

Horizon 2020

Societal Challenge: Improving the air quality and reducing the carbon footprint of European cities



Project: 690105 – ICARUS

Full project title:

Integrated Climate forcing and Air Pollution Reduction in Urban Systems

D8.14 Third and final report on outcomes of project events targeted at the scientific community and key stakeholders

WP8: Dissemination, communication and involvement of stakeholders

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1 Executive summary

Communication and dissemination activities played a significant role throughout the project in achieving ICARUS goal of developing integrated tools and strategies for urban impact assessment in support of air quality and climate change governance in European cities that is grounded on evidence-based analysis. Thus, the ICARUS WP8 was specifically dedicated to the “Communication, dissemination and involvement of stakeholders” and aimed at taking strategic and targeted measures for promoting the ICARUS project and disseminating the project results and outputs. The communication and dissemination activities carried out during the project lifetime are a result of continuous efforts undertaken in WP8 towards reaching out to a wide range of audiences including policy makers, practitioners, researchers and local communities.

To this end ICARUS has been seeking maximum dissemination for the project findings at relevant conferences, seminars and workshops of interest for the project at both national and international level, ranging from academic, policy and industry events such as for example the C40 World Mayors Summit, the Air Quality Conference series, the International Scientific Conference on Energy and Climate Change, the International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes series, as well as the International Society of Exposure Science–International Society of Environmental Epidemiology (ISES/ISEE) just to mention some of them.

In these events we presented ICARUS work in multi-formats: regular papers presenting the progress and results of the project; panels or roundtables with invited speakers on the project’s topics; and communication workshop targeted at relevant stakeholders as part of the “cities” activities to increase their awareness and commitment to disseminating the project’s outcomes.


Project dissemination activities that were carried out by ICARUS team took mainly the form of presentations followed by discussion. The presentations were mainly about the ICARUS methodology framework and results obtained in the different cities and how this was relevant to the audience.

In this light the aim of this report is to provide an overview of the ICARUS events targeted at the scientific community and key stakeholders organized in the last 24 months of the project, to reflect on achievements and to conclude with key messages arising from the interactions with the events participants.

From September 2018 up to September 2020, the ICARUS team organized or participated in various communication and dissemination activities through which we were able to reach different types of audiences to increase project visibility by sharing and discussing about project findings and methodologies. ICARUS team used various platforms to reach out to various audiences.

Overall in its final phase covering the last 2 years ICARUS partners have participated/organized **52** conferences and dissemination events in Europe and worldwide to show and discuss project methodology, tools and results obtained towards a better understanding of the complex links between policies, environment and health in urban settings. These will be complemented by the ICARUS Final conference which will take place in a telematics format on 26-27 October 2020 in the frame of the 20th MESAEP International Symposium.


ICARUS research created evidence that lead to date to **21** peer-review papers published and contributed to **3** book chapters and **3** PhD or MSc. thesis. Other ca. **40** scientific papers have been either already submitted or are being finalized and will be published in peer-review journals in the next few months.

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In addition, in the last 2 years the ICARUS project shared **34** news articles in magazine/blogs/press releases, **13** Radio broadcasting/Podcast/TV Interviews and **3** training international events.

This huge effort allows ICARUS to increase the common perception and understanding of the air quality and climate change problems in both scientific community and general population and provided them with clear suggestion about on how to improve urban environments quality. The presentations and discussions we had often allowed for unprecedented and detailed insights in the subject addressed by ICARUS to audiences both inclined and not to scientific issues. According to the audience intercepted in the present report the main dissemination/communication activities have been grouped in different types including scientific conferences/workshops; radio/press interviews, publications in popular magazines, open days and social media.

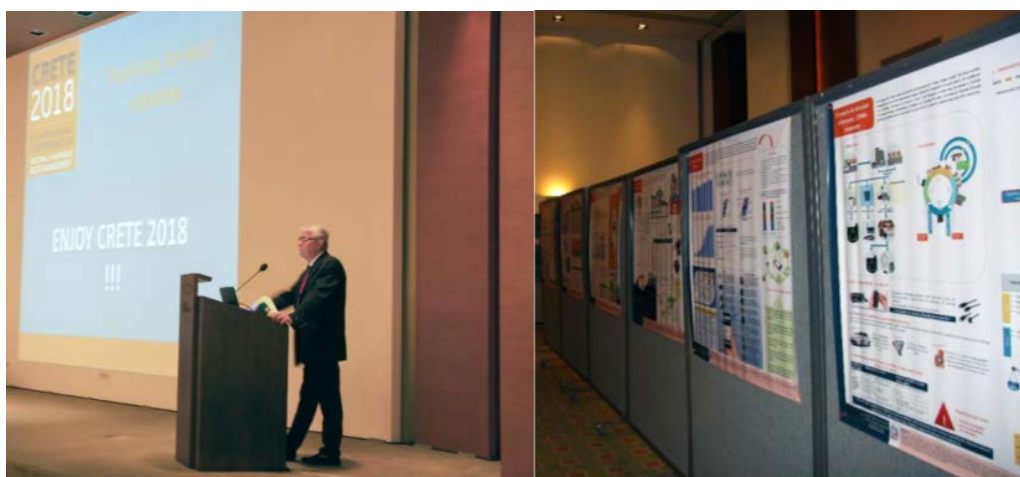
From this report all the project activities addressing specifically local authorities responsible for air quality, climate change and health protection in the different ICARUS cities were excluded as they represent the specific subject of deliverable D8.12 “Second report on outcomes of stakeholder interactions”.

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2 Main dissemination/communication events undertaken by the ICARUS consortium members

2.1 Conferences/Workshops/Symposium/Seminars

- 1) On 1-2/03/2018 at Seattle, USA, Institute for Health Metrics and Evaluation (IHME) has organized the workshop on *“The global burden of Disease-Pollution and Health Initiative”* to increase knowledge on the contributions of pollution and climate to the Global Burden of Disease (GBD) study. ICARUS team participated in this event with an oral presentation on *“Air pollution and the exposome”*. The workshop identified key priorities for the GBD-Pollution and Health initiative. Topics discussed included PM2.5 and lead pollution, neurodevelopmental neurotoxins, exposure science, climate change, policy and economics, and management of potential conflicts of interest in relation to judging causal relationships and effects. Link to the event can be found [here](#).
- 2) The ICARUS team participated in the event *“Earth-System and Sustainable Development Initiative – 2”* organized by EUCENTRE in collaboration with the University of Advanced Studies (IUSS) on 6/7/2018 in Pisa, Italy to share information and methods on *“How data fusion techniques can improve the overall assessment of air quality in urban environments”*.
- 3) The ICARUS team participated in the *“7th International Conference on Industrial and Hazardous Waste Management”* hold on 4-7/09/2018 in Chania, Greece with the following oral presentation: *“Facing the complexity of Health Impact Assessment (HIA) in Industrial Contaminated Sites (ICSs): the exposome connectivity paradigm”*. The conference program included 165 oral presentations, organized in 23 general sessions, 8 workshops and 2 special workshops in Greek, as well as 56 poster presentations, covering all aspects of hazardous wastes characterization, management and treatment. Link to the event can be found [here](#).

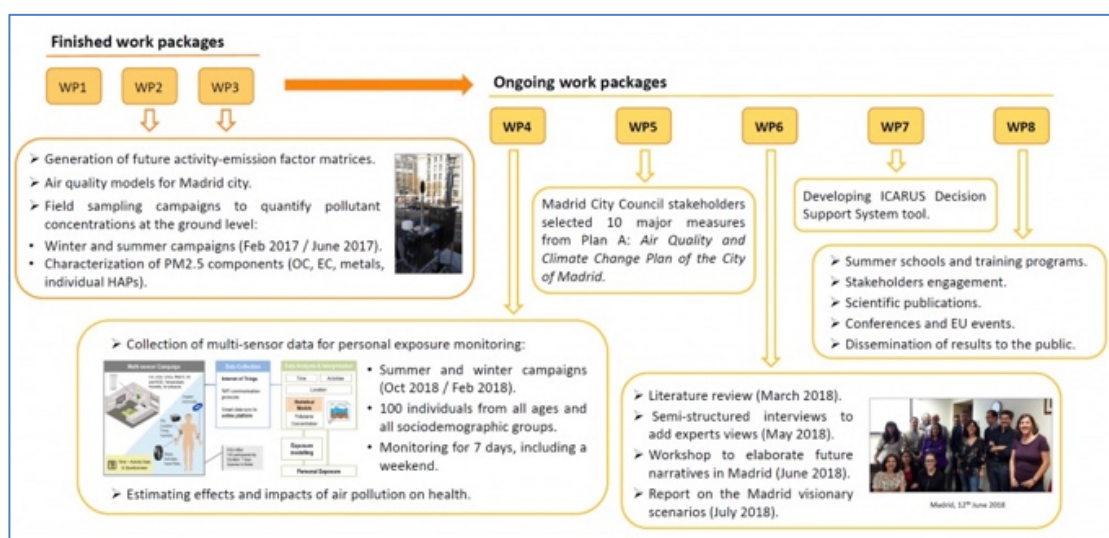


- 4) The ICARUS team organized a working meeting with the University of Basel on 16th Sep 2018 at the Swiss TPH in Basel to discuss scientific collaboration opportunities with *the University of*


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Basel". A major outcome of the meeting was the decision to include atmospheric mercury measurements in the ICARUS campaign in Basel.

- 5) ICARUS participated in the 36th Congress of Spanish Society of Epidemiology and the 13th Congress of Portuguese Society of Epidemiology held in September 2018 in Lisbon with an oral presentation entitled: ICARUS project: Integrated Climate Forcing and Air Pollution Reduction in Urban System.



- 6) The ICARUS team participated in the “*International Society of Exposure Science – International Society of Environmental Epidemiology ISES/ISEE joint annual meeting*” held on 26-30/09/2018 at Ottawa with an oral presentation titled on “Integrated use of Agent Based Modelling (ABM) with wearable sensors for personal exposure assessment”. The Joint ISES-ISEE conference brought together scientific experts and practitioners from academia, government, industry, and non-governmental organizations dedicated to the protection of health and environment. The conference highlighted issues that reflect the complexities in environmental exposure and health research and policy development such as: interactions between social and environmental determinants; combined assessments of both exposure and health; exposures across multiple media, sources, and stressors; exposures in different microenvironments; temporally and spatially varying exposures; mixtures and cumulative exposures; gene-environment interactions; the vast array of clinical and subclinical health impacts; and translation of research into policy and other decision making. Link to this event is [here](#).
- 7) ICARUS participated in the “*International Conference Sport and Public Space*” organized in September 2018 in Ljubljana (Slovenia) with an oral presentation entitled “Towards an active citizenship in a modern urban environment”
- 8) The ICARUS team participated in the “*11th International Scientific Conference on Energy and Climate Change – 3rd Green Energy Investments Forum*” held on 10-12 Oct 2018 at University of Athens with an oral presentation entitled “Weather clustering approaches and air quality climatic trends in urban environments”.

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11th International Conference on Energy and Climate Change,
 10-12 October, Athens, Greece





Department of Mechanical Engineering
 Environmental Technology Laboratory

- The present study is in the frame of European founded H2020, ICARUS Project.

The ICARUS project's main objective is to develop integrated tools and strategies for urban impact assessment in support of air quality and climate change governance in EU Member States leading to the design and implementation of appropriate abatement strategies to improve the air quality and reduce the carbon footprint in European cities.


More information could be found in <https://icarus2020.eu/>


ICARUS


11th International Conference on Energy and Climate Change, 10-12 October, Athens, Greece

- 9) The EUC team attended the *Euro-cities Environmental Forum* organized at Tampere (Finland) on 17-19 October 2018. The forum aimed at improving the understanding of the links between air pollution, climate change, and public health, exploring different scenarios for the designing of integrated policies delivering co-benefits. By focusing on examples from the energy, constructions and transport sectors, participants will discuss the opportunities to achieve the Paris Agreement while creating immediate local benefits for people and health. The ICARUS project was presented in various round tables and chaired the session on “win-win solutions for air pollution exposure management in cities”.



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- 10) The RECETOX team attended the 5th *Geological congress* held in Velenje (Slovenia) in October 2018 to present the results of source apportionment campaign executed in Ljubljana. In addition, measures and policies for reduction of emissions for Ljubljana were presented in the presentation entitled “Integrated climate forcing and air pollution reduction in urban systems (ICARUS): Ljubljana case study, Velenje, Slovenia”.
- 11) ICARUS was present at the LfU Symposium on Air Quality Control (Clean Air Planning - Measures and strategies against nitrogen oxides) in Augsburg in October 2018, where new findings and possible measures to improve the emission situation have been presented.
- 12) On behalf of ICARUS team, AUTH has participated in symposium “1st *Scientific Symposium on Health Climate Change*” organized by Italian National Institute of Health (ISS) on 3-5/12/2018 in Rome, Italy. The general objective of the Symposium was to promote an intersectoral and multidisciplinary approach to estimate, and to prevent, climate change related events as well as to prepare the authorities to put in place measures to reduce adverse health effects. The ICARUS team gave two presentations on “The climate exposome: a new tool for addressing the health impacts of climate change” and “Extreme events of perceived temperature over Europe in the future: the humidity role”. ICARUS findings suggested to take into account adaptation strategies to heat stress conditions also over region never considered before. In this context ICARUS findings contributed to the discussion for identifying and defining the main outcomes and future needs: the adaptation strategy should be applied at all governance levels; strong support must be provided to research on adaptation to climate changes to bridge the gaps in the knowledge of effects on ecosystems and health; the adaptation policies must be coordinated; adaptation actions based on an ecosystem-based approach and use of green infrastructure should be implemented; early warning systems need to be established; harmonization and collaboration between the health and environmental sector should be improved. Link to this event can be found [here](#) and [here](#).
- 13) The *American Geophysical Union (AGU)* organized its annual conference on 10-14/12/2018 at Washington DC, USA. The ICARUS team participated in this conference and gave an oral presentation entitled “The ability of ambient air PM_x to generate reactive oxygen species: link to sources/ Air pollution exposure management at a city level – the ICARUS approach”. Case studies on valuing health and air quality was presented. In addition, questions from scientists who were interested in measuring how their work benefits society were answered. It was illustrated how economic valuation tools can be used to quantify the societal benefits that result from the use of Earth science information in specific decision contexts. Further readings are [here](#).
- 14) The AUTH team participated in the conference “*Sensitization Campaign: Air Pollution and Health Impact: New Perspectives and Solutions within a Cross-Border Framework*” organized by INTERREG – IPA CBC on 11/12/2018 at Thessaloniki, Greece with an oral presentation entitled “Combatting urban air pollution and climate change: the ICARUS paradigm”. This conference was organized to sensitize the urban environmental issues through networking with other EU-funded projects in the cross-border areas of Greece. During his talk Prof.


