

# Deliverable D3.1: Summary document of Prague city demonstration measurement campaign

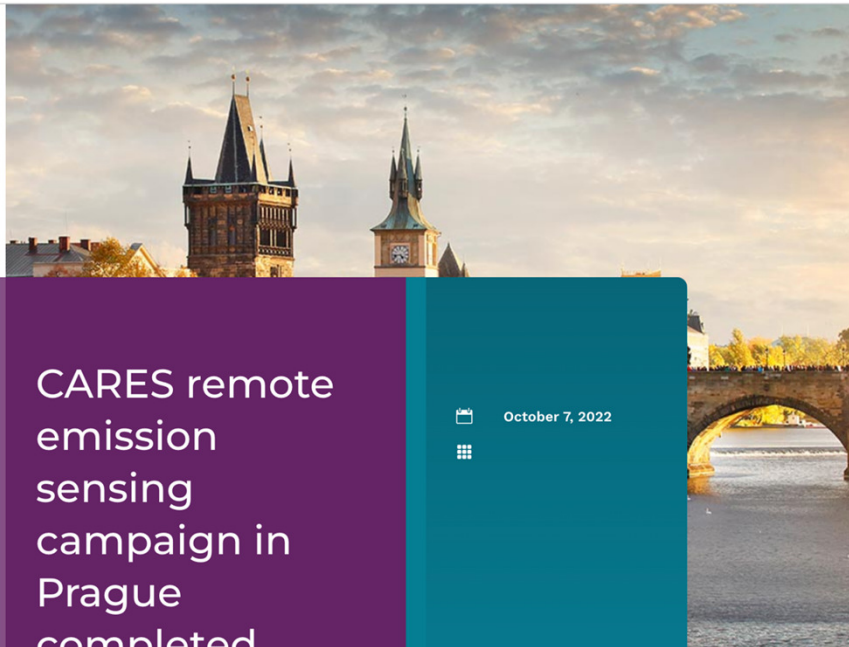
February 6, 2023

Prepared by:

Yoann Bernard (ICCT)

Michal Vojtisek (CVUT)

Peter Mock (ICCT)



see also CARES website: <https://cares-project.eu/prague-remote-emission-sensing-campaign-completed/>



# Summary

- This summary document provides an overview of the CARES Prague campaign, with a description of the objectives, timeframe, participants, measurement set up and data collection.
- Results of the measurements will only become available at a later stage and are not part of this document. Results will be documented in D3.4, a summary report on partner cities' measurement campaigns.

# Participating organizations

- **Czech Technical University of Prague, Czech University of Life Sciences in Prague**: Overall organization, PEMS (FTIR), point sampling (CO, NO, PN).
- **OPUS RSE**: open-path system (measuring NO, NO<sub>2</sub>, HC, CO, PM, CO<sub>2</sub>).
- **Technical University of Graz**: Point sampling (measuring NO, NO<sub>2</sub>, black carbon, PN, CO<sub>2</sub>).
- **Airyx: Plume chasing car** (measuring NO, NO<sub>2</sub>, CO<sub>2</sub>).
- **TNO: Plume chasing van** (measuring NO, NO<sub>2</sub>, PN, CO<sub>2</sub>).

With support from: the Transport Research Centre, NOx consulting, Traffic Police Service Department of the Central Bohemian Region Police Directorate, coordinated by the Directorate of the Traffic Police Service of the Police Presidium, TUV Nord CZ, IIASA, TU Dresden, the ICCT, and IVL.



# Attainment of the objectives and explanation of deviations (1/3)

## Description of work related to deliverable as given in DoW

- The primary objective of the demonstration measurements in Prague was to demonstrate the role that remote sensing can play in the identification of high (or low) emitters.
- Against this main objective, the consortium would use all three remote-sensing techniques in real traffic situations: the commercially available cross-road remote emission sensing instrument of the OPUS-type, as well as the point sampling and plume chasing systems further developed in WP1. The objective was to cover at least 3-5 measurement spots within the city of Prague, delivering data for about 100,000 individual vehicles.

# Attainment of the objectives and explanation of deviations (2/3)

## Time deviation from original DoW

- Measurements in Prague were originally planned first among the three CARES city demonstration measurement campaigns, and scheduled in September 2020. However, as measurements got pushed back due to implications from the COVID pandemic, measurements in Prague took place last in September 2022, after the Milan and Krakow campaigns.

