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Document information

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Executive summary

The exploitation plan lists for each of the foreseen results the exploitation by the uCARE consortium partners as well as uptake by organisations outside the consortium.

The method used to compile this exploitation plan is:

- Create a list of all foreseen results
- Ask all partners about all foreseen and hoped for exploitation
- Check the validity and modify/extend where needed the foreseen exploitation of results as presented in section 2.2.1 of the uCARE proposal.

A range of exploitable results has been produced as planned. All partners are aware of the produced materials and where they can exploit these early results, they will. The dissemination enabling exploitation outside the consortium is hampered by COVID-19: scientific conferences being postponed sometimes by a year. Web-based contacts with stakeholders have proven to be less effective especially with new contacts.

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Definitions & Abbreviations

AEM	Augmented Emission Map
COPERT	Computer Programme to calculate Emissions from Road Transport
DOW	Description of Work
FTIR	Fourier Transform InfraRed spectroscopy/spectrometer
HBEFA	Handbook Emission Factors for Road Transport
NGO	Non-Governmental Organization
OBD	On-Board Diagnostics
PEMS	Portable Emission Measurement System
TAP	Transport and Air Pollution (conference)
TRA	Transport Research Arena (conference)
TWP	Tyre Wear Particles

1 Introduction

1.1 Background uCARE

With four million people dying annually due to outdoor pollution, improvement of air quality has become one of society's main challenges. In Europe, traffic and transport have a large effect on air quality, specifically passenger cars and commercial vehicles and to a lesser extent non-road mobile machinery. While technical improvements and more stringent legislation have had a significant impact, traffic and transport emissions are still too high and air quality is still poor. Although the use of electric and other zero-emission propulsion technologies may drastically reduce the pollutant exhaust emissions from traffic, the slow introduction of such vehicles as well as the trend of increasing vehicle lifetimes means that vehicles with internal combustion engines are expected to dominate the fleet beyond 2030. This project is the first opportunity to improve emissions of vehicles, not by improving vehicle technology, but by actively involving vehicle users and enabling their contribution to clean driving.

So far, expertise on pollutant emissions has mainly been used to advise European policy makers on limited effectiveness of emission legislation (through real-world emission factors such as HBEFA and COPERT) and how to reduce traffic and transport pollutant emissions. The numerous mitigation methods are rarely extended to include the perspectives of users uCARE enables a next essential step: providing user targeted emission reduction measures. These measures will be implemented and evaluated in real-life pilot projects.

The overall aim of uCARE is *to reduce the overall pollutant emissions of the existing combustion engine vehicle fleet by providing vehicle users with simple and effective tools to decrease their individual emissions and to support stakeholders with an interest in local air quality in selecting feasible intervention strategies that lead to the desired user behaviour*. The overall aim is accompanied by the following objectives:

1. To identify **user-influenced vehicle emission aspects** (such as driving behaviour and vehicle component choice).
2. To determine the **emission reduction potential** of each vehicle emission aspect with help of the uCARE model developed within a toolbox.
3. To develop a **toolbox**, containing models and emission reduction measures, that enables stakeholders to identify the most appropriate intervention strategies that reflect the specific users and their motivation.
4. **Support policy makers** and other **stakeholders with an interest in air quality**, such as municipalities and branch organizations, **in identifying intervention strategies** that translate the measures into desired behaviour of the user.
5. **To test and evaluate** intervention strategies in a set of pilot projects conducted with various target user groups in at least four European countries. The pilot projects illustrate effectiveness and feasibility of the toolbox and intervention strategies developed on its basis.
6. Perform an **impact assessment** of the intervention strategies effectiveness, in terms of cost, penetration, achieved emission reduction and lasting effects.
7. **Actively feed** European cities and international parties with uCARE learning and results, via awareness raising campaigns, communication tools, interactive web application and other dissemination activities. Open access to the broad public to the toolbox, data and developed tools.
8. Summarise the findings **in blueprints for rolling out** different user-oriented emission reduction programmes, based on successful pilots.

The Exploitation Plan is part of Work package 5 and lists the foreseen exploitation of the uCARE results by the uCARE consortium partners and by organisations outside the consortium.

1.2 Purpose of the document

This Deliverable gives an overview of the plans for exploitation of the uCARE results in the next two years of the project.

1.3 Document Structure

Between the introduction in chapter 2 and conclusions in chapter 4, chapter 3 describes the exploitation of results, ordered by Work package producing the results.

