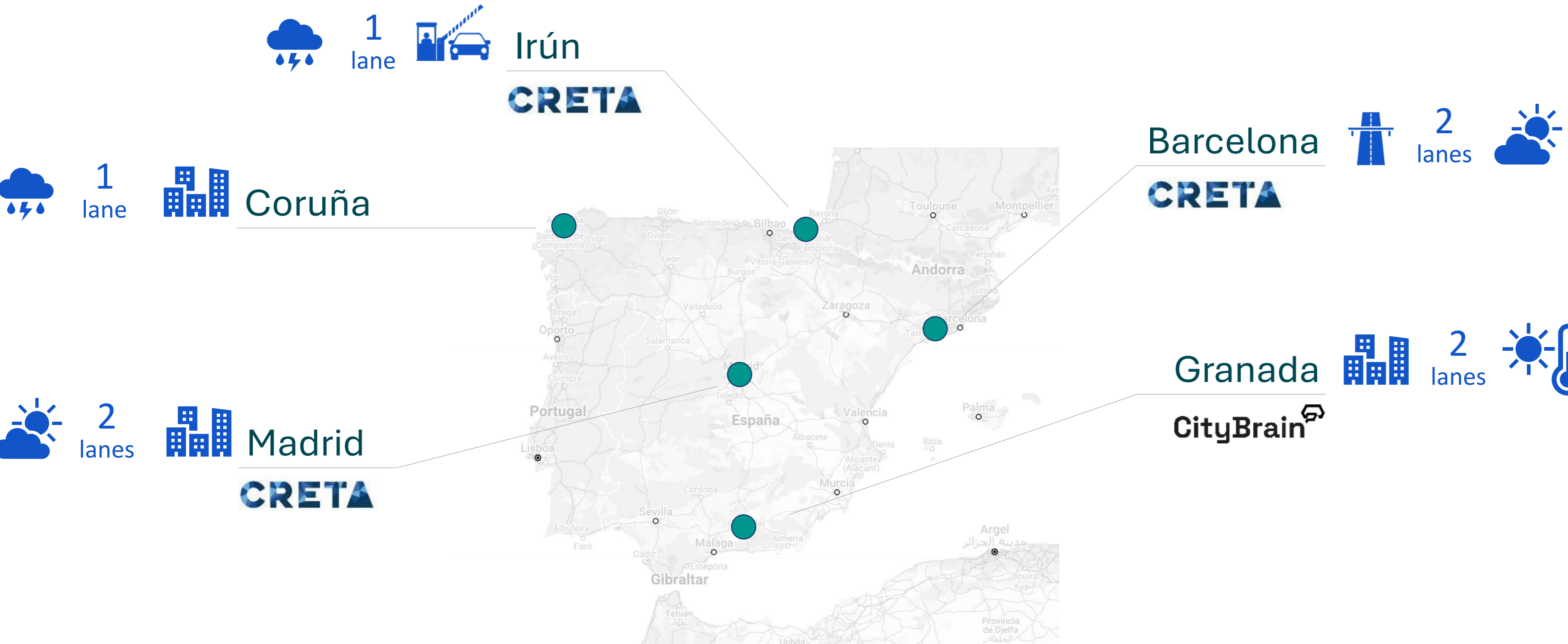
Main objectives of the RSD in CRETA

- 1 Fully autonomous 24/7 operation
- 2 5G integration for real-time analysis and enforcement
- 3 Include the measurement of NH3



Fixed RSDs in Spain

- The RSD is housed in protective cabinets for a fixed installation.
- 24/7 operation with zero human intervention.



IP 65 protection and real-time control



Rain sensor and door to automatically close the cabinet in the rain



Air conditioning. RSD stable temperature despite extreme high or low temperatures.