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Sarigiannis presented the main objectives of ICARUS explaining the effects of air pollution on human health as well as the ways to reduce air pollution depending on the emission sources and pointed out the need to coordinate infrastructure so that the citizens may have direct access to air quality data at a specific place and time. Many other relevant projects had the opportunity to publish their results and find ways for practical cooperation & utilization of their data. Link to the event can be found [here](#).

- 15) The ICARUS team presented an oral paper entitled “Air quality for High schools, using ICARUS outputs” on 22/2/2019 at Střední průmyslová škola a Vyšší odborná škola (Secondary Industrial School and Higher Vocational School) in Brno, Czech Republic, where the basic introduction to the air quality research and explanation of the ICARUS methods and results were discussed. This activity was part of the Science-to-citizens dissemination and public awareness about the project.
- 16) The ICARUS team participated in the “2nd International Conference on Information and Computer Technologies (ICICT 2019)” on 14/3/2019 at Kahului Hawaii, USA with an oral presentation entitled “Towards meaningful air quality participatory sensing”. Further reading can be found in [1](#) and [2](#).



- 17) On behalf of ICARUS consortium, JSI participated in the “11th Jožef Stefan international postgraduate school students’ conference” on 15/4/2019 at Planica, Rateče, Slovenia. ICARUS tem members submitted abstract, poster and gave oral presentations on “Challenges in change of paradigm in air quality monitoring – from passive sensing to participatory air quality sensing”. Further information is available at [1](#), [2](#), [3](#) and [4](#).


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- 18) The ENVIROS team gave an oral presentation entitled “ICARUS: Integrated assessment of air quality in Brno” on 16-17/4/2019 organized at the Hotel Santon, Brno, Czech Republic where current ICARUS results were widely discussed. This event was mainly tailored for the Czech and Slovak science community and relevant stakeholders from the region of the South Moravia. For more information please click [here](#).



- 19) On behalf of ICARUS team RECETOX participated in the *International spring school and international scientific-practitioner conference “European dimensions of sustainable development”* on 23-24/4/2019 in Kyiv, Ukraine providing an oral presentation entitled “Cooperation on Health and Environment in Europe (incl. ICARUS project)” where an overview of the ICARUS results were shared and discussed.
- 20) On 2-4/5/2019 the ICARUS team gave a talk entitled “ICARUS in European cities”, at the Geneva International Conference Centre (CICG), Switzerland within the *UN ninth meeting of*

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the Conference of the Parties to the Stockholm Convention (SC COP-9). The theme of the meetings was "Clean Planet, Healthy People: Sound Management of Chemicals and Waste". The state-of-art ICARUS results and methodologies where shared and discussed with the audience.




21) The 7th *International Conference on Environmental Management, Engineering, Planning and Economics (CEMEPE 2019)* and *SECOTOX Conference* was held on 19-25/05/2019 at Mykonos, Greece. The conference was designed to encourage the exchange of ideas and knowledge between diverse groups of the scientific community concerned by current issues in environmental science, engineering, and management. The ICARUS team participated in this event and gave three oral presentations on:

- Addressing complexity of health impact assessment in industrially contaminated sites via the exposome paradigm.
- Exposome science for public health protection and innovation.
- Air pollution exposure management at a city level – the ICARUS approach.

Prof. D. Sarigiannis (AUTH) presented how the assessment of individual exposure to air pollutants and the prediction of their health effects can be improved through innovative methodological approaches for the assessment of “personal” exposure. In addition, the lifestyle behavior and activity of different population groups in different regions of Europe were discussed. In addition, state-of-the-art waste management technologies were presented that further contribute to the reduction of greenhouse gas emissions. Link to the event is available [here](#).

22) On behalf of ICARUS, EUCENTRE in cooperation with IUSS Pavia (University School For Advanced Studies) gave a presentation entitled “Integrated Climate Forcing And Air Pollution Reduction In Urban Systems (ICARUS) - Sensor campaigns in the cities” on the PhD day held on 20 May 2019 in Pavia.

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23) CMCC participated in the “19th International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes” held on 3-6 June 2019 in Bruges, Belgium and gave an oral presentation on “A Novel Approach For Air Quality Trend Studies And Its Application To European Urban Environments”.

24) USTUTT organized the “6th International Conference on Models and Technologies for Intelligent Transportation Systems” on 5-7 June 2019 at Kraków, Poland and gave an oral presentation entitled “Integrating ridesharing services with automated vehicles into macroscopic travel demand models”. This event resulted in a fruitful discussion on enhanced methods for modelling ridesharing services in macroscopic travel demand models. Link to the event can be found [here](#).

25) Given the important role of NPAHs and OPAHs in air pollution the ICARUS team presented its results on NPAHs and OPAHs at the 17th International Conference on Chemistry & the Environment (ICCE) on 16-20/6/2019 in Thessaloniki (Greece) entitled “NPAHs and OPAHs in the atmosphere of two central European cities: seasonality, urban-to-background gradients and gas-to-particle partitioning” where, key finding of ICARUS were shared with international scientific community with special focus on the nitro- and oxy- PAHs.



26) The “7th International Conference On Sustainable Solid Waste Management” was held on 26-29/06/2019 in Heraklion, Crete, Greece. The Conference was aimed to address the significant issue of sustainable solid waste management through the promotion of safe practices & effective technologies. The Conference focuses mainly on modern solid waste technologies. It aims to stimulate the interest of scientists and citizens and inform them about the latest developments in the field of municipal solid waste management. ICARUS team has actively participated in this conference and gave an oral presentations entitled “Circular economy and health: examples from Greece with a focus on plastics”. Special attention was drawn to the

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valorization prospects & the products from solid waste, such as: biofuels and on circular economy in all key action areas (production, consumption, waste management, secondary raw materials, innovation, investment & monitoring) and all priority sectors (food waste, plastics, biomass and bio-based-products, construction & demolition waste, critical raw materials), as well as waste management issues and resource efficiency in islands and generally isolated and remote areas. Link to this even can be found [here](#).



27) On behalf of ICARUS team, ISCIII has participated in the “XVIII Congreso de la Sociedad Española de Salud Pública y Administración sanitaria (SESMA)” held on September 2019 and gave a presentation entitled “Health impact assessment by the implementation of Madrid city Air Quality Plan (Plan A) in 2020”. In this event, the reduction of health risk due to NO₂ and O₃ levels was demonstrated based on the ICRSU results. Link to the presentation can be found [here](#).

28) On behalf of ICARUS, Aarhus University participated in the “X Scientific Conference Cycling, Society and Social Justice, Cycling and Society Research Group Annual Symposium 2019, Chester, UK.” on September 2-3, 2019 where an oral presentation entitled “Urban mobility practices and uneven dispositions for cycling as normalized everyday transport” was given. In the conference paper, social stratification related to policies of cycling as an active form of sustainable mobility is examined.

29) The ICARUS team presented an oral presentation titled “Health Impact Assessment by the implementation of Madrid City Air-Quality Plan (Plan A) in 2020” at the XXXVII Annual Scientific Meeting of the Spanish Society of Epidemiology (SEE) on 3rd-6th September 2019 in Oviedo (Spain). Link to the event can be found [here](#).

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30) The ICARUS team participated in the “16th International Conference on Environmental Science and Technology (CEST 2019)” on September 4th -7th 2019 in Rhodes, Greece to present the work entitled “The effect of Boundary Layer Meteorology in GHGs concentrations – the case study over 3 European cities using an aerial platform”. For further reading please click [here](#).


31) The ICARUS team participated in international event “OpenLivingLab (OLLD)” on 3-5 Sep 2019 in Thessaloniki, Greece. OLLD is the annual gathering of the global Living Lab community and a space for public officials, companies, entrepreneurs, academics, Living Lab representatives, and innovators to connect and work together. It was organized by the European Network of Living Labs (ENoLL), the international federation of benchmarked Living Labs in Europe and worldwide. During the event ICARUS members were part of the discussions related to health and wellbeing in urban environments, a topic highly related to the solutions towards green and healthy cities. Kostas Georgiou (ADDMA/ORS) participated also in the event providing information for the Resilience Athens programme and actions.

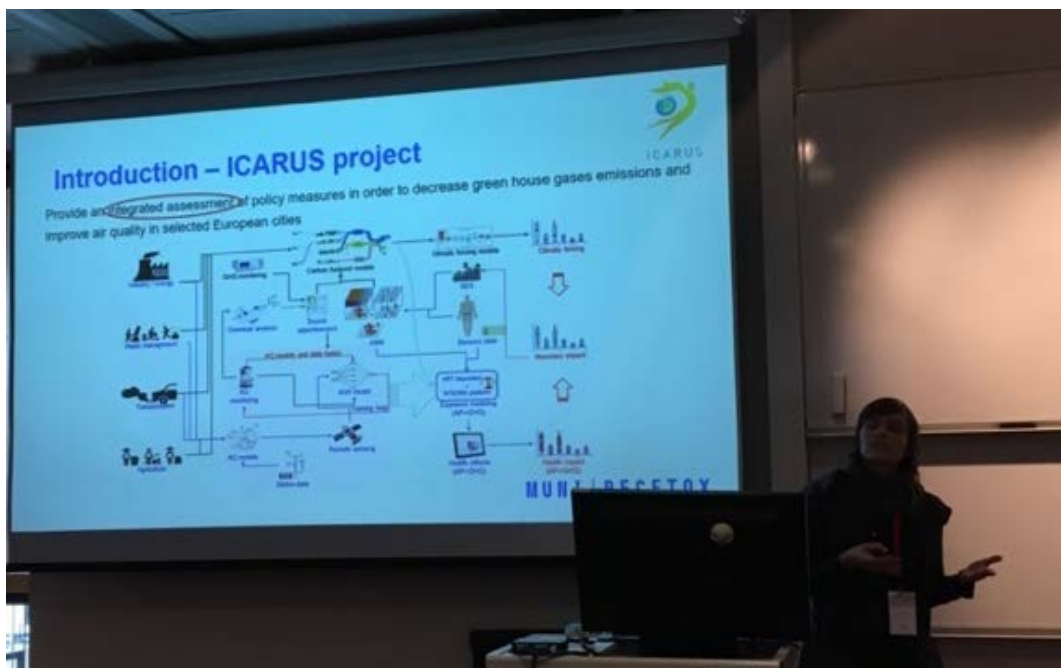
ICARUS to take part in OpenLivingLab Days (OLLD) 2019, 3 – 5 September 2019




The ICARUS project will be part of the “Health and Well-being including ageing population” round table, within the OpenLivingLab Days (OLLD) 2019, held in Thessaloniki September 3 to 5, 2019. OpenLivingLab Days is the annual gathering of the global Living Lab community. This actually provides the opportunity to various stakeholders and innovators to develop ideas together, enhancing networking of various communities and knowledge sharing experience. ICARUS will be part of the discussions related to health and wellbeing in urban environments, a topic highly related to the solutions towards green and healthy cities.

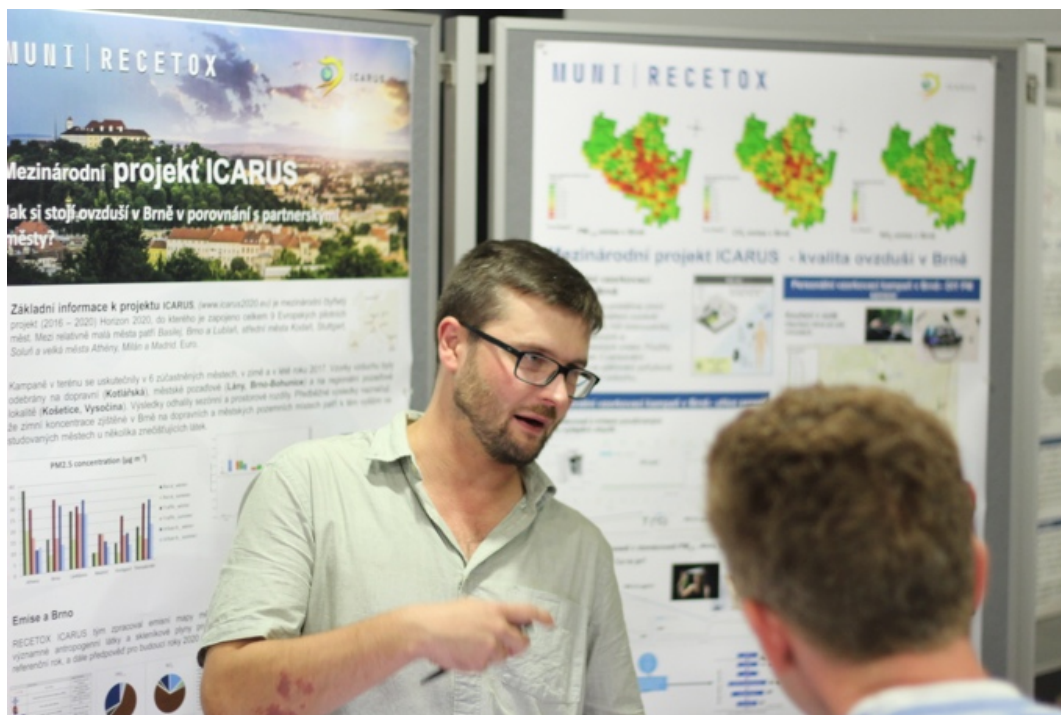
32) The ICARUS team participated in the “International Symposium on Polycyclic Aromatic Compounds (ISPAC)” on September 9-12, 2019 with a presentation entitled “NPAHs and OPAHs in the atmosphere of two central European cities: seasonality, urban-to-background gradients and gas-to-particle partitioning”.

