



ICARUS Newsletters - 2nd issue

Integrated Climate forcing and Air pollution Reduction in Urban Systems

Welcome to the second newsletter of the ICARUS project. This issue covers the period from January 2017 to June 2017 and gives you an overview of the progress we made in our project.

The ICARUS Newsletter shares information about results and events of the EU research project ICARUS aiming at keeping all relevant stakeholders, interested in air quality and climate change in urban areas.

Your engagement is very important to us. Therefore, we would like to encourage all interested parties and stakeholders to support us in our endeavor and to constructively collaborate in achieving the study results for the benefit of the society as a whole. We hope that you find this information useful and we were looking forward to hearing your effective and constructive feedback.

We are looking forward to making your voice matter in revamping our cities and combatting climate change!!

If you would like to see previous issues of the newsletter, you can find them all at the ICARUS website https://icarus2020.eu/category/news/

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Introduction

During this semester, the general objective of ICARUS was to gather the knowledge, the tools and the technologies to support the ICARUS conceptual framework for an integrated urban impact assessment in support of optimal air quality and climate change governance in EU Member States leading to the design and implementation of appropriate strategies to improve air quality and reduce the carbon footprint in European cities, while contributing to the overall urban resilience taking into account socio-economic dynamics and differences across the EU. In this semester we defined the ICARUS methodological framework, which will allow us in the next years to evaluate the efficacy of policies aiming at mitigating both air pollution related health effects and GHGs emission throughout the project.

The developed framework encompasses a number of operational steps along the impact pathway from policies to health effects and the associated economic costs including high dimensional data fusion and refined tools for environmental and health impact assessment (Figure 1).



Figure 1: The ICARUS paradigm

To support the development of the ICARUS paradigm a number of reviews of the state-of-theart were undertaken and a common review protocol was prepared to be used as basis for all literature reviews.

The use of sensor technologies in defining external exposure at individual level

Key messages from the systematic review conducted on 293 peer-reviewed papers on the use of sensor technologies in defining external exposure at individual level:

 New sensor technologies are being used increasingly in practice to assess exposure of individuals. The ability to monitor personal exposure using low-cost, portable and easy to use sensors has the potential to provide citizens and communities with the opportunity to directly monitor phenomena that can benefit their lives and wellbeing.

- Data acquired by individual sensors are worthless without interpretation Big data requires statistical advances, sophisticated data mining techniques, computing power as well as a careful sharing of data sources while also maintaining privacy protections
- One of the most important disadvantages is that the majority of the available low-cost

technologies for air quality are still in testing phase and without clearly demonstrated fitness of purpose. This is in a big part a result of challenges related to quality control of the results obtained by these devices, e.g. efficient pre-calibration of sensors reflecting environmental conditions during the deployment



Figure 2: Distribution of studies included in ELS with reported location

With regard to analysis of suitable candidate sensor technologies to be used by volunteers in the frame of the sensor campaigns in ICARUS the review provided the following recommendations:

 Multi-sensor setup should comprise environmental, location and personal movement/activity data, combined in user friendly, easy to use "package". Location tracking is an essential component in exposure assessment. The suggested environmental parameter is particulate

(preferably matter PM2.5 or PM1) NO2, O3 and CO, as it is widely recognized as a pollutant of concern in urban environments. Regardless of the device used, it should pre-calibrated, be preferably using the co-location approach under same environmental conditions as during the deployment.

A multi-platform data



Figure 3 Garmin Vivosmart 3 for physical activity tracker

collection tool needs be developed in order to store, manage and process all data coming from different devices.

Influence of socioeconomic status in relation to exposure

- Citizens with low socioeconomic status are generally more likely to be exposed to higher levels of air pollution despite lower levels of polluting car use in these groups. In order to create healthy cities particular attention needs to be paid to reducing exposure to air pollution and technology take up in low SES groups, reducing car use in high SES groups and encouraging higher participation in cultural activities among low SES groups. There are also well established links between SES and housing and SES and smoking.
- There is considerable evidence suggesting that higher levels of SES are associated with higher adoption, interest or willingness to adopt technologies aiming at reducing emissions and cut energy consumption.
- Income, education and occupational status are important determinants in explaining the take-up of new technologies, as well as the awareness of environmental issues. This calls for policies aiming at addressing this issue and increasing incentives for more disadvantaged households to access these technologies
- High SES people are more likely to use cars for transport and to travel longer distances. Just under half of the associations found for active

transport indicated that high SES groups were less likely to use active transport.

- Cycling was often found to be more common among high SES groups particularly when the SES measure was education.
- High SES were more likely to participate in cultural activities such as sport and high culture.
- Study findings for walking tends to suggest that higher SES groups were less likely to walk.

Emissions inventories at EU level for the years 2015, 2020 and 2030

Complete emission inventories comprising all major anthropogenic emission sources for Europe (EU28 + Switzerland + Norway) were finalized.