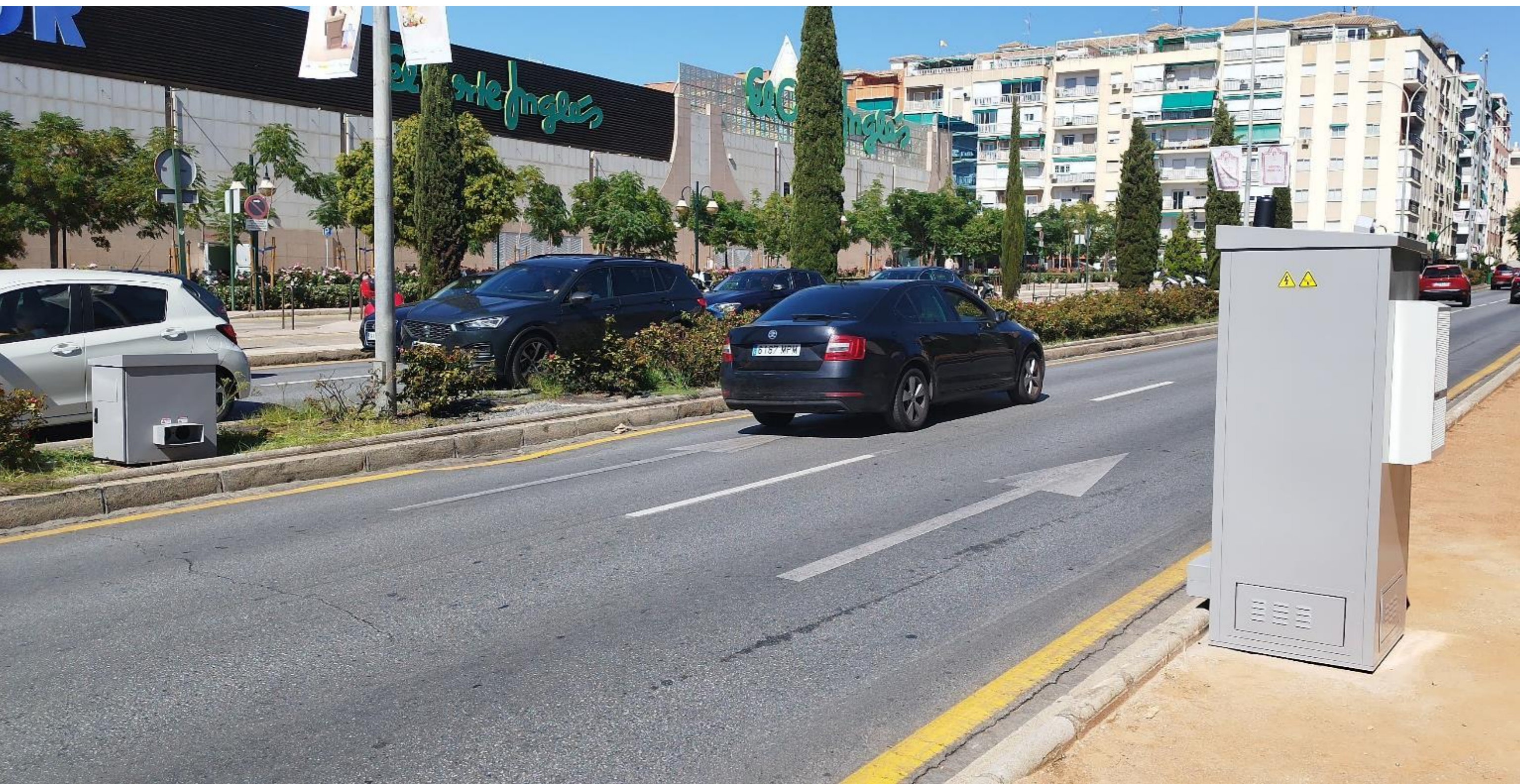
CORUÑA



- In operation since Sep' 2023.
- A city with about 150 days of rain a year.
- A 1-lane street with pedestrians
- Located at one of the main entrances to the city.
- The system is integrated with the city's Low Emission Zone network and air quality monitoring and prediction network.

GRANADA

CityBrain[®]



- In operation since Sep' 2024.
- One of the hottest cities in Spain, with average temperatures of 39°C in summer, with peaks of up to 45°C.
- One of the busiest 2-lane streets of Granada.
- Located at one of the main entrances to the city.
- Integrated in a new SmartCity platform.

IRÚN - BORDER WITH FRANCE



- In operation since Sep' 2024.
- The busiest tolling point of Spain.
- One of the rainiest areas in Spain, with 185 days of rain per year.
- Thousands of trucks a day are monitored.
- A “polluters-pay” pilot will be tested, modifying the tolling fees according to the real-driving emission levels.

MADRID

CRETA

Funded by the European Union



- Installation planned on end Oct, 2024 .
- Installed on one of the branches of the M30 ring-road, the most heavily used road in Spain.
- A 2-lane strategic site, with some 10,000 vehicles measured every day.
- Connect to a 5G node and to third-party mobility platforms.

Real Emissions Variable Tolling

Barcelona, Spain
C-32 highway

- Integrated with Abertis tolling system.
- Site with speed Limited at 120 km/h.
- Simultaneous measurement of 2 lanes.
- Real-time vehicle type and vehicle emissions profile identification.



High emitters
Increase in toll rate



Clean vehicles
Discounts through
AWAI's app

RSD
detector
cabinet

POLLUTERS-PAY PRINCIPLE



CRETA

Control y Reducción
de las Emisiones del Tráfico

Real Emissions Variable Tolling

Barcelona, Spain
C-32 highway

- Integrated with Abertis tolling system.
- Site with speed Limited at 120 km/h.
- Simultaneous measurement of 2 lanes.
- Real-time vehicle type and vehicle emissions profile identification.



- ✓ Small footprint, far from traffic.
- ✓ Easy installation and maintenance for 24/7 monitoring.
- ✓ Adaptable to multiple environments.
- ✓ IP65.
- ✓ Integrable with existing ITS systems: license plate cameras, artificial intelligence, Lidar, vehicle occupancy sensors, noise sensors, air quality sensors, etc.