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- 33) On behalf of the ICARUS consortium USTUTT and CSTUTT team participated in the conference "Universitätstagung Verkehrswesen 2019 (University Conference on Transportation 2019): Meeting of German speaking, transport related university institutes, presentation of research topics" organized by Universität der Bundeswehr München and held on 15-17 Sep 2019 at Lengri, Germany. The ICARUS members gave an oral presentation entitled "Integration von Ridesharingangeboten in makroskopische Verkehrsnachfragemodelle (Integrating ridesharing services into macroscopic travel demand models)". This event contributed to the discussion on enhanced methods for modelling ridesharing services in macroscopic travel demand models.
- 34) In order to spread the awareness about air quality research among the university students, ICARUS members arranged the event "Oral presentation for students" under the 'science-to-citizen' domain on 17/9/2019 at RECETOX, Gymnásium Jihlava. The basic introduction to the air quality research and explanation of the ICARUS findings and results were widely discussed with students.
- 35) The RECETOX team participated in the Brno Science Night Event on the 27th September 2019 in Brno (Czech Republic) where ICARUS had a stand. During the event RECETOX team illustrated the project and showed key finding from the sensor campaigns to broader public. Around 6,000 people participated in the event.

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- 36) ICARUS participated in the “7th international WeBIOPATR workshop & conference. Particulate Matter: Research and Management” on 2/10/2019 in Belgrade, Serbia where an oral presentation entitled “Validation Of Low-Cost Sensor Systems For Estimating An Individual’s Exposure To Particulate Matter” was given. You can find further information at [1](#), and [2](#).
- 37) The “C40 World Mayors Summit” has been held on 11th October 2019 in Copenhagen. The ICARUS team presented a work entitled “Cities: Drivers of Post-Carbon Transitions” and gave 3 ‘flash talks’ based on the poster. Flash talk, presentation of poster and discussion of ICARUS research and findings at the C40 side event. In addition, C40 participants, citizens and other stakeholders visited the ‘open air’ site created by ICARUS team. During the night, this event opened up to Copenhagen citizens at the Culture Night.
- 38) AUTH participated in the “Exposome Collaborative at Johns Hopkins University Launch Event” held on 08/11/2019 at Baltimore, USA and gave an oral presentation on the “Connectivity paradigm in unraveling the link between the exposome and health”. At the workshop ICARUS results and the climate exposome were presented and based on them, a comprehensive approach was developed for the development of innovative tools, integrated analysis and statistical modeling for further research. Link to the workshop is [here](#).
- 39) On behalf of ICARUS team USTUTT participated in the “3rd International Symposium: Environmental process engineering and technologies” on 8/11/2019 at VDI Haus Stuttgart GmbH, Stuttgart, Germany. USTUTT members gave an oral presentation entitled “Source Apportionment in 6 European cities” The symposium was aimed to find a coalition point for international speakers to share their experiences working and researching on environmental

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technologies in the fields of Solid Waste, and Waste Water Process Engineering along with Air Quality Control. Link to the presentation can be found [here](#).



- 40) To enhance networking with other projects funded under the same call The ICARUS team participated in the final event “*Improving the Smart Control of Air Pollution in Europe*” of the sister project iSCAPE in Dublin on 8 November 2019. During the event Dr. Gotti from Eucentre participated to the Panel discussion “*Passive Control Systems for Healthier Cities*” where experience from ICARUS were shared with the panelists and the audience.
- 41) The ICARUS team participated in the annual conference of the “*American Institute of Chemical Engineers 2019 (AIChE)*” held on 10-15/11/2019 in Orlando FL, USA, giving an oral presentation entitled “A Personal Exposure Agent Based Model (ABM) with the Capacity of Aggregation at Various Levels of Population Size. The AUTH team presented the developed ABM that integrates Socio-Economic Status (SES) indicators with the capacity for aggregation and analysis at various levels of population size, leading to an exposure assessment model especially useful for vulnerable groups of population, such as children, the elderly and people living in hot spot areas. The city scale ABM was developed for urban Thessaloniki, Greece. It was suggested that the proposed method can be used for evaluating the probable impacts of different public health policies prior to implementation reducing, therefore, the time and expense required to identify efficient measures. Link to this event can be found [here](#).
- 42) On behalf of ICARUS team, RECETOX provided an oral presentation at the IRAS, University of Utrecht, Netherland on 19/11/2019 at the Institute for Risk Assessment Sciences (IRAS) entitled “Overview of the ICARUS project”. State-of-the-art ICARUS results were shared and discussed with the audience.


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- 43) At the “2nd International REKLIM Conference”, held on 2 December 2019 in Berlin, Germany, the ICARUS team gave an oral presentation entitled “Extreme events of perceived temperature over Europe in the future: the humidity role”. ICARUS findings suggested to take into account adaptation strategies to heat stress conditions also over region never considered before. Link to this event is available [here](#).




- 44) ICARUS team participated in “American Geophysical Union (AGU) annual meeting” held on 11 Dec 2019 in San Francisco, USA to give an oral presentation entitled “Extreme events of perceived temperature over Europe in the future: the humidity role”. Future projections of extreme events of perceived temperature (considering both temperature and humidity) over

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Europe were presented. These look different from what we may expect for extreme events considering temperature only: northern regions will be subject to stress conditions more than what we may expect considering extreme temperature only. In addition to this, ICARUS findings suggested it is critical to take into account adaptation strategies to heat stress conditions also over region never considered before. Link to this event can be found [here](#).

- 45) On behalf of the ICARUS consortium the UNEXE team participated in the “*IAERE, Italian Association of Environmental and Resource Economists*” on 6-7 February 2020 in Brescia, Italy to provide an oral presentation entitled “Cost-Benefit Analysis of carbon mitigation measures in European cities: the importance of co-benefits”. In this event, valuable feedback from the audience on price of carbon and Value of a Statistical Life in different countries was received. [Link to the event](#)
- 46) Prof. Denis Sarigiannis made a presentation on TEDxAUTH’s pre-event called “Lungs” that was hosted in Thessaloniki on February 19th 2020. Prof. Sarigiannis spoke about how environmental pollution is affecting not only the planet’s “lungs”, but also our own. He also went on to explain that some small changes in our modern lifestyle could make a big difference and help us reduce our ecological footprint, thus promoting a healthier and greener way of life. [Link to the event](#).
- 47) The ICARUS team participated in the “*Sanidad Ambiental*” annual conference on 4th March 2020 at SESA (Spanish Society of Environmental Health) and gave an oral presentation entitled “Health impact assessment by the implementation of Madrid City air-quality plan in 2020” Link to the event can be found [here](#).
- 48) The ICARUS team participated in the “*UK Network for Environmental Economists*” event organized by the University of Exeter on 13th March 2020 (online) and gave an oral presentation entitled “Cost-Benefit Analysis of carbon mitigation measures in European cities: the importance of co-benefits”. [Link to event](#).
- 49) On 16-18 March 2020 the “*8th International Conference on Remote Sensing and Geo-information of Environment*” was held in Paphos, Cyprus. Within this event the ICARUS team gave a presentation entitled “ICARUS Decision Support System: Assisting Governance and Policy Making for Air Pollution Reduction and Climate Forcing in European Cities” where the ICARUS DSS functionalities were demonstrated and discussed. [Link to the event](#).
- 50) Within the “*12th Jožef Stefan international postgraduate school students’ conference*”, held on 15/5/2020 at Ljubljana, Slovenia (online), ICARUS team gave an oral presentation entitled “Uncertainty associated with assessing personal exposure to particulate matter with high temporal resolution using low-cost portable sensors”. Further information: [abstract](#), and [PPT](#).

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51) The ICARUS team widely participated in the “12th International air quality conference science and application” held in Thessaloniki. In order to support the global effort to minimise the risk from COVID-19 spreading further, the Conference has been organized in an online format in May 2020 ([Link to the event](#)). The ICARUS team gave the nine following oral presentations during the event:

- “PAHs in fine particulate matter of six European cities: seasonal and spatial variations and implications for human health”. In this presentation the spatial and seasonal variations of concentration levels of PAHs measured in six ICARUS cities together with their statistical analysis were showed to the audience.
- “Air pollution exposure management at the city level – the ICARUS approach” where the results of a city scale ABM developed and applied for the metropolitan area of Thessaloniki to evaluate the potential impacts of different public health policies prior to their implementation were provided.
- “Air pollution health impact assessment of five win-win policy solutions at the urban scale in the city of Milan” where results in terms of air quality improvement and benefit on human health brought by the potential implementation of five selected policy options as win-win solutions at the urban scale in the city of Milan were presented.
- “Source apportionment of Polycyclic Aromatic Hydrocarbons (PAHs) in aerosols and study of their effect in human health: a comparison between the warm and the cold season of the year” where the main sources emitting PAHs in the atmosphere of Thessaloniki were discussed together with the assessment of lung cancer induced by exposure to PAHs. In addition, the study examined the variation of emission sources and PAHs induced lung cancer risk throughout the seasons of the year.
- “Novel methodologies for climate change impact to urban air quality for European cities. The case of Thessaloniki” where the weather clustering results derived from the methodology developed in ICARUS which utilized existing fine scale EURO CORDEX Regional Climate Model (RCM) simulation data up to 2050, according to the RCP4.5.scenario, was presented
- “Sensor-based monitoring of Personal Exposure and indoor air pollutants in Madrid (Spain)”. In this presentation the use personal sensors for the measurement of individual and real exposure to PM10 and PM2.5 was showed. A common agreement was that use of low-cost sensor/personal monitors could open up a new approach to monitor personal exposure to ambient air pollutants.
- “PM2.5 Source Apportionment in 6 European Cities: The ICARUS Project” where data collected in the frame of the ICARUS field campaign on source apportionment along with key results from statistical data analysis were presented.
- “Cost-Benefit Analysis of carbon mitigation measures in European cities: the importance of co-benefits”. Following this presentation, participants showed particular interest in the Athens case study and promotion of electric vehicles in Athens.
- “Lifelong exposure to PM2.5 and NO2 and resulting health effects for population subgroups in Europe”. This presentation was on the methodology to assess lifelong exposure to air pollution and respective health outcomes.

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52) University of Aarhus team participated in the online seminar - “*CMCC webinar: Planning a sustainable city: strategies and tools - CMCC Series on Urban Adaptation*” on 28th May 2020 and gave oral presentation entitled “Climate change at a cross-road: Nature Based Solutions and urban sustainable transitions”. The seminar was focused on governance of cities in the transition to sustainable, healthy and clean, post-carbon cities. ICARUS findings on the use of visions in local governance were addressed in examination of the role of urban nature. At the seminar, the audience was comprised of researchers and urban policy makers and planners, who participated in questions and debates following the presentation. The awareness of climate change, air quality issues, and healthy and equitable inclusive cities was raised among the participants, where a number subsequently contacted the ICARUS presenter for more details.


2.2 ICARUS Final Conference

The final ICARUS conference entitled “Climate change mitigation and air pollution abatement – towards win-win solutions” will be organized in the frame of the 20th MESAEP International Symposium on 26-27 October 2020 in a telematics format.

The ICARUS special session will include several oral and poster presentations on the key results obtained during the project addressing the different facets composing the integrated assessment of policies covering the continuum from emission to cost-benefit analysis.


The objective of the ICARUS special session will be to provide a forum for interested stakeholders in the field of the environmental sciences carrying out research related to chemical contamination and the other sources of pollution in urban settings, and also those in economics and politics. At the moment of writing this report, we are finalizing the scientific program of the ICARUS session which will include the following presentations:

- Fine particulate matter chemical composition and sources in 6 European cities: the ICARUS project.
- Transition to Climate Friendly and Unpolluted Cities until 2050.
- Uncertainty associated with assessing personal exposure to particulate matter with high temporal resolution using low-cost portable sensors.
- Cost-benefit analysis of carbon mitigation measures in European cities: the importance of co-benefits.
- Development of an integral modeling system to study air quality climatic trends in European urban areas.
- Multi-sensor data collection for personal exposure monitoring: ICARUS experience.
- Air pollution health impact assessment and cost-benefit analysis of win-win policy solutions at the urban scale in the city of Milan.
- Integrated Assessment of Policy Scenarios for Air Pollution Control and Greenhouse Gas Emission Reduction in the City of Stuttgart.
- Air quality and health risk assessment (HRA) around the Valdeingómez Environmental Complex located in Madrid.
- Future trends on green and healthy cities. The Madrid (Spain) case.