1.4 Deviations from original DoW

1.4.1 Description of work related to deliverable as given in DoW

This Deliverable describes the ways how the uCARE consortium partners expect to exploit the results of uCARE during the project.

1.4.2 Time deviations from original DoW

None

1.4.3 Content deviations from original DoW

None

2 Introduction to the exploitation plan

The exploitation plan lists for each of the foreseen results the exploitation by the uCARE consortium partners as well as uptake by organisations outside the consortium.

The method used to compile this exploitation plan is:

- Create a list of all foreseen results
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3 Exploitation plan ordered by results by Work package

3.1 WP1

A taxonomy for vehicles and tools to facilitate the use of the taxonomy have been developed. In addition to the application by uCARE, the Taxonomy has already been adopted by the CARES project and the LIFE project MILE21. Considering the fact that already two projects benefitted from the structure of the taxonomy, further update by scientists and/or projects for structuring emission related data will be likely. TNO, TUG and LAT will actively promote this use of the taxonomy in future projects. EMPA is using the taxonomy internally already and will use it in future projects. IVL will implement the taxonomy in the existing CONOX remote sensing database.

Augmented Emission Maps (AEMs) have been developed as a means to share emission data of specific cars.

- On one hand a standard for the AEM has been developed. The standard (D1.2)[1] will be exploited whenever a new AEM is created according to this standard.
- The uCARE project will create and publish a collection of AEMs for various types of pollutant emissions. The use of these AEMs, for instance by tool makers/software developers, constitutes the exploitation of these AEMs.
- Various tools to create and find the proper AEMs have been created. These tools have been submitted to the public domain and are exploited by creators and users of AEMs.

LAT will use AEM in future research activities aiming in smart processing of data to further evaluate the behaviour of both recent but mostly older vehicle technologies of vehicles. Aim is to reflect the results of such activities in improved vehicle emission modelling.

TNO will use all three forms of exploitation of AEMs.

The promotion of AEMs in the scientific community was planned in the TRA (26 – 30 April, Helsinki) and the TAP (16 – 18 September, Graz). Both conferences were cancelled due to COVID-19. As soon as possible the exploitation oriented dissemination will be resumed.

As a back-up, an animation of the potential exploitation of the AEMs was made. This animation can be used as part of the exploitation oriented dissemination and as a stand-alone video.

EMPA will use AEMs in future projects.

The AEMS will be used in the CARES project as well.

Five cheap and simple monitoring solutions were created (D1.4) [2]. The videos are being used in WP3 to inform interviewees.

- The NO_x feedback tool is connected to the OBD of the vehicle and a bar of LEDs. It provides drivers insight into the real-time NO_x emission of their vehicle.
- The Crossyn system is connected to installed sensors as well as the OBD of the vehicle. The purpose is to log the data received from both channels.
- The particle sensor, based on a cheap smoke detector, is capable of detecting severely damaged/removed DPR.
- Mini PEMS can be used for all gaseous pollutant and particulate matter and is suited for vehicles with small engines.
- The portable FTIR is a universal tool for measurement of nearly all gaseous pollutant and is suited as an alternative for PEMS. The exploitation of these tools is mainly foreseen in pilots. Either the equipment can be installed in the vehicles of a few tens of drivers or the equipment can be used in fairground events.

The following partners intend to exploit these tools in spin-off pilot-like projects with stakeholders after the uCARE project has ended: TNO and Crossyn (combined with the WP2 results).

uCARE created a number of videos [3], allowing drivers to check the performance regarding pollutant emissions for their own vehicle. In awareness campaigns by partners and in spin-off pilot-like projects these videos are intended to be exploited. Some initial contacts with relevant organisations¹ were initiated, however due to COVID-19 further dissemination and promotion of this materials with environmental and car related organisations was hampered.

The partners intended to do so are the same as those for the cheap and simple monitoring solutions.

VUB intends to apply the gained insights on tampering on various policy studies aiming at improving local air quality levels:

- Feasibility study on the extension of the low emission zone City of Gent
- Policy study on preventing and opposing emission fraud with road vehicles requested by the Flemish government
- Study requested by the Flemish government regarding emission factors of plug-in hybrids
- Study 'Ban the diesel in 2030' for the region Brussels

3.2 WP2

The key result of WP2 is software for trip analysis based on AEMs, and thereby made car specific.

This software can be used in various ways. Within the uCARE project driver behaviour will be compared with alternative driver behaviour. Alternatively, the same trip can be analysed using different cars.