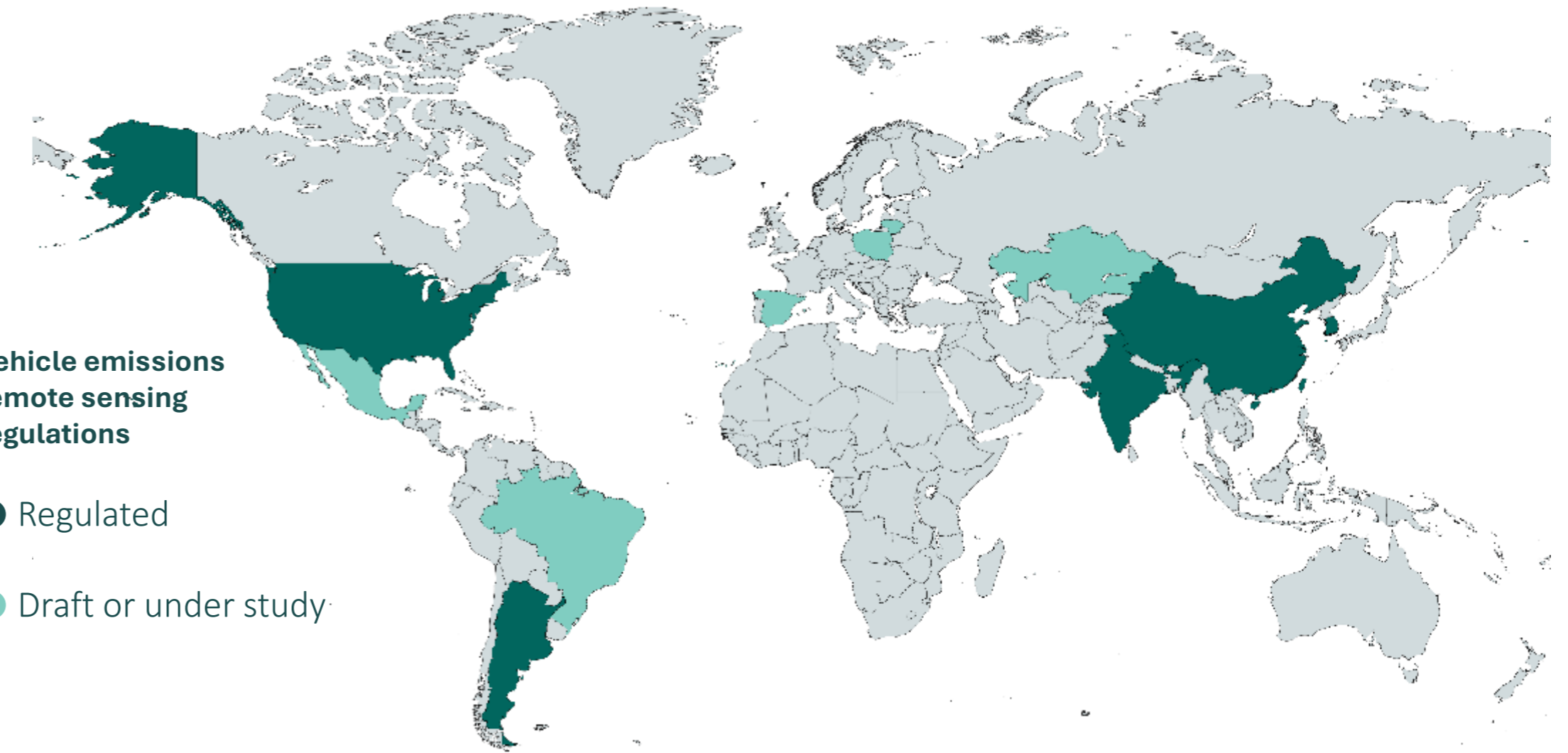
04

REGULATION

UNE

Vehicle emissions RS standard

- The Spanish Association for Standardization, UNE, and the Spanish Metrology Centre, CEM, are developing a **UNE standard for instruments used for vehicle emission remote sensing**.
- This pioneering standard, to be published at the end of 2024, will harmonize this type of instrument in Spain, and develop a **basis for future regulation**.
- As any UNE standard, once published in Spain, it will be **easily adopted or replicated** by other countries.



CEM promotes a UNE standard for the remote measurement of vehicle emissions

08/11/2023

- This pioneering national standard, which is scheduled for publication towards the end of 2024, has arisen from the need expressed by some councils of cities with more than 50,000 inhabitants, and will be useful for Low Emission Zones (LEZ).
- The aim of the initiative is to harmonise this type of instrument in Spain, and develop a basis for future regulation in this area. Technical standards are a useful tool for public agencies in the effective development and deployment of public policies.



Real Measurements.
Efficient solutions.

javier.buhigas@opusrse.com

www.opusrse.com