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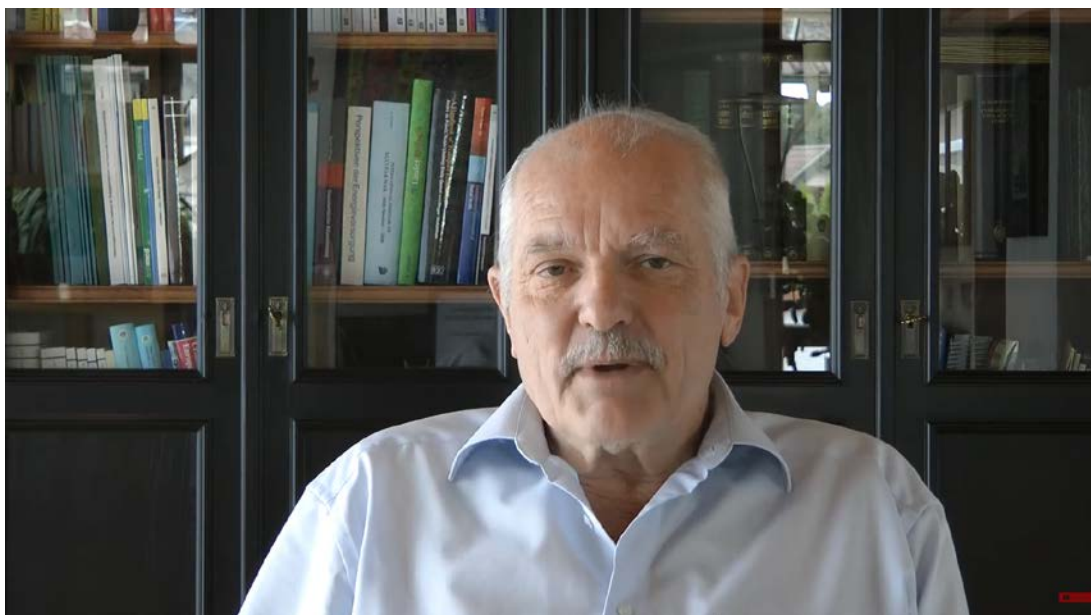
- PAHs in fine particulate matter of six European cities: seasonal and spatial variations and implications for human health.
- NPAHs and OPAHs in the atmosphere of two central European cities: seasonality, urban-to-background gradients and gas-to-particle partitioning.
- Integrated exposure modelling for cadmium.
- Exposure modelling and risk assessment of endocrine disrupting chemicals.
- Exposure modelling assessment for flame retardants.
- Determining the Spatial Effects of Climate Change in Urban Areas .
- Personal exposure to air pollution: the Milan sensor campaign in ICARUS project.

The final program together with full details of the event including the main outcomes and key messages will be included in the ICARUS Final report.

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2.3 Radio Programs/Radio broadcasting/Podcast/TV Interviews

- 1) The ICARUS team published a video on [the ICARUS YouTube channel](#) where Prof. R. Friedrich from University of Stuttgart reported the ICARUS methodology and main findings. [Link](#) to the video.



- 2) Mr. Georgios Sarigiannis from UPCOM discusses the RQuality mobile app developed within the ICARUS project. The app enables users to monitor their steps towards embracing a more environmental friendly lifestyle. Thanks to the RQuality app users are able to check air-quality metrics of CO₂, NO₂ and O₃ in real-time and calculate your eco-footprint according to their consumption patterns and lifestyle. The video has been posted on the [ICARUS YouTube channel](#).



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- 3) Tim Taylor and Anna Maccagnan (Univ. of Exeter) shared a Podcast entitled “*Results from a cost-benefit analysis of air quality measures in European cities*” where they discussed the main results and key messages of the Cost-Benefit Analysis carried out to examine carbon mitigation and air quality measures in the ICARUS cities. You can find the podcast on the [ICARUS YouTube channel](#).




Results from a cost-benefit analysis of air quality measures in European cities



- 4) Professor D. Sarigiannis (AUTH) gave video interview to “*Καθημερινά και απλά*”, EPT3 TV on 18/04/2018. Professor Sarigiannis talked about Climate Change and the national need for green growth in Greece. Information about ICARUS project and its results has been shared and discussed in detail. Link to this interview can be found [here](#).



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- 5) To promote the work and results obtained, the ICARUS team participated in the “Roskilde Music Festival” on 4 -7 July 2018. During the event the Aarhus team carried out several interviews with citizens of Roskilde and visitors gathering information on their travel patterns and lifestyle and to sensitize them on the role and the impacts of air pollution and climate change in urban areas.

The engagement with the Roskilde Festival has produced data on perceptions and behavioral choices related to air pollution, climate and health among music festival participants and businesses. These engagements centered on investigating how cultural events can stimulate a reflection and behavioral changes towards sustainable cities among participants and business. The management of the Roskilde Festival was very interested in the results and invited for further interaction in the perspective of qualifying the Festival’s sustainability efforts and objectives. Unfortunately the COVID-19 epidemic has put the breaks on this.

- 6) Prof. Sarigiannis (AUTH) gave a TV interview on 16/7/2019 at the Vergina TV. The interview was conducted on the occasion of the ongoing study carried out by the Laboratory of Environmental Engineering of AUTH in the framework of the ICARUS project. Prof. Sarigiannis talked illustrated the objectives of the campaigns and provided some insights of first results.



- 7) In November 2018 the Department for City Culture and Environment of Roskilde organized “Radio broadcasting event” on local radio studio. ICARUS team participated with an audio interview entitled “Post carbon and green city visions in City of Roskilde”. ICARUS member shared a) in-depth knowledge on procedures and 1st and 2nd generation Roskilde Post-Carbon vision, b) policy making procedures for cross sectors, c) public administration awareness of AQ and CC actions based on ICARUS work.
- 8) The Czech Radio Broadcast (CRB) organized a radio broadcasting event on 25/1/2019 at “Czech Radio Broadcast studio”. RECETOX team participated in this event and gave an audio interview entitled “Research at RECETOX” where an overview of the current state of the ICARUS project was given and invitation for the potential participants to sensor campaign were distributed.


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This program had National impact and gave rise opportunity for new volunteers to sign-up for the ICARUS sensor campaign. Link to the event can be found [here](#).

- 9) ICARUS team wrote an article entitled “Science Takeover: A day at the Swiss TPH” for “*Higgs online magazine*” on 6th March 2019. The magazine appreciated ICARUS project for its field study (i.e. collection of the data from sensor campaign) and decided to highlight the video on HIGGS’ Instagram page. Link to this video is [here](#).



- 10) On 12th of October 2019, the ICARUS team participated in radio program conducted at “*Danish National Radio*” and gave an audio interview on the “Cities as drivers in managing the climate and sustainability challenge”, followed by an in-depth discussion with IPCC Climate scientist, Mayor of Roskilde Thomas Breddam. During the debate, the ICARUS participant raised awareness and discussion on the links between air pollution, citizens health and wellbeing, climate change, social equality, future cities and the politics and governance of European cities in a present and future perspective. Increasingly, public and political attention is turned towards a more detailed understanding of systemic interaction between the major urban challenges and cities’ capacities to take the necessary actions more rapidly on these issues. Visions and the position of inclusive and healthy cities were drawn into the discussions, also assisted by recognition by other panelists (i.e. mayor of Roskilde and climate scientists).


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- 11) The Aarhus team members participated in a local radio studio program on January 2020 and gave an audio interview on *"Climate change and AQ policies in City of Roskilde"*, followed by the discussion with local policy makers.
- 12) The ICARUS team participated in the Radio/Podcast event - *"Podcast investigating future transport scenarios"* which was organized by ZVW on 13/01/2020 (online) and gave an audio interview entitled *"Verkehr der Zukunft: So werden wir fahren (Future mobility: That's how we will drive)"*. The number of cars needed can be reduced by far if private cars were abandoned and carsharing/ridesharing is offered instead, has been discussed as potential future transport scenarios. Link to this event is [here](#).
- 13) The ICARUS team participated in an online event - *"O2 Virtual coffee break"* which was part of *"Weekly peer-to-peer virtual"* presentation on 15/09/2020 at Department of Environmental Sciences of JSI. During the event JSI staff gave a video presentation entitled *"Modeling an individual's intake dose of particulate matter using novel sensing technologies"*.

2.4 Scientific publications


All research partners of the ICARUS consortium have been contributing to disseminate the results via publications in peer-reviewed scientific journals. Because of the wide scope and multidisciplinary nature of the project, publications were on purpose targeting different journals in order to access different audiences.

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ICARUS takes part in the Pilot on Open Research Data in Horizon 2020 following the European Commission strategy to make sure open access to research results from projects funded by Horizon 2020. Partners are choosing either a “green” or a “gold” open access model for scientific and technical publications, making its outcomes available for access in the project website, without having to consider Intellectual Property Rights or copyright. To comply with the Guidelines to the Rules on Open Access to Scientific Publications and Open Access to Research Data in Horizon 2020 a scientific repository has been created in Zenodo. You can access the ICARUS paper repository [here](#).

The following peer-reviewed publications and book chapters have been published in the period covered by this report.

1. Chapizanis, D., Karakitsios, S., Gotti, A., Sarigiannis, D. “Assessing personal exposure using Agent Based Modelling informed by sensors technology”. Environmental Research, 192 (2021) 110141 <https://doi.org/10.1016/j.envres.2020.110141>
2. Saraga, D., Maggos, T., Degrendele, C., Klánová, J., Horvat, M., Kocman, D., Kanduč, T., Garcia, S., Peteira, R. F., Gómez, P. M., Manousakas, M., Bairachtari, K., Eleftheriadis, K., Kermenidou, M., Karakitsios, S., Gotti, A., Sarigiannis, D. “Multi-city comparative PM_{2.5} source apportionment for fifteen sites in Europe: The ICARUS project”. Science of The Total Environment (2020) 141855 <https://doi.org/10.1016/j.scitotenv.2020.141855>
3. Izquierdo, R., García Dos Santos, S., Borge, R., Paz, D.D.L., Sarigiannis, D., Gotti, A., Boldo, E. “Health impact assessment by the implementation of Madrid City air-quality plan in 2020”. Environmental Research (2020) 183 <https://doi.org/10.1016/j.envres.2019.109021>
4. Li, N., Friedrich, R., “Methodology for Estimating the Lifelong Exposure to PM_{2.5} and NO₂—The Application to European Population Subgroups”. Atmosphere 2019, 10(9), 507 <https://doi.org/10.3390/atmos10090507>
5. McLagan D., Wohlgemuth L., Flückiger B., Vienneau D. “Concurrently Measured Concentrations of Atmospheric Mercury in Indoor (household) and Outdoor Air of Basel, Switzerland”. Environmental Science & Technology Letters, 2020 7 (4), 234-239 <https://dx.doi.org/10.1021/acs.estlett.0c00110>
6. Sarigiannis, D.A., Kontoroupi, P., Nikolaki, S., Gotti, A., Chapizanis, D., Karakitsios, S. “Benefits on public health from transport-related greenhouse gas mitigation policies in Southeastern European cities”. Science of the Total Environment (2017) 579: 1427-1438.
7. Novak, R., Kocman, D., Robinson, J.A., Kanduč, T., Sarigiannis, D., Horvat, M. “Comparing airborne particulate matter intake dose assessment models using low-cost portable sensor data”. Sensors (Switzerland) (2020) 20 (5), <https://doi.org/10.3390/s20051406>
8. E. Richter, M. Friedrich, A. Migl and J. Hartleb, "Integrating ridesharing services with automated vehicles into macroscopic travel demand models," 2019 6th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), Cracow, Poland, 2019, pp. 1-8, <https://doi.org/10.1109/MTITS.2019.8883315>
9. Life cycle assessment of municipal waste management options (Environmental Research (2020), accepted, in press).
10. Refining PM exposure using low-cost portable sensor data and human respiratory tract deposition modelling (Journal of Exposure Science and Environmental Epidemiology (2020), accepted, in press).

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Monographs - Books - Book chapters

In addition, the work carried out in ICARUS contributed in drafting the following book chapters:

11. Sarigiannis, D.A. *"The exposome paradigm in environmental health"*. Chapter in: Environmental exposures and human health challenges. Paradopoulou, P., Marouli, C., Misseyanni, A. (eds.), IGI Global (2019).
12. Sarigiannis, D.A., Gotti, A., Karakitsios, S.P. *"The waste-energy-health nexus: the social (in)justice dimension"*. Chapter in: Environmental exposures and human health challenges. Paradopoulou, P., Marouli, C., Misseyanni, A. (eds.), IGI Global (2019).
13. Sarigiannis, D.A., Gotti, A., Karakitsios, S.P. *"Indoor air and public health"*. Chapter in: Management of emerging public health issues and risks. Roig, B., Weiss, K., Thireau, V. (eds.), Academic Press (2019).