Crossyn intends to build, based on the simple monitoring solution and the software, a driver guidance service. This service still needs further detailing and will depend on the outcomes of WP3 pilots.

LAT will use the uCARE model methodology for the development of tools allowing real time evaluation of vehicle emission performance. Such tools may be combined with small emission measurement systems (SEMS) and portable emission measurement systems (PEMS) to both enhance the data derived from them but also provide guidance during execution of on-road experiments.

¹ Relevant organisations include environment oriented NGOs, automobile clubs, eco-driving schools, etc.

TUG wants to exploit the uCARE software tool in an application for driving schools and Eco-drive trainings to give feedback on emission savings. This can be extended to automobile clubs.

Analysing a typical trip using different vehicles might provide guidance to consumers intending to purchase a car and can therefore be an exploitation by consumer platforms. However this might also be part of a scientific analysis.

VTI wants to exploit the uCARE software for trip analyses as basis for further emission reduction projects in Northern countries where studded tyres are used. Some additions and modifications are expected for this. Except for airborne particles, VTI would also like to use the model also for total emission of tyre wear particles (TWP) which is a dominating source to microplastics. The model, or specific subroutines, might also be possible to combine with the NORTRIP emission model, which is specifically developed to describe non-exhaust and road dust emission, which are periodically high in Northern countries.

3.3 WP3

The four key results of WP3 are:

- an increased understanding of factors that encourage or discourage change.
- a detailed description of pilot projects, including: technical and human resources.
- a description of methods used to collect data and impact evaluation indicators.
- a summary of the effects of awareness-raising campaigns and teaching material aimed at changing driver behaviour

Exploitation of these results will be in:

- pilots (small scale) for new stakeholders
- campaigns (large scale) based on the pilots

The stakeholders participating in the uCARE pilots will in principal be selected based on their intention to exploit the pilot results for a large scale campaign.

LAT intends to exploit intervention strategies and any information collected during the validation and evaluation of the pilot projects in future research activities elements aimed at improving of the emission performance of vehicles. More specifically, the aim is to combine these elements with engine and vehicle technological measures to maximize the expected emission reduction in future research activities. One example is the inclusion of uCARE measures in in-vehicle equipment (driver assistance, ECU software etc.).

VTI intends to exploit the education material produced in WP3 as well as successful pilots in further research and emission reducing activities.

TNO intends to perform pilot like projects. VUB intends to perform a pilot study in Flanders.

The University Leeds hopes to enhance their reputation among stakeholders that are not yet connected with the university. This will help in the translation between academic results and policy decisions. They can use this project as evidence in the Impact Statement in their Research Excellence framework submission to the UK.

3.4 WP4

The key result of WP4 is an extrapolation of the pilot results with respect to reduction of pollutant and the improvement of air quality to large scale roll out e.g. in campaigns. The tools created can be used to evaluate also future pilots. For those who intend to convert uCARE pilots into campaigns, the effect calculated by extrapolation will be input to their business case.

ICCT will try to make sure that all results will be used by various stakeholders after the project. ICCT will do this by continuously talking about these results to policy makers and

regulators. ICCT is involved in MILE 21 and CARES and will suggest to use results from uCARE in those projects.

IVL will try to exploit the pilot results in Sweden among their stakeholders, such as national authorities, municipalities, cities etc.

LAT will try to exploit results with regional and national authorities in Greece aiming in execution of local projects for the improvement of air quality via uCARE measures.

The university of Leeds will exploit the results (see WP3). Leeds hopes to let the whole city of Leeds profit from the outcomes of the pilot performed with local secondary schools.

INFRAS will benefit from the results from uCARE by validating, and possibly improving, the emission factor application HBEFA (Handbook of Emission Factors for Road Transport), which INFRAS develops in collaboration with TU Graz, EMPA, Heinz Steven and other partners outside uCARE. HBEFA is used by authorities, private consultants and universities and represents an important input for other emission calculation tools like COPERT, EcoTransIT or TREMOD.

4 Review and update

The Exploitation Plan will be reviewed and updated periodically. This will facilitate an effective exploitation and will ensure that any deviations from the plan are detected in an early stage. This review can also lead to that new activities are identified and, thus, included in the plan.

5 Conclusions

A range of exploitable results have been produced as planned. All partners are aware of the produced materials and where they can exploit these early results, they will. The dissemination enabling exploitation outside the consortium is hampered by COVID-19: scientific conferences being postponed sometimes by a year. Web-based contacts with stakeholders have proven to be less effective especially with new contacts.

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