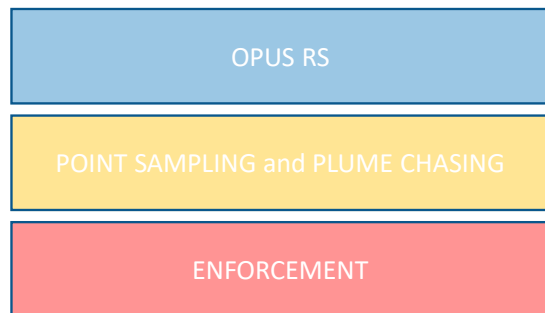
# Attainment of the objectives and explanation of deviations (3/3)

## Content deviation from original DoW

- None.
  - The target of measuring 100,000 vehicles was exceeded, with 100,026 valid measurements for the OPUS commercial remote sensing technology alone.
  - In addition, point sampling technology recorded over 24,000 valid plates of individual vehicles.
  - The plume-chasing car and van combined measured over 1,000 vehicles.
  - The testing in Prague was supplemented by chase vehicle testing on Prague-Brno motorway and by remote sensing and point sampling at three locations in Brno.
  - PEMS measurements with FTIR were conducted.

# Testing timeframe

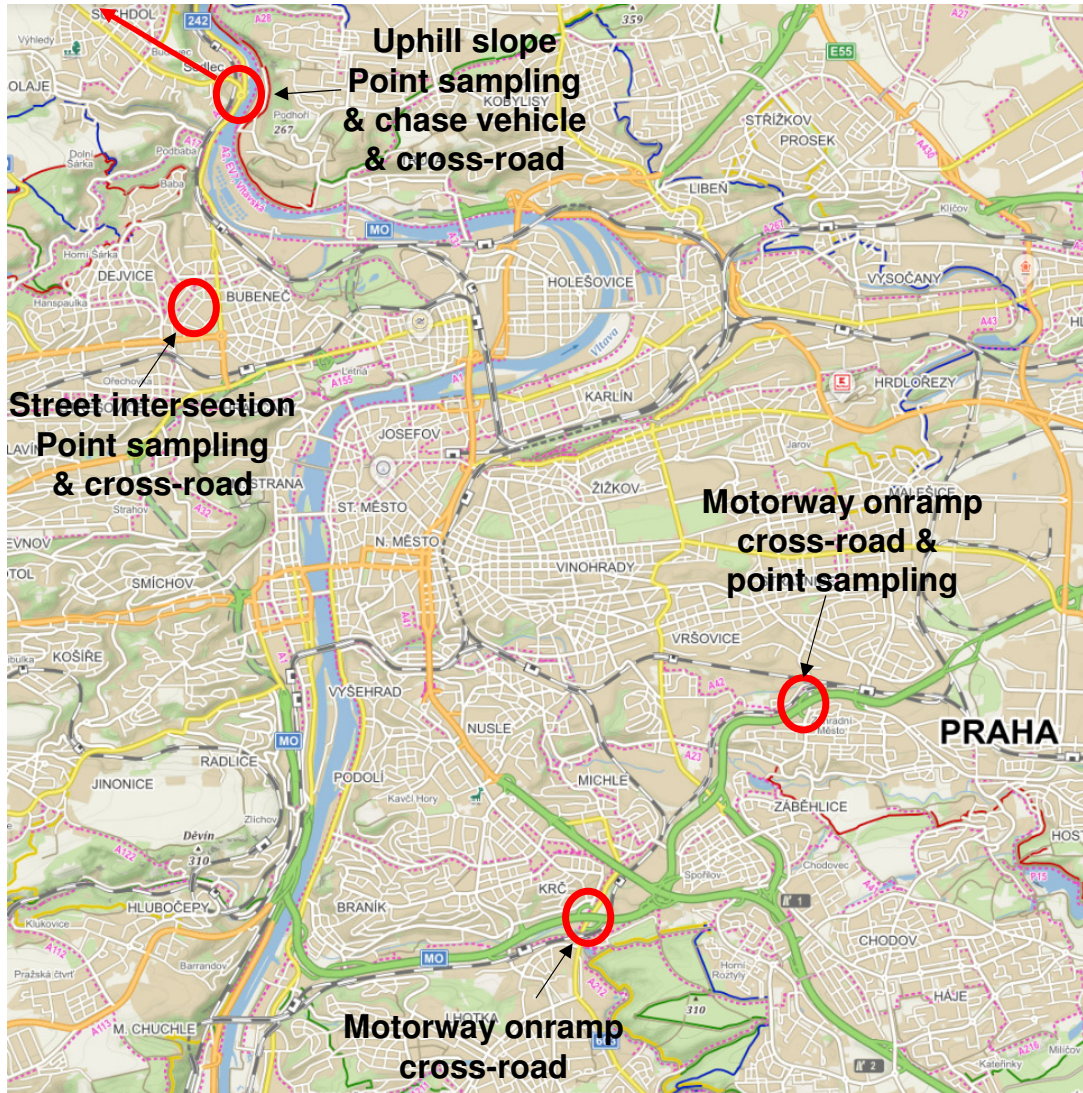
- OPUS testing from September 5<sup>th</sup> to 23<sup>rd</sup> of September.
- Plume chasing and point sampling from September 12<sup>th</sup> to 23<sup>rd</sup>.
- Truck enforcement campaign from September 12<sup>th</sup> to 16<sup>th</sup>.