All the above publications complemented the scientific publications enlisted in the previous report covering the period from the beginning of the project up to September 2018, namely:

1. Taylor, T., Mackie, P. (2017) Carbon footprinting in health systems: One small step towards planetary health. *Lancet Planetary Health* Vol 1, Issue 9, PE357-E358, December 01 2017. [https://doi.org/10.1016/S2542-5196\(17\)30158-4](https://doi.org/10.1016/S2542-5196(17)30158-4).
2. Scoccimarro E., Fogli P.G., Gualdi S. The role of humidity in determining scenarios of perceived temperature extremes in Europe. *Environ. Res. Lett.* 12 (2017) 114029. <https://doi.org/10.1088/1748-9326/aa8cdd>.
3. Juan Antonio Ortega-García, Lydia Tellerías, Josep Ferrís-Tortajada, Elena Boldo, Ferran Campillo-López, Peter van den Hazel, Sandra Cortes-Arancibia, Rebeca Ramis, Marisa Gaioli, Rebeca Monroy-Torres, Constanza Farias-Guardia, Mirta Borrás, Karla Yohannessen, Marcelino García-Noriega-Fernández, Alberto Cárceles-Álvarez, Diana Carolina Jaimes-Vega, Marcia Cordero-Rizo, Fernando López-Hernández, Luz Claudio. Threats, challenges and opportunities for paediatric environmental health in Europe, Latin America and the Caribbean, *PAnnals of Pediatrics*, Volume 90, Issue 2, February 2019, Pages 124.e1-124.e11 <https://doi.org/10.1016/j.anpede.2018.11.008>
4. Hiscock, R., Asikainen, A., Tuomisto, J., Jantunen, M., Pärjälä, E., Sabel, C.E. City scale climate change policies: Do they matter for wellbeing? *Preventive Medicine Reports*, Volume 6, 1 June 2017, Pages 265-270. <https://doi.org/10.1088/1748-9326/aa8cdd>
5. R. Franco Peteira, P Morillo, A. Aguilar, M.C. Torres, S. García, Dos Santos, T. Maggos, T. Kanduč, D. Kocman, C. Degrendele and S. Karakitsios The organic carbon (OC) and elemental (EC) in 5 European cities. The ICARUS experience. *Proceeding of the 40th International Conference on Environmental and Food measurements (ISEAK 40)*, 19-21 June 2018, Santiago Compostela (Spain).
6. Rebeca Izquierdo, Rebeca Ramis, Rosalía Franco, Julio A. Soria-Lara, Denis Sarigiannis, Alberto Gotti, Saul García Dos Santos-Alves and Elena Boldo. ICARUS project: Integrated Climate Forcing and Air Pollution Reduction in Urban Systems. *Proceeding of the XXXVI Annual scientific meeting of the Spanish Society of Epidemiology*, 11-14 September 2018, Lisbon (Portugal).
7. Kocman, David, Kanduč, Tjaša, Kontić, Davor, Robinson, Johanna A., Lojen, Sonja, Snoj Tratnik, Janja, Mazej, Darja, Horvat, Milena, Towards an active citizenship in a modern urban

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environment. Proceeding of the International Conference Sport and Public Space, 20-23 September 2018, Ljubljana (Slovenia).


8. Kanduč, Tjaša, Kontić Davor, Snoj Tratnik Janja, Kocman David, Robinson J.A. Integrated climate forcing and air pollution reduction in urban systems (ICARUS): Ljubljana case study. 5th Slovenian Geological congress, 3–5 October 2018, Velenje (Slovenia).
9. Scoccimarro E., Fogli P.G., Gualdi S. Extreme events of perceived temperature over Europe in the future: the humidity role. ECCS&I Symposium proceedings. Belgrade Academy of sciences, Belgrade, 2017
10. Th. Maggos, Th. Soulos, M. Lenarčič, D. Kocman, T. Kanduč, P. Panagopoulos, H. Flocas, Ch. Vasilakos, A. Gotti, S. Karakitsios, D. Sarigiannis. GHGs and AQ measurements over European cities using aerial and ground platforms as part of the ICARUS air pollution and climate change mitigation strategy. Proceeding of International Conference - Climate Change 2018 in the Mediterranean & Middle East: Challenges and Solutions, 18-19 May 2018, Nicosia (Cyprus).
11. Ondřej Mikeš; Céline Degrendele; Roman Prokeš; Ondřej Sáňka; Adéla Holubová Šmejkalová; Pavel Čupr; Gerhard Lammel; Jana Klánová. Integrated climate forcing and air pollution reduction in urban systems (ICARUS): project overview and objectives. Proceeding of Air 2017 Conference, 10-12 April 2017, Brno (Czech Republic).

You can access all the ICARUS publication [here](#).

At the time of writing this report, in addition to the above publications several other peer-reviewed papers have been either already submitted or are being finalized. ICARUS partners will continue to publish the results of project in peer-reviewed journals even after the formal end of the project.

A preliminary list of these includes (titles may not be final):


1. Influence of four policy measures on the emissions of atmospheric pollutants and greenhouse gases for the city of Brno, Czech Republic (submitted to Journal Environment, Development and Sustainability in August 2020)
2. Visions of European cities: Critical decisions, creative engagement and transitions in envisioning future city space (submitted to Journal of Social and Cultural Geography in September 2020)
3. The economics of city level carbon mitigation and air pollution co-benefits in European cities (submitted in October 2020)
4. Sources of polycyclic aromatic hydrocarbons (PAHs) in aerosols and the study of their effect on human health: a comparison between warm and cold seasons
5. Methodology for estimating individual exposure using new sensing technologies: experience from multi-sensor personal exposure monitoring campaigns in seven ICARUS cities
6. Harmonization and visualization of data from a multi-sensor personal exposure campaign
7. User-centered design of a final report for participants in multi-sensor personal exposure monitoring campaigns
8. Complex activity recognition using portable PM and ambient sensors with activity tracker data

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9. Participant experience in an multi-sensor personal air quality exposure study: a qualitative assessment
10. PAHs in fine particulate matter of six European cities: seasonal and spatial variations and implications for human health
11. NPAHs and OPAHs in the atmosphere of two central European cities: seasonality, urban-to-background gradients and gas-to-particle partitioning
12. Levels and profiles of PCBs and OCPs in silicone wristbands worn by Brno participants: importance of residential exposure
13. The influence of organic carbon (OC) and elemental carbon (EC) in the urban air quality of 5 European cities, the ICARUS experience
14. Personal exposure to PM particles using low-cost sensors and its combination with stationary system of monitoring and personal behavior
15. Personal exposure assessment from the sensor campaign from all cities
16. Comparison of health impact assessment for BAU and the policy scenarios in the ICARUS cities
17. Scenarios for Sustainable Urban transport futures: Climate, air pollution, health and social inclusion in European cities
18. Citizen preferences in Roskilde on outside leisure activities, air pollution and travel patterns
19. Mobility patterns, social inequality and health in Roskilde
20. Sustainability and culture: moving towards clean post carbon cities with music festivals and Viking heritage
21. Agent-based modelling approach to estimate air pollution exposure among different sociodemographic groups
22. Going "safe": Map-based online surveys to study perceived safety from contagion risk in Denmark after the re-open policy
23. A Novel Approach For Air Quality Trend Studies And Its Application To European Urban Environments
24. GHGs and AQ measurements over European cities using aerial and ground platforms

Finally, several abstracts have been submitted by ICARUS partners for the ICARUS final Conference which will be held virtually within the 20th MESAEP Symposium on October 26-27, 2020. These includes:

1. Rainer Friedrich, Julia Neuhäuser, Emely Richter, Manfred Wacker. Transition to Climate Friendly and Unpolluted Cities until 2050
2. Rok Novak, David Kocman, Tjaša Kanduč, Milena Horvat, Johanna Amalia Robinson, Dimosthenis Sarigiannis. Uncertainty associated with assessing personal exposure to particulate matter with high temporal resolution using low-cost portable sensors
3. Tim Taylor, Anna Maccagnan, Denis Sarigiannis, Alberto Gotti, Julia Neuhäuser, Danielle Vienneau, Jan Harnych, Céline Degrendele, Anastasia Gkika, John Bartzis, Davor Kontić, et al. Cost-benefit analysis of carbon mitigation measures in European cities: the importance of co-benefits

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4. John G. Bartzis, Ioannis A. Sakellaris, Thalia A. Xenofontos, Vasilis Balafas, Julia Neuhäuser, Friedrich Rainer, Alberto Gotti, Dimosthenis A. Sarigiannis. Development of an integral modeling system to study air quality climatic trends in European urban areas
5. David Kocman, Tjaša Kanduč, Ondrej Mikeš, Celine Degrendele, Danielle Vienneau, Benjamin Flückige, Alberto Gotti, Marco G. Persico, Saul Dos Santos, Thomas Magos, Dimitris Chapizanis, Denis Sarigiannis. Multi-sensor data collection for personal exposure monitoring: ICARUS experience
6. Marco Giovanni Persico, Alberto Gotti, Francesca Bugnoni, Jaideep Visave, Spyros Karakitsios, Ioannis Sakellaris, John Bartzis, Julia Neuhaeuser, Rainer Friedrich, Anna Maccagnan, Tim Taylor, Dimosthenis Sarigiannis. Air pollution health impact assessment and cost-benefit analysis of win-win policy solutions at the urban scale in the city of Milan
7. Julia Neuhäuser, Rainer Friedrich Integrated Assessment of Policy Scenarios for Air Pollution Control and Greenhouse Gas Emission Reduction in the City of Stuttgart
8. Dikaia Saraga, Thomas Maggos, Kyriaki Bairachtari, Maria Dasopoulou, Celine Degrendele, Jana Klanova, David Kocman, Tjasa Kanduč, Saul Garcia, Miriam Chacón Mateos, Alberto Gotti, Dimosthenis Sarigiannis. Fine particulate matter chemical composition and sources in 6 European cities: the ICARUS project.
9. Céline Degrendele, Jana Klánová, Petr Kukučka, Gerhard Lammel, Thomas Maggos, Spyros Karakitsios, Marianthi Kermenidou, Tjasa Kanduč, Devid Kocman, Pilar M Gómez, David G Madruga, Saul G Dos Santos. PAHS in fine particulate matter of six European cities: seasonal and spatial variations and implications for human health
10. Céline Degrendele, Gerhard Lammel, Roman Prokeš, Ondřej Saňka, Adéla Holubová Šmejkalová, Adriana Husárová, Ondřej Mikeš, Petr Kukučka, Tjasa Kanduč, David Kocman, Thomas Maggos, Denis Sarigiannis. NPAHs and OPAHs in the atmosphere of two central European cities: seasonality, urban-to-background gradients and gas-to-particle partitioning
11. Dimosthenis Sarigiannis, Spyros Karakitsios, Dimitris Chapizanis, Ioannis Petridis. PM exposure using portable sensor data and human respiratory tract deposition modelling
12. Beatriz Nunez Corcuera, Elena Boldo, Rebeca Izquierdo, Rosalia Franco Peteira, Saul Garcia Dos Santos, Pilar Morillo Gómez, Alberto Gotti, Denis Sarigiannis, Julio A Soria Lara. Future trends on green and healthy cities. The Madrid (Spain) case
13. Dimosthenis Sarigiannis, Spyros Karakitsios, Ioannis Petridis. Integrated exposure modelling for cadmium
14. Dimosthenis Sarigiannis, Spyros Karakitsios, Ioannis Petridis, Achilleas Karakoltzidis. Exposure modelling and risk assessment of endocrine disrupting chemicals
15. Dimosthenis Sarigiannis, Spyros Karakitsios, Ioannis Petridis, Achilleas Karakoltzidis. Exposure modelling assessment for flame retardants
16. Marianthi Kermenidou, Christodoulos Hondrogiorgis, Spyros Karakitsios, Dimosthenis Sarigiannis. Source apportionment of polycyclic aromatic hydrocarbons (PAHs) in aerosols and study of their effect in human health: A comparison between the warm and the cold season the year

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Full papers for publication in special issues of the Fresenius Environmental Bulletin, the International Journal for Environment and Public Health, Environmental Research or Toxicology Reports will be submitted by December 31, 2020 after peer-review.

2.5 Articles in magazine/blogs/Press releases


- 1) On 8th February 2019, ADDMA published one press release in a local newspaper where the information about the ICARUS workshop on “Trends and Challenges for Smart, Green and Healthy Cities 2050” was shared. The link to press release is [here](#).