The emission inventories are based on an activity-emission-factor matrix, which contains different kinds of activities for each emission source category and corresponding emission factors for the following eighteen pollutants and greenhouse gases (Figure 4)



Figure 4: Air pollutants and greenhouse gases in the ICARUS emission inventories



Figure 5:General methodology of spatially distributing emissions



Figure 6: Gridded NOx emissions from residential combustion (incl. mobile) for 2015 and 2030

The resulting dataset contains European-wide gridded emissions with a high spatial resolution of up to 1km by 1km to be used as a baseline for policy simulation reflecting the current level of air pollution and greenhouse gas emissions as reflected in the emission inventory for the year 2015. To be able to consider long-term effects and future policies, the dataset also comprises two emission inventories for future years (2020 and 2030), representing a business-as-usual case, i.e. only currently implemented and already decided future policies to reduce air pollution are taken into account.

The underlying activity-emission-factordatabase provides a rich tool to easily model technical measures, only affecting emission

The emission inventories developed will be then used in regional air quality models in WP3 to predict air quality and health impacts.

Next step will be to develop bottom-up emission inventories for the nine ICARUS city-areas.

Remote sensing

The ICARUS aerial monitoring campaign started in two of the six ICARUS cities (Athens, Thessaloniki) through the use of a N.A.S.A Awarded Light Manned Aircraft .

The specific type of aircraft is specially designed for providing Aerial Environmental Monitoring equipped with high-tech scientific equipment (e.g. High End Geodaitic GPS/IMU system to provide accurate geolocation for every measurement and 4 Geodaitic GPS/GLONASS R.T.K in order to provide Land Surveying measurements) which can produce aerial mapping products and log accurate environmental data even to inaccessible areas using remote sensing techniques.



Figure 7: The Light Manned Aircraft used ion the ICARUS campaigns

The aircraft is designed as an aerial platform of sensing environmental data and it is operating at different height profiles providing i) Air Quality Data and selected GHGs (CO₂, CH₄, N₂O, SF₆), VOCs) at different height profiles and ii) Remote sensing images in order to detect urban gaseous emissions using aerial thermal camera (heat mapping of the above ICARUS cities).

Both in Athens and in Thessaloniki, two flights were executed over three selected different (urban, suburban, regional) monitoring locations. For each city six samples of VOCs and six samples of GHGs were collected above the mixing layer. The same number of samples/ air pollutants were collected within the mixing layer.

Next step will be the execution of the flights over Thessaloniki, Athens and Ljubljana during the

summer period and the flights over Ljubljana during the winter period.

Preliminary results showed that during the winter period GHGs concentration were slightly higher in the mixing layer than above it for both cities. In contrast, most of GHGs were higher above the mixing layer during the summer in both cities.

In general, higher values were measured in Thessaloniki compared to Athens during both observation periods.

There were not observed significant differences between urban and suburban sites while we observed cases where rural site values were higher than the values for urban sites in both cities.

Dissemination, communication, and involvement of stakeholders

ICARUS aims at disseminating and communicating its objectives, methods, tools and

results so as to inform various stakeholders, to raise awareness and to encourage the widespread adoption of the project findings.



Figure 8: The home page of the ICARUS Web-porta (www.icarus2020-eu)

The project portal (www.icarus 2020.eu) has been developed and regularly updated. The ICARUS web site is the first point of access for all interested scientific and business parties in order to raise and grow awareness over the project results on the broadest possible international scale and as the integral project knowledge base for the consortium members. Google Analytics have been integrated on the portal so that the administrators were able to track statistics regarding the portal's traffic (total number of visitors, the total number of new visitors, how long visitors stay on each page, most popular pages, etc.). Overall, the ICARUS website has been accessed by an average of 400 unique visitors and 2,500 page views per month.

Dissemination Activities

A number of dissemination and networking activities happened during these 6 months. These included the participation at international conferences, congress and scientific workshops hereinafter summarized:

- ICARUS team gave an oral presentation entitled "Integrated Climate forcing and Air Pollution Reduction in Urban Systems" at the 3rd VDI expert forum on atmospheric chemistry in December 2016 in Frankfurt (Germany).
- ICARUS participated to Hellas GIS 9th Symposium held in Athens (Greece) in December 2016
- ICARUS together with the ClairCity project participated to the TFIAM/FAIRMODE Workshop in Utrecht (the Netherlands), in February 2017 on Modelling of urban and regional measures for improved air quality providing a presentation entitled Assessment of co-benefits of air pollution measures
- The ICARUS project was presented as part of the research to European Centre for Environment and Human Health Seminar Series, University of Exeter, March 2017.
- ICARUS has participated to the 13th Czech-Slovak conference on air quality in Brno (Czech Republic) in April 2017 with an oral presentation entitled "Integrated climate forcing and air pollution reduction in urban systems (ICARUS): Project overview and objectives"
- ICARUS presented a poster entitled "The extreme events of perceived temperature over Europe: a projected northward extension of dangerous area" at European Geosciences Union General Assembly, in April 2017 in Vienna (Austria).
- ICARUS participated to the 27th Annual Meeting of the Society of Environmental Toxicology and Chemistry (SETAC) in Brussels (Belgium) in May 2017, giving oral presentation entitled "Conceptualizing Stakeholder Engagement in the realm of tackling Air Pollution & Nurturing Environment - conscious Citizens, for Smart, Sustainable & Resilient Cities"
- ICARUS participated to the 6th International Conference on Environmental Management, Engineering, Planning & Economics (CEMEPE) and SECOTOX held in Thessaloniki (Greece) in June 2017, giving two oral presentations entitled "Can Agent Based Modelling, coupled with sensors data, be used for personal exposure assessment?" and "A

holistic approach in support of air quality for future green and resilient cities"

ICARUS Publications

Three papers including conference proceedings have been produced and submitted during this semester.

- D.A. Sarigiannis, P. Kontoroupis, S. Nikolaki, A. Gotti, D. Chapizanis, S. Karakitsios. Benefits on public health from transport-related greenhouse gas mitigation policies in Southeastern European cities. Science of The Total Environment, Vol. 579, 1 February 2017, Pages 1427–1438.
- E. Scoccimarro, P.G. Fogli, S. Gualdi. Extreme events of perceived temperature over Europe: a projected northward extension of dangerous area. EGU Geophysical Research Abstract 2017, Vol. 19, EGU2017-4417-1, 2017.
- O. Mikeš, C. Degrendele, R. Prokeš, O. Sáňka, A. Holubová Šmejkalová, P. Čupr G. Lamme. Integrated climate forcing and air pollution reduction in urban systems (ICARUS): Project overview and objectives. Ovzduší 2017, Program a sborník conference, April 2017. ISBN:978-80-210-8544-2.



Figure 9: ICARUS peer-reviewed paper published on Science of The Total Environment

Communication

A wide range of communication channels were employed to spread the main concepts and objectives of the ICARUS project so as to reach an audience as wide as possible.

Articles in newspaper

The work done in ICARUS has been widely promoted by our team through ten articles in widespread newspapers. Click on the links below to access them.

<u>Article 1</u>, <u>Article 2</u>, <u>Article 3</u>, <u>Article 4</u>, <u>Article 5</u>, <u>Article 6</u>, <u>Article 7</u>, <u>Article 8</u>, <u>Article 9</u>, <u>Article 10</u>

Press releases

Two press releases have been produced. You may have a look at them clicking on the links below.

Press release 1, Press release 2

TV interviews

As a part of communication strategy, ICARUS Coordinator Prof. D Sarigiannis gave three TV interviews which were broadcasted in widespread TV Channels and where he presented the aims and the innovation capacity of ICARUS, as well as the effect of lack of tools for integrating GHG and air pollution policies through real-life examples.

You may watch the interviews clicking on the pictures below.

During the interview at the PONTOS TV Prof. Dimosthenis Sarigiannis, presented the aims of ICARUS, related to the development of tools for proposing policy measures for climate change mitigation and management as well as reduction



Figure 10: Interview at the PONTOS TV of air pollution in cities.

Prof. Dimosthenis Sarigiannis explained the health and environmental implications from biomass burners used for heating in Greece at an interview for the EPT3 TV Channel. Misuse of climate policies that result in unexpected burden of air pollution and human health is something unbearable and is one of the main axis of ICARUS work, that has been explained here



Figure 11: First interview at the EPT3 TV Channel

During a further interview EPT3 TV Channel, Prof. Denis Sarigiannis discussed about the use of wood burning as a domestic heating source. This particulate air pollution may lead to as significant health implications as monetary costs on the public healthcare system - environmental injustice and inequity. In the ICARUS project both human health and the relative monetary cost will be taken into account towards win-win solutions for mitigating climate change and air pollution.



Figure 12: Second interview at the EPT3 TV Channel

Social media

Twitter @ICARUS2020 is used regularly to link to content on the website and build networks outside of the project.

By addressing the broader community and the general public, the project will contribute to bridging the gap between science and society.



Figure 13: The ICARUS twitter page

ICARUS reports

For all, detailed information about deliverables, milestones please visit <u>http://icarus2020.eu/work-packages/</u>. All materials are downloadable.

Next Issue

The next issue will feature other news and documents developed by the ICARUS Consortium covering the period of next 6 months from July 2017 to December 2017.

Contact us

We want to hear from you! Please do not hesitate to send us your feedback, comments or questions <u>here</u>.

For more information Visit:

http://icarus2020.eu/



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