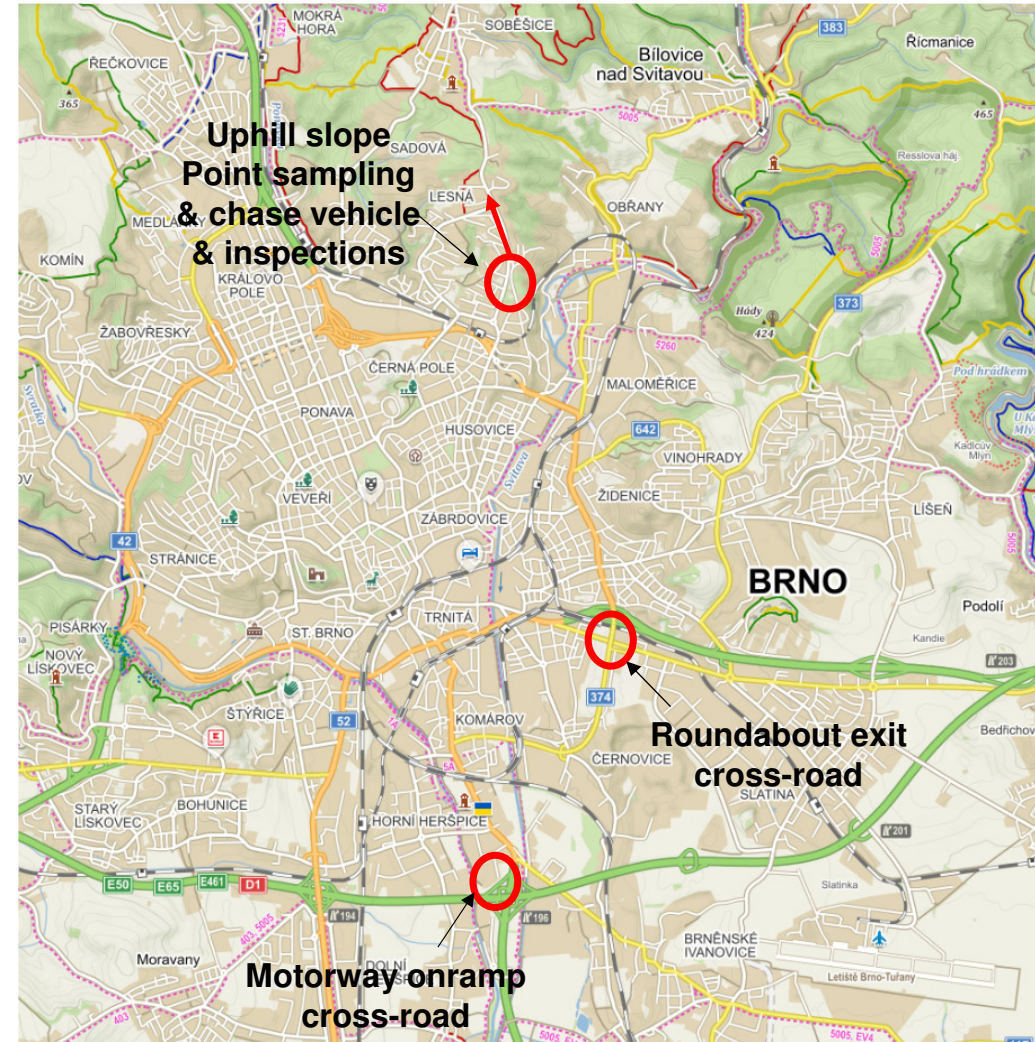
## September 2022

S	M	T	W	T	F	S
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1

# CARES fixed testing locations



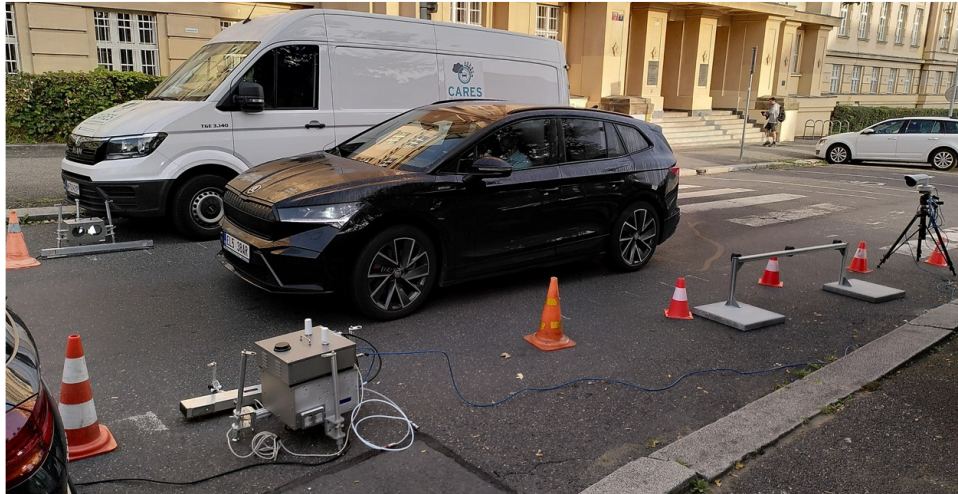
Map source: [www.mapy.cz](http://www.mapy.cz)





# Measurement set-up

Point sampling van and OPUS remote sensing instruments



Plume chasing car



Emission monitoring screen from the plume chasing car



Plume chasing van



# Detection of HDV high-emitters and tampering

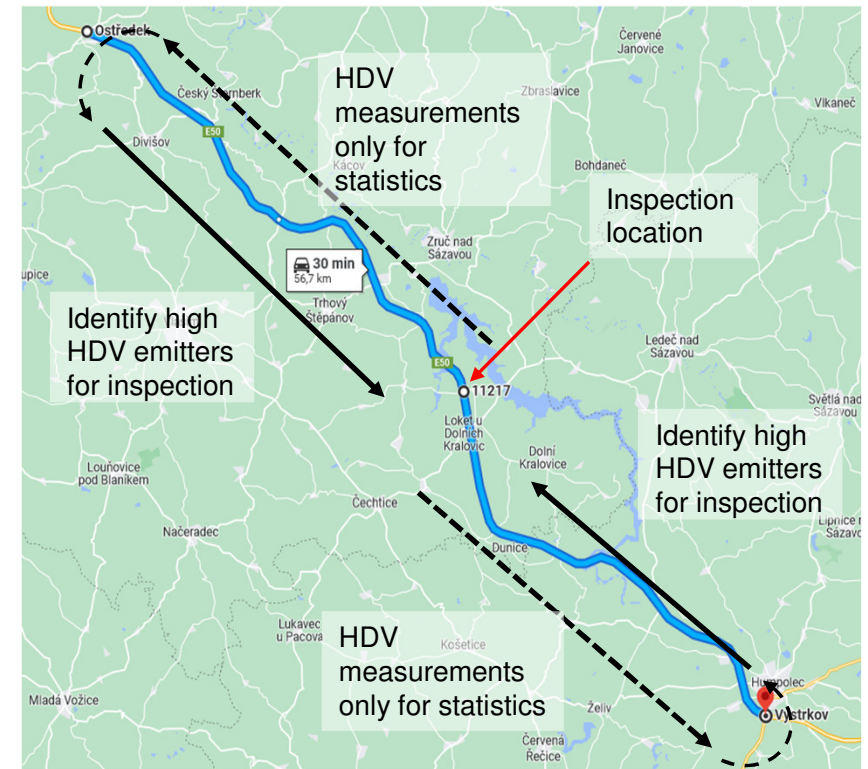
Plume chasing car with Airyx analyzers



Police inspection



NO<sub>x</sub> aftertreatment system defeat device



# Status of datasets

- Over 100,000 valid measurements were collected by OPUS.
- Point sampling data in post-processing of over 20,000 records.
- Over 1,000 vehicles measured with plume chasing.
- Vehicle specification retrieval from license plates.
  - License plates were delivered to the Ministry of Transport in November 2022.
  - The Ministry of Transport delivered the first version in early January 2023.
  - 40 % of the vehicles identified had missing information as well as other issues.
  - The Ministry of Transport delivered a second and corrected version of the vehicle information in mid-January 2023.

# Next steps

- On-going:
  - Post-processing of emissions measurement data, including quality control. First consolidated datasets from OPUS and point sampling are expected in February.
  - Dissemination of the plume chasing results for trucks based on the emission standard reading visible from the side of trucks (e.g. presented to the ERMES group in October 2022).
- Upcoming:
  - Analysis of anonymized remote-sensing data, including a consolidation of the plume-chasing records.
  - Dissemination of the conclusions about the instrument comparison and comparability, fleet composition, emission levels, estimated rate of defect or tampering, etc.





# CARES

CITY AIR REMOTE EMISSION SENSING



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 814966

## CONSORTIUM PARTNERS



UNIVERSITÄT  
HEIDELBERG  
ZUKUNFT  
SEIT 1386