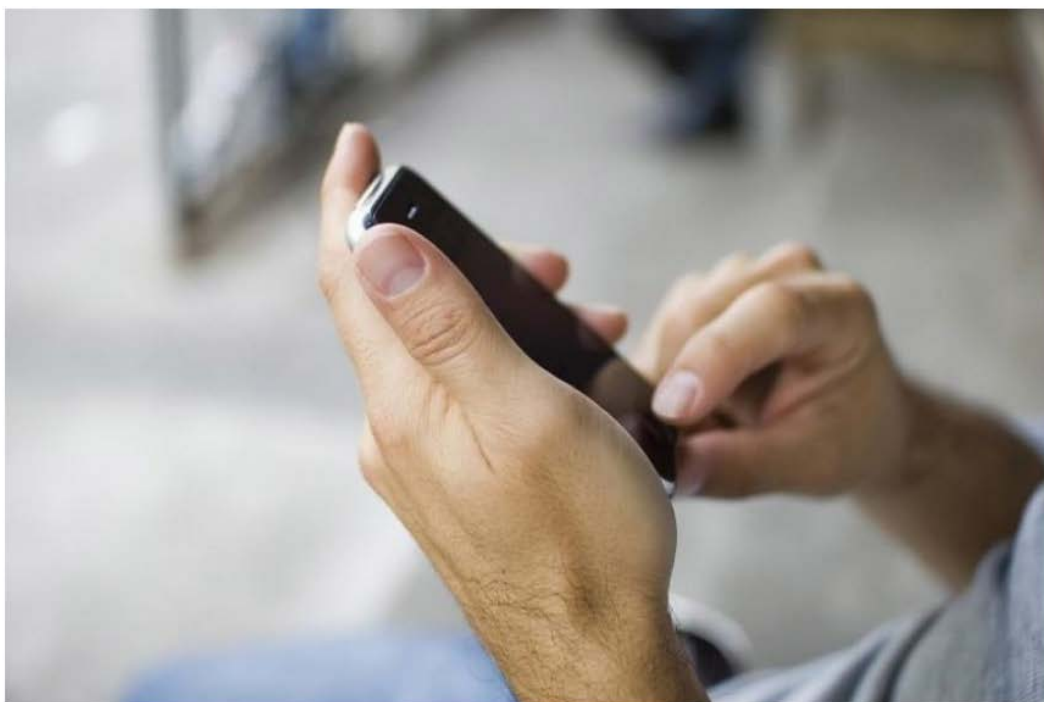
- 1) Municipality of Athens published an article entitled "*Trends and Challenges for Smart, Green and Healthy Cities 2050*" on a local newspaper was published on 26/02/2019. Link to this news is [here](#).
- 2) On behalf of ICARUS team, the Office of Resilience and Sustainability (ADDMA/ORS)/City of Athens published a press release on 7/4/2019 and promoted materials for Athens Sensor Campaign. Dissemination on social media of #AthensSensorCampaign. Link is [here](#).
- 3) The RECETOX team participated on July 2019 in the "*Intra-department communication*" publishing an article in the RECETOX Newsletter about "*Personal campaign and meeting with stakeholders*" where an overview of the ICARUS results were shared. This communication was aimed at enhancing public awareness on the ICARUS project. Link to the newsletter can be found [here](#).
- 4) In the online magazine "Thinkfree.gr", the AUTH team published on 13/9/2019 a press release "*Innovative Technological Tools Fight Climate Change*" (*Καινοτόμα Τεχνολογικά Εργαλεία καταπολεμούν την κλιματική αλλαγή*). The press release discusses climate change in the context of the Greenwave Festival, where the goals of the ICARUS project were reported. The link to this article can be found [here](#).
- 5) THE ISCIII team published two articles in the local news web -"*News of ISCIII web*":

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- “Así investiga el ISCIII la relación entre cambio climático y salud” on 13/12/2019. Link is [here](#).
 - “Las medidas de control de la calidad del aire reducen la mortalidad prematura” on 12/02/2020. In this article the results of Plan A control of Madrid air quality were published. The link can be found [here](#).
- 6) On behalf of ICARUS team, AUTH (Envelab) published an article entitled “Aristotle University of Thessaloniki applications measure how much pollution we receive daily (Εφαρμογές του ΑΠΘ μετρούν πόση ρύπανση δεχόμαστε καθημερινά)” in the online magazine “Onairnews.gr” on 23/01/2020. Link to this articles is [here](#).
 - 7) AUTH published an article entitled “AUTH: Our mobile phone will measure the air pollution we receive (ΑΠΘ: Το κινητό μας θα μετρά την ατμοσφαιρική ρύπανση που δεχόμαστε!)” in the “Μακεδονία-Newspaper” on 23/1/2020. Link is [here](#).
 - 8) On the local newspaper “Η Προοδος-Newspaper” of 23/01/2020, the AUTH team wrote an article entitled “Application Developed By Auth Measures The Pollution We Receive Daily (Εφαρμογή Που Ανεπτυξε Το Απθ Μετράει Την Ρυπανση Που Δεχομαστε Καθημερινα)”. The link to this article can be found [here](#).
 - 9) In the online magazine “Greenagenda.gr”, the AUTH team published an article on the ICARUS mobile app entitled “Application of AUTH on mobile phones will measure how much pollution we receive every day (Εφαρμογή Του Απθ Στα Κινητα Θα Μετρα Ποση Ρυπανση Δεχομαστε Καθημερινα)” on 23/01/2020. The link to this article can be found [here](#).
 - 10) In the online magazine “Greenagenda.gr”, the AUTH team published an article on the ICARUS mobile app entitled “Application of AUTH on mobile phones will measure how much pollution we receive every day (Εφαρμογή Του Απθ Στα Κινητα Θα Μετρα Ποση Ρυπανση Δεχομαστε Καθημερινα)” on 23/01/2020. The link to this article can be found [here](#).
 - 11) The AUTH team published on 23/1/2020 an article on the online magazine “Voria.gr” entitled “The researchers of the Laboratory of Environmental Engineering of AUTH are in the last stage of the application for the measurement of the exposure to pollutants (Οι ερευνητές του Εργαστηρίου Περιβαλλοντικής Μηχανικής του ΑΠΘ βρίσκονται στο τελευταίο στάδιο της εφαρμογής για τη μέτρηση της έκθεσης σε ρύπους). You can find the article at this [link](#).
 - 12) In the online magazine “Thestival.gr”, the AUTH team published an article on the ICARUS mobile app entitled “The measurement of air pollution that we receive, with the application of AUTH, on our mobile phone! (Η μέτρηση της ατμοσφαιρικής ρύπανσης που δεχόμαστε, με εφαρμογή του ΑΠΘ, στο κινητό μας!)” on 22/01/2020. The link to this article can be found [here](#).

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Η μέτρηση της ατμοσφαιρικής ρύπανσης που δεχόμαστε, με εφαρμογή του ΑΠΘ, στο κινητό μας!



🕒 22/01/2020 22:00 | ✍️ ΜΑΓΔΑ ΠΕΤΡΟΠΟΥΛΟΥ

 Οι ερευνητές του Εργαστηρίου Περιβαλλοντικής Μηχανικής του ΑΠΘ (ENVELAB) στο πλαίσιο του προγράμματος ICARUS, με επικεφαλής τον καθηγητή Περιβαλλοντικής Μηχανικής στο Τμήμα Χημικών Μηχανικών του ΑΠΘ, Δημοσθένη Σαρηγιάννη ετοιμάζουν εφαρμογές για τα κινητά, έξυπνες συσκευές, οι οποίες ειδοποιούν τον κάθε χρήστη ξεχωριστά για τα επίπεδα των ρύπων στην περιοχή που βρίσκεται, αλλά και σε αυτήν που θέλει να μετακινηθεί.

- 13) The AUTH team wrote a further article on the ICARUS mobile app entitled “*Aristotle University of Thessaloniki applications measure how much pollution we receive daily* (Εφαρμογές του ΑΠΘ μετρούν πόση ρύπανση δεχόμαστε καθημερινά)” on the newspaper ‘Metro News-Newspaper’ on 24/1/2020. Link is [here](#).
- 14) The ICARUS project and its mobile app were presented in the *Thessaloniki Free Press* on 05/03/2020. Link to the article is [here](#).

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15) The AUTH team published an article on 15/3/2020 on the online magazine “Politismika .gr” entitled: *Innovative applications that change our habits. The achievements of the Icarus program (Καινοτόμες εφαρμογές που αλλάζουν τις συνήθειες μας. Τα επιτεύγματα του προγράμματος ICARUS)* where Prof. Sarigiannis provided information on the ICARUS sensor campaign carried out in Thessaloniki pointing out how these smart applications not only can inform users individually about their exposure levels but also can inform and raise awareness among citizens on what behaviors can reduce their exposure. The link to this article can be found [here](#).

16) The AUTH team published on 5/6/2020 an article on the online magazine “Voria.gr” entitled *“The Metro will save 150 million in the National Health System (Το Μετρό θα εξοικονομήσει 150 εκατομμύρια στο Εθνικό Σύστημα Υγείας)”* The link to this article can be found [here](#).

17) On the same subject AUTH published other three articles on 6/6/2020 respectively entitled *“Reduction of pollution and profit of 150 million euros from the Thessaloniki Metro (Μείωση της ρύπανσης και κέρδος 150 εκ ευρώ από το Μετρό Θεσσαλονίκης)”* in the online magazine “Typosthes.gr” Link is [here](#). *The operation of the Thessaloniki Metro can save 150 million euros in the Public Health System (Η λειτουργία του Μετρό Θεσσαλονίκης δύναται να εξοικονομήσει 150 εκατομμύρια ευρώ στο Δημόσιο Σύστημα Υγείας)”* in the magazine ‘michanikos-online.gr’ and in the blogspot “sidirodromikanea.blogspot.co”” Link and [here](#).

The articles refer to the benefits that the construction of the metro of the city and its use by the residents will give to the society of Thessaloniki as results of the ICARUS work. References were also made to the creation of a Center for the Prevention of Environmental Problems and Extreme Phenomena.


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The ICARUS work on the association between air quality and the COVID-19 pandemic resulted in the following articles published in various Greek magazines:

- 18) The AUTH team published on 5/6/2020 an article in the magazine “Thinkfree.gr” on the association between air pollution and the COVID-19 pandemic entitled “*Pollution makes us more vulnerable to viruses and pandemics New data* (Η ρύπανση μας κάνει πιο ευάλωτους σε ιούς και πανδημίες Νέα στοιχεία)”. The link to the article is [here](#).
- 19) On 5/6/2020 The AUTH team published two articles in the online magazines “Epixeiro.gr” and “latronet.gr” entitled “*Need for a comprehensive response to environmental health risks* (Ανάγκη μιας ολοκληρωμένης αντιμετώπισης των περιβαλλοντικών κινδύνων στην υγεία)”. The link to these articles can be found respectively [here](#) and [here](#).




- 20) AUTH team published an article entitled “*Rising pollution makes us vulnerable to pandemics, according to a new study* (Η αύξηση της ρύπανσης μας κάνει τρωτούς στις πανδημίες σύμφωνα με νέα μελέτη)” on 5/6/2020 in the online magazines “Energypress.gr” and “Thesstoday.gr”. The links can be found respectively [here](#) and [here](#).
- 21) In the online magazine “Boreiosellas.gr”, the AUTH team published on 5/6/2020 an article entitled “*Thessaloniki would have 4-5% fewer deaths with the Metro-Pollution and risks for COVID* (Η Θεσσαλονίκη θα είχε λιγότερους θανάτους 4-5% με το Μετρό-Ρύπανση και κίνδυνοι για COVID)” The link to this article can be found [here](#).

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- 22) On 6/6/2020 AUTH published an article in the online magazine 'Avatonpress.gr' entitled "*Pollution makes us more vulnerable (Η ρύπανση μας κάνει πιο ευάλωτους)*". The link to the article is [here](#).
- 23) ICARUS team published on 7/6/2020 an article entitled "*Pollution levels increased in Athens and Thessaloniki after the removal of the lockdown*" (Δ.Σαρηγιάννης: «Αυξήθηκαν τα επίπεδα ρύπανσης σε Αθήνα και Θεσσαλονίκη μετά την άρση του lockdown») in the online magazine 'thesseconomy.gr'. Prof. Sarigiannis explained the results of the large-scale experiment that was the lockdown for Greek cities which demonstrated the importance of urban transport in the environmental burden on public health. He pointed out that the electrification of transport in cities is an important opportunity to reduce the environmental impact on the health of residents. Link to article is [here](#).
- 24) AUTH team published an article in the online blog "Agioitheodoroi.blogspot.com". The title of the article was "*Coronavirus: How quarantine affected the human body and the role of pollution (Κορωνοϊός: Πώς η καραντίνα επηρέασε τον ανθρώπινο οργανισμό και ο ρόλος της ρύπανσης)*". Link to the article can be found [here](#).
- 25) AUTH team published an article on the association between air quality and the COVID-19 pandemics on the magazine "Madata.gr" entitled "*Unprecedented findings of scientists (Πρωτοφανείς διαπιστώσεις των επιστημόνων)*" on 7/6/2020. Link to article can be found [here](#).
- 26) The AUTH team published an article on 'Politispress.gr', on 7/6/2020 entitled "*After the COVID-19 season. The need for a comprehensive response to environmental health risks (Μετά την COVID 19 εποχή. Η ανάγκη μιας ολοκληρωμένης αντιμετώπισης των περιβαλλοντικών κινδύνων στην υγεία)*". Link can be found [here](#).
- 27) The AUTH team published an article in the online magazine "healthview.gr" on 8/6/2020 entitled "*AUTH research: The more pollutants, the more threatening COVID19 (Έρευνα ΑΠΘ: Όσο περισσότεροι οι ρύποι τόσο πιο απειλητικός ο COVID 19)*". Link to the article can be found [here](#).
- 28) The AUTH team published an article on the online magazine 'medicaltime.gr' on 9/6/2020 entitled "*Coronavirus: How quarantine and pollution affected the human body (Κορωνοϊός: Πώς επηρέασε η καραντίνα και η ρύπανση τον ανθρώπινο οργανισμό)*". Link can be found [here](#).

