CARES – City Air Remote Emission Sensing

- IVL
- Uni Leeds
- Uni York
- IIASA
- ICCT
- TNO
- Techn Uni Graz
- Uni Heidelberg
- Airyx
- Innovhub
- City of Milan
- Czech Techn Uni
- Czech Uni Life Sc
- Krakow Smog Alert
- Uni Thessaloniki
- EMPA
Overarching objective

- to reduce the hurdles for the practical application of remote emission sensing and to make it a widespread means for the monitoring and enforcement of vehicle emissions, leading to improvements in air pollution
Specific objectives

- Develop and demonstrate:
  - methodologies and practical guidance for contactless and non-intrusive monitoring of vehicle fleet emissions under real-world driving conditions, and for utilizing the collected data for informing on and measuring the effectiveness of specific policies and measures;
  - methodologies and practical guidance for detecting, with high accuracy, individual vehicles with either a malfunctioning or tampered emissions control system;
  - two innovative non-commercialized non-intrusive remote emission sensing measurement techniques that can be utilized in conjunction with commercialized remote emission sensing equipment, in order to widen the applications for remote emission sensing;
  - standardized data management processes and a framework linking database set, including vehicle registration and air quality monitoring information, as well as an EU-wide master database for remote emission sensing results;

- Reduce barriers for deployment of:
  - Remote emission sensing across the EU through demonstration of the further developed measurement techniques and data infrastructure in three selected cities;
  - Remote emission sensing internationally, through collaboration in particular with China, exchanging knowledge and experience between researchers, cities and national authorities in the EU and China.
CARES applications

1. Identification of individual high (or low) emitters
2. Generation of real-world emissions factors
3. Steering new policies
4. Tracking policy effectiveness
5. Track technology effectiveness
6. Screen fleet for market surveillance
7. Monitor a single fleet
8. Understand the impact of driving and ambient conditions
9. Inform purchasing decisions
The CARES concept

**Development**
- **Hardware**
  - Plume chasing
  - Point sampling
  - Comparison & evaluation
- **Software**
  - Commercialized techniques
  - Plume chasing
  - Point sampling
  - Near real-time linking

**Integration**
- **Data analysis toolbox**
  - Open-access software package for user application
- **Best practice guide**
  - Best-practice examples and guidance for authorities

**Demonstration**
- **Project cities**
  - Milan, Prague, Krakow
  - 9 applications of remote emission sensing
  - 4 different techniques
- **Wider network**
  - Cities' Exchange Network
  - Stakeholder Advisory Board
  - Scientific Advisory Board

**Dissemination and exploitation**
- Matching Chinese project proposal co-ordinated by VECC-CRAES
CARES Work package structure

**Development**
- WP1: Further developing plume chasing and point sampling techniques (UoY)
- WP2: Establish a standardized and enriched data infrastructure (UoL)

**Integration**
- WP3: Overcome hurdles for practical implementation in cities (ICCT)
- WP4: Integrate remote sensing into policy making and enforcement practices (IIASA)

**Demonstration**
- WP5: Dissemination and communication (IVL)
- WP6: Exploitation of Results (ICCT)
- WP7: Project coordination and management (IVL)

Matching Chinese project proposal co-ordinated by VECC-CRAES

CARES
CARES hardware elements

1. CARES system components:
   - Source & detector module
   - Speed & acceleration detector
   - Video camera & license plate reader
   - Data processing & video display
   - Lateral transfer mirror

2. Monitoring and analysis:
   - Analyzer

3. Remote sensing system:
   - EDAR unit (vehicle emissions remote sensing system)
   - Weather sensor
   - Camera (speed and license plate)
   - Reflective strip

CARES logo
CARES outputs → outcomes → impact

CARES Outputs
- Improved non-intrusive measurement systems
- Standardized and smooth data handling
- Increased data accuracy and availability
- Numerous applications demonstrated
- Educated stakeholders
- Deepened international collaboration

CARES Outcomes
- Wider use of non-intrusive measurements
- Increased number of users
- Increased number of applications for non-intrusive measurements
- Decreased cost and improved accuracy of non-intrusive measurements

CARES Impacts
- Better policies based on real-world emission data for all vehicle types
- Decreased number of high-emitters
- Reduced gap between real-world and test emissions
- Reduced air pollution from road vehicles

Improved health and sustainable cities for all