2.6 Training events

- The ICARUS team organized the "*Expert and Stakeholders workshop: trends and challenges for Smart, Green an Health cities 2050*" at the Europe Direct, Serafio - Sports, Culture and Innovation Center, in Athens (Greece) on 8 February 2019. The workshop aimed at engaging


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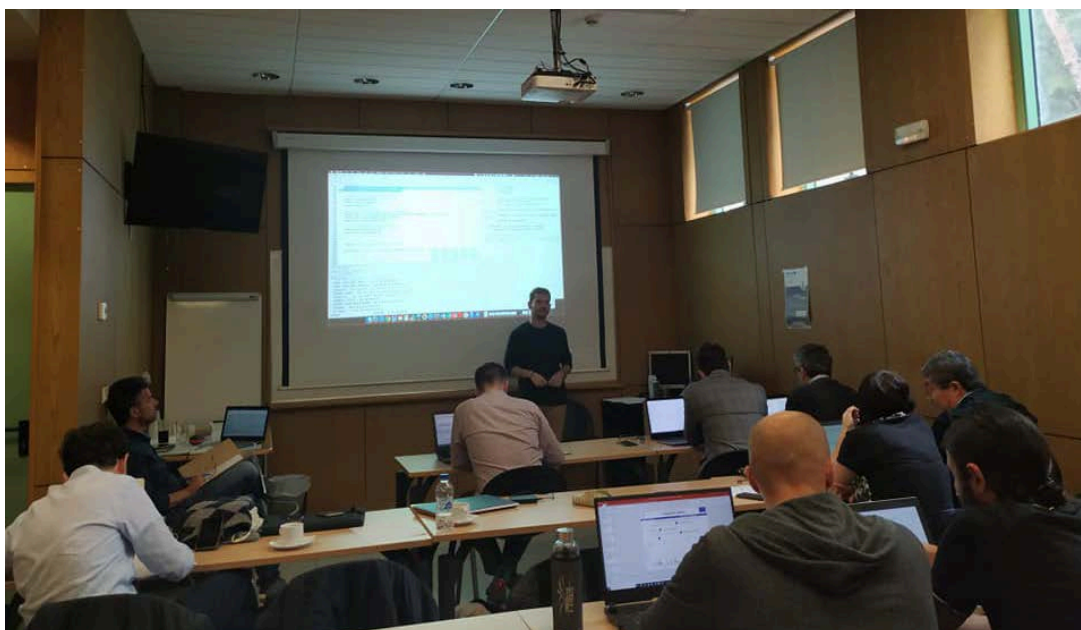
and involving stakeholders and experts in developing smart, green and healthy city visions seeking to minimize environmental, climate and health impacts in nine EU cities of variable size. The audience was composed by ICARUS member and local stakeholders mainly in the policy domain. During the workshop ICARUS members presented the current status of sensor campaigns in the ICARUS cities. Participants were also informed about results, experiences and methodologies applied to integrally assess policies and measures in the ICARUS cities. Links to the event [here](#).

- The ICARUS team organized ICARUS 2nd user training workshop entitled “*Training on ICARUS results in pilot applications in participating cities*” on 3-4 July 2019 at the Europe Direct, Serafio - Sports, Culture and Innovation Center, in Athens (Greece). The 2-days training event provided users with background information and ‘hands-on’ experience on the multiple facets of the integrated assessment of policies. Key topic addressed included: air quality and emission modelling, source apportionment techniques, trends in climate change , methods for personal sensors of exposure to air pollutants, approaches for assessing health impacts of policies/measures at the local level and cost-benefit analysis modelling .




- The NCSR D organized the training event entitled “*ICARUS WP4 workshop*” and gave training cum ‘hands-on’ on “*Training on sensors data treatment*”. This training event was held in Athens at the NCSR D campus on November 4th 2019. The audience was trained in the harmonization and statistical analysis of data collected during the sensor campaign. Practical examples on advanced computational tools and hand-on training of the statistical package R were provided and widely discussed. In addition, the content and format of feedback report for the participants to the sensor campaigns in all the ICARUS cities was thoroughly discussed with experts and agreed.

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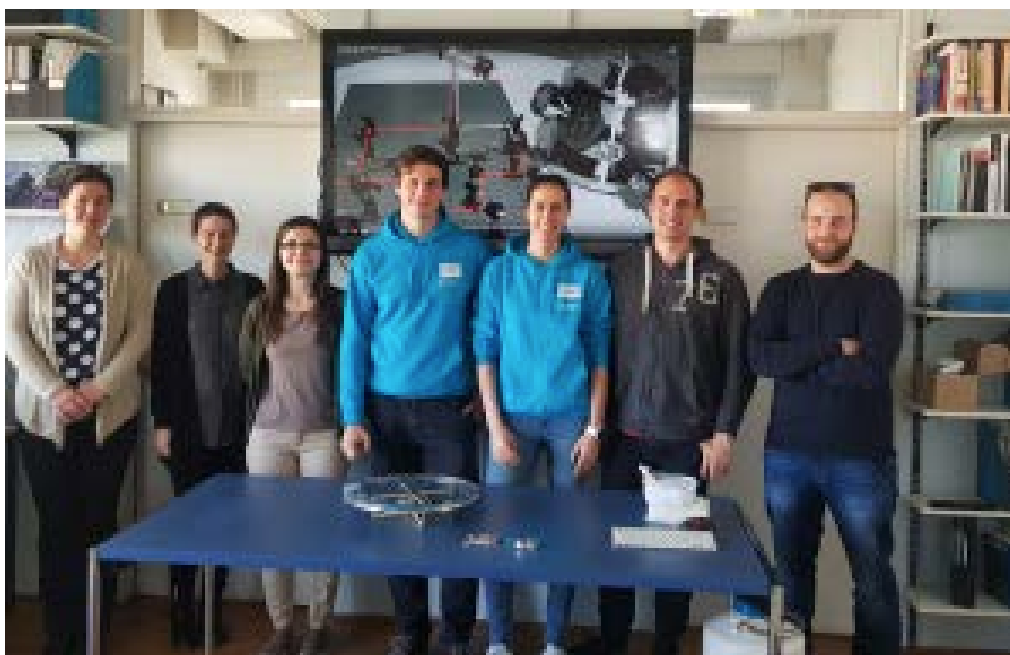


2.7 Other relevant activities

- All the ICARUS partners involved in the sensor campaigns sent custom designed and personalized detailed feedback reports to each participant in the study. The letters were distributed to each participant following a common template and translated in the different languages of the city participants. Participants were happy to receive personalised feedback on their home/personal air quality measurements in comparison to other participants in the Basel campaign. At the same time the ICARUS team in each city collected feedback from the participants which allows us to identify strengths and weaknesses for potential improvement of future sensors campaigns.
- Aarhus team members started an “outreach activity” called “Ongoing web consultation with stakeholders and citizens” from 1st August 2020 onwards. Under this activity a web-based was developed where citizens individually track their daily travels and visualizes locations of places visited relative to each other, as well as proximity to major transport infrastructure, green spaces and residential areas. Moreover, questions concerning respondents’ preferences for particular places and the significance of air pollution, health and green spaces relative to their choice of transport mode, route and place they favour for stops. This is further linked to questions concerning their attitudes toward air pollution which among the respondents stimulate reflection on air pollution, urban places and routes, travel choice, health and wellbeing. The survey provides an online platform via Facebook, where the ICARUS responds daily to questions and comments from respondents. The site informs about ICARUS, the survey and factual and ethical issues related to the survey. Moreover, the survey hosts a well-visited Facebook page (<https://www.facebook.com/paavejedinby/>) that tells about ICARUS and where respondents comments and openly discuss aspects of the survey as well as communicate their reflections. As part of recruitment, the AU team furthermore has offered lectures on urban air quality, climate change, health, social inclusiveness and equity, and choice of transport routes.

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- On 23/3/2019 at the 27th days of Jožef Stefan" in Ljubljana the JIS team organized a session entitled "*Integrated climate forcing and air pollution reduction in urban systems (ICARUS): Ljubljana case study*". Presentations of research activities in the frame of the project for the general public and recruitment of participants for the sampling campaigns were the main outcomes of the event. More information about the event can be found [here](#).



- In the frame of the Open Sunday held on 12 May 2019 in Thessaloniki the AUTH team illustrated the project and showed key finding from the sensor campaigns to broader public of students and researchers.



- Targeting regional awareness, the ISCIII team has shared a short communication of the preliminary results from the campaign in this event. Link is [here](#). The tweet reads "*Ministerio de Ciencia e Innovación (@CienciaGob) twitteó: Un estudio del @SaludISCIII y @La_UPM reitera que las medidas de control de la calidad del aire reducen la mortalidad prematura. Se*

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estima que la reducción de las emisiones del tráfico en Madrid podría suponer un ahorro de 500 muertes prematuras al año”

Based on the work carried out in ICARUS during these 4 years the following **PhD and MSc thesis** were completed:

- Prof. Denis Sarigiannis ICARUS coordinator, supervised the PhD thesis entitled “*Exposomic analysis – emerging methodologies for environmental exposure measurements*”, which was successfully defended by D. Chapizanis on the 18th of April 2019.
- Prof. M Horvat (JSI) supervised the Master Thesis entitled “*Validation Of Low-Cost Sensor Systems For Estimating An Individual’s Exposure To Airborne Pollutants*” which was successfully defended by R. Novak on the 17th June 2019. Link to the thesis can be found [here](#).
- Prof. Denis Sarigiannis ICARUS coordinator, supervised the PhD thesis entitled “*Integrated Assessment of Air Pollution and Climate Change Policies in European Cities: the Case of Milan*”, which was successfully defended by M. Persico on the 3rd of April 2020.


2.8 Web site and social media

The ICARUS website (<http://www.icarus2020.eu/>) is operational since the beginning of the project and it is hosted by UPCOM. The portal 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. It was built upon WordPress as a Content Management System. This ensured scalability and the possibility to quickly expand the current structure. The layout of the website is responsive, providing an optimal viewing and interaction experience, regardless of the used device (pc, tablet, smartphone). The website automatically detects the device through which the user is visiting, adapting the layout to the viewing environment by using fluid, proportion-based grids, flexible images and CSS3 media queries.

The ICARUS website presents the project and its on-going activities, key results and outputs as well as it announces the main dissemination events. The website was designed in a way to guarantee a high level of accessibility and usability and will stay online for at least four more years at UPCOM. The portal includes widgets for interaction with all the major Social Media, as well as links to all the project’s Social Media pages.

Google Analytics have been integrated on the portal and on the social media pages, so that the administrators are able to track statistics regarding the traffic (total number of visitors, total number of new visitors, how long visitors stay on each page, most popular pages, etc.). Data from the Website and social media analytics are reported hereinafter

Website and social media analytics Report (Period: 30-10-2018 - 09-10-2020)

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ICARUS website

Audience Overview

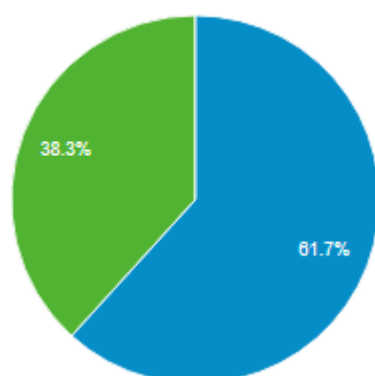
Sessions: **5,514**

Users: **3,403**

Page Views: **14,297**

Average Session Duration: **00:02:27**


■ New Visitor ■ Returning Visitor



Ratio of new/returning visitors

Overview by Country

Country	Unique Sessions	Page Views
1. Greece	1,054	25,86%
2. Italy	845	14,61%
3. Spain	437	9,36%
4. United States	359	2,94%
5. India	326	2,77%
6. Germany	303	4,76%
7. Czech Republic	286	4,77%
8. United Kingdom	247	7,40%
9. Slovenia	244	4,53%
10. Belgium	194	4,08%

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Overview by City

City	Unique Sessions	Page Views
1. Other	418	6,510 (45.5%)
2. Thessaloniki	404	2,044(14.3%)
3. Athens	376	902(6.03%)
4. Pavia	356	790(5.5%)
5. Madrid	261	868(6.1%)
6. Brno	238	596(4.2%)
7. Ljubljana	227	581(4.1%)
8. Milano	191	505(3.5%)
9. Stuttgart	165	396(2.8%)
10. Pune	137	166(1.2%)

ICARUS YouTube channel

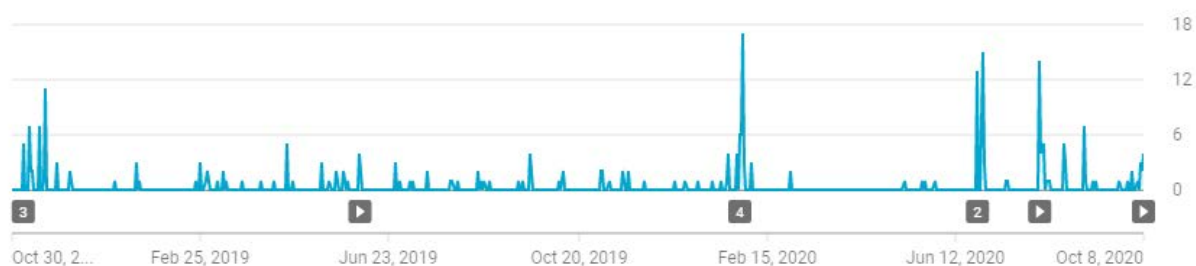
Lifetime Report (Oct 30, 2018 – Oct 09, 2020)


General Statistics

Views ▲
262






Watch time (hours) ▲
4.9

Subscribers ▲
+4



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Top Videos

Video		Average view duration	Views
1	 <p>Dr. Nora Hampl from Brno during the Madrid Workshop Nov 6, 2018</p>	1:39 (27.3%)	79
2	 <p>IT Consultant Georgios Sarigiannis, UpcomLtd & the ICARUS Project H2020 fund... Aug 4, 2020</p>	0:56 (39.6%)	37
3	 <p>Prof. Rainer Friedrich from Stuttgart during the Madrid Workshop Nov 6, 2018</p>	1:01 (10.2%)	30
4	 <p>Dr. Saul Garcia from Madrid during the Madrid Workshop Nov 6, 2018</p>	0:43 (11.7%)	19
5	 <p>ICARUS2020 Jun 26, 2020</p>	0:18 (90.0%)	18

ICARUS ResearchGate

Followers 0 new 10

Reads ⓘ 0 new 69

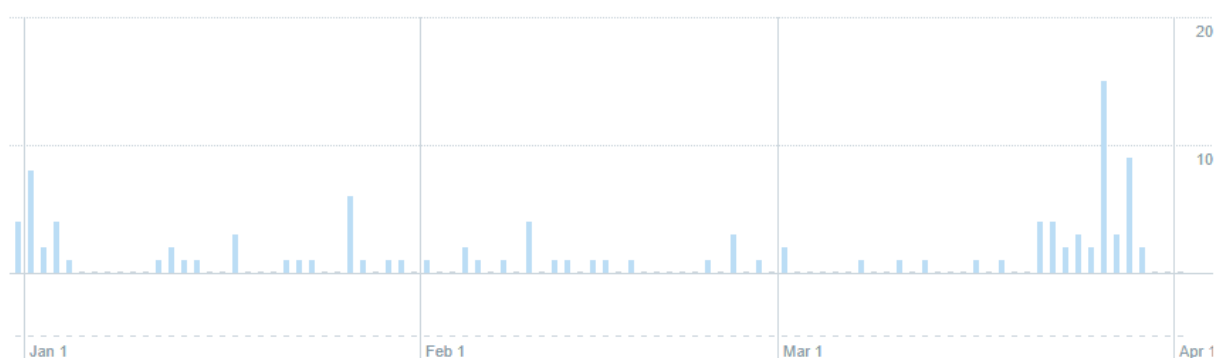
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Twitter

Lifetime Report (Oct 30, 2018 – Oct 09, 2020)

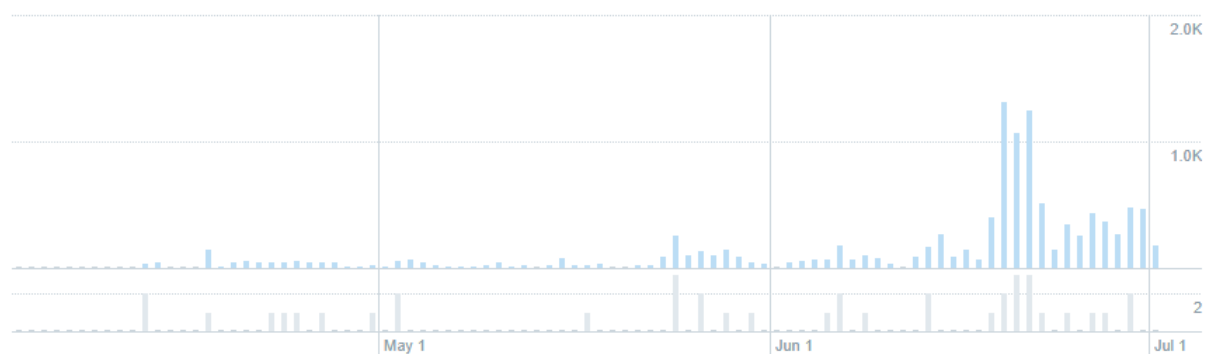
Jan 2018 – Mar 2018


Your Tweets earned **109 impressions** over this **92 day** period



Apr 2018 – Jun 2018

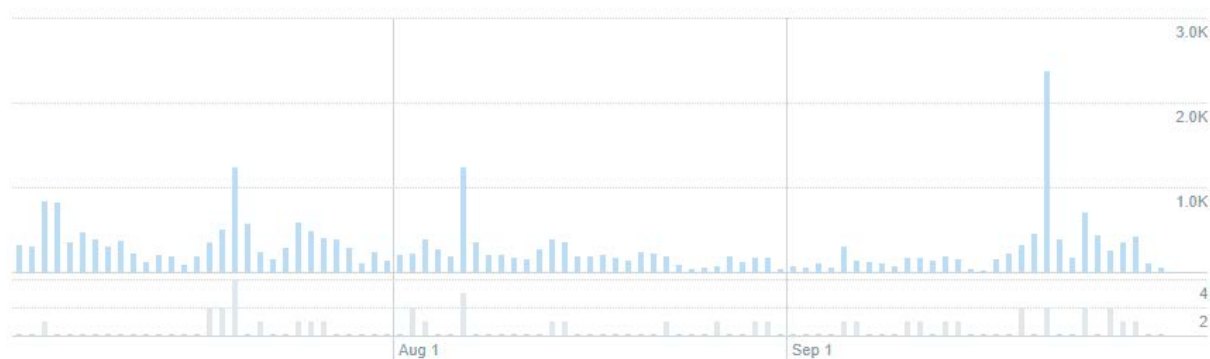
Your Tweets earned **11.2K impressions** over this **91 day** period



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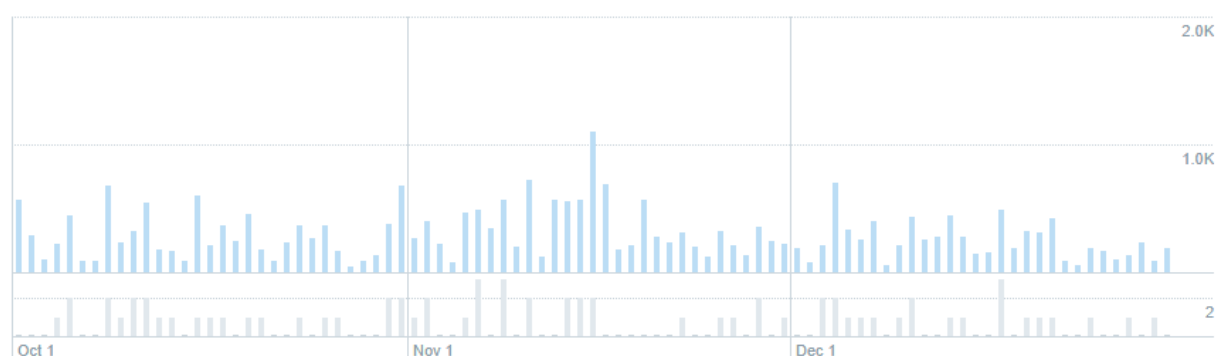
Jul 2018 – Sep 2018

Your Tweets earned **26.1K impressions** over this **91 day** period



Oct 2018 – Dec 2018


Your Tweets earned **27.2K impressions** over this **91 day** period



Dec 2018 – March 2019

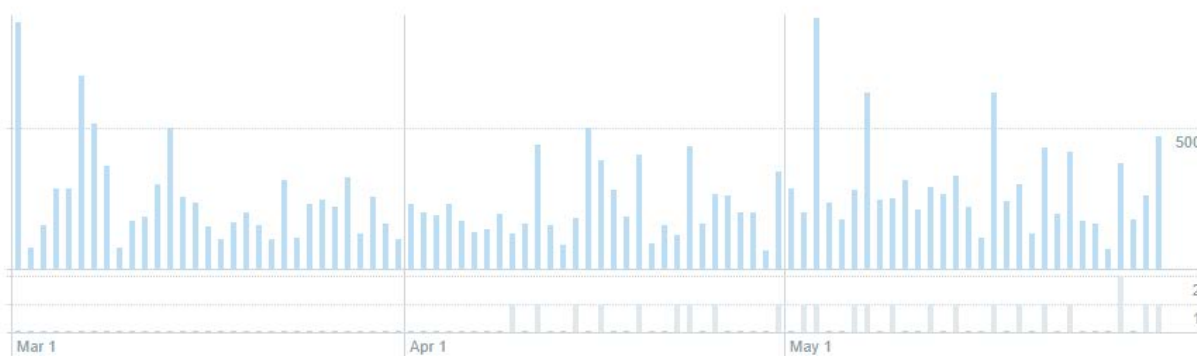
Your Tweets earned **14.2K impressions** over this **67 day** period



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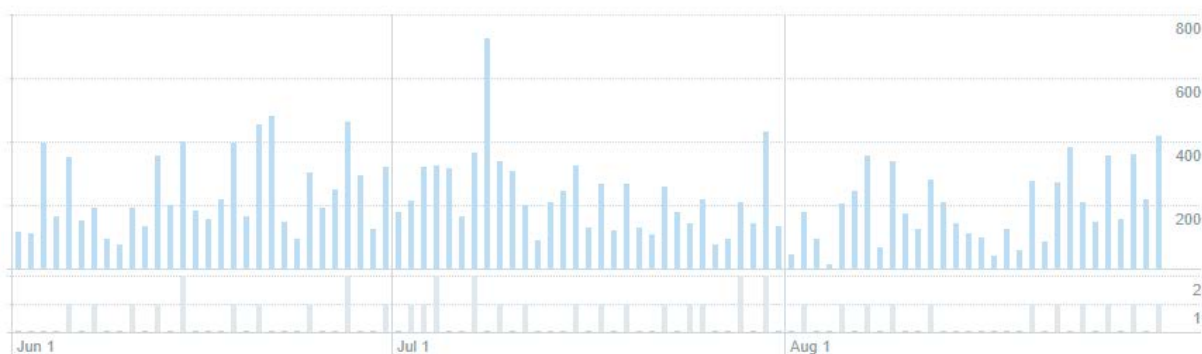
March 2019 – May 2019

Your Tweets earned **23.5K impressions** over this **91 day** period



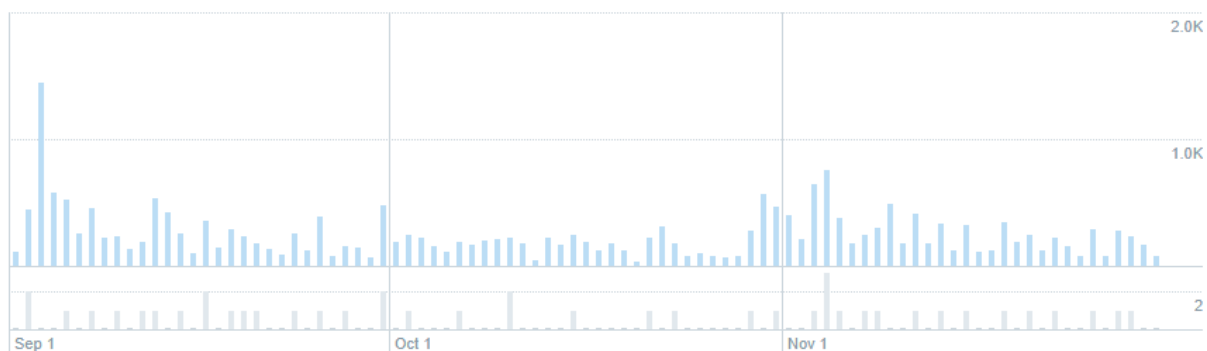
June 2019 – August 2019


Your Tweets earned **20.2K impressions** over this **91 day** period



September 2019 – November 2019

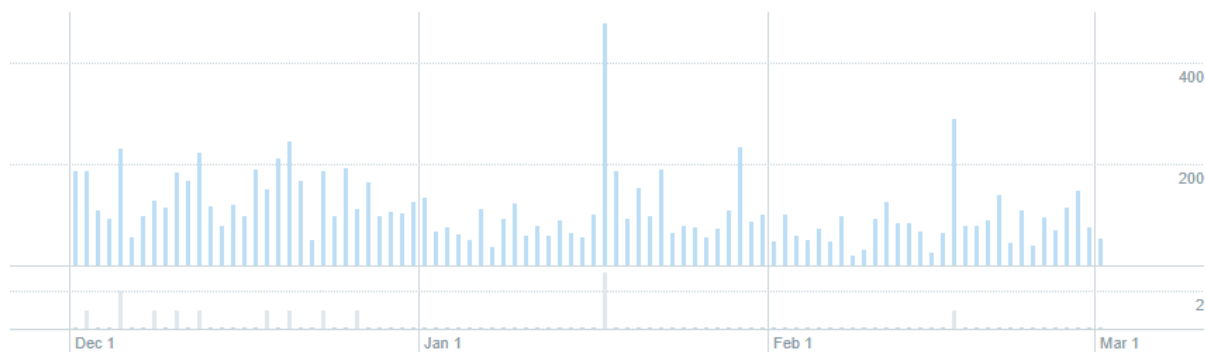
Your Tweets earned **22.7K impressions** over this **91 day** period



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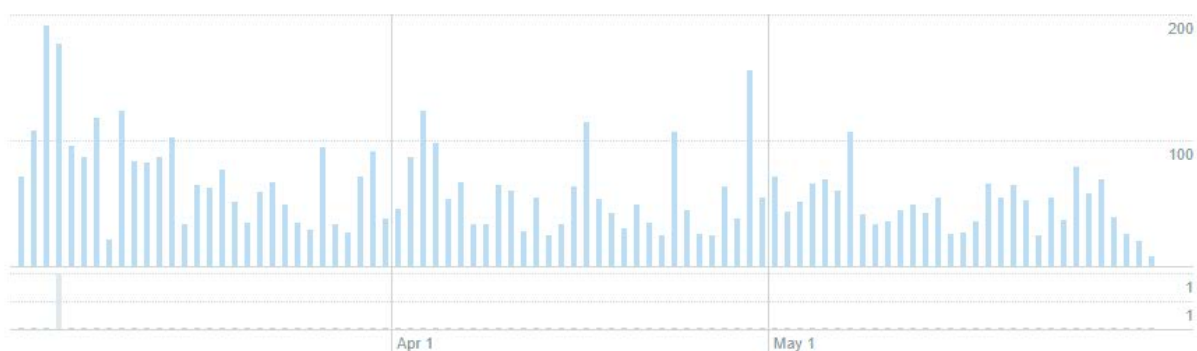
December 2019 – February 2020

Your Tweets earned **10.2K impressions** over this **92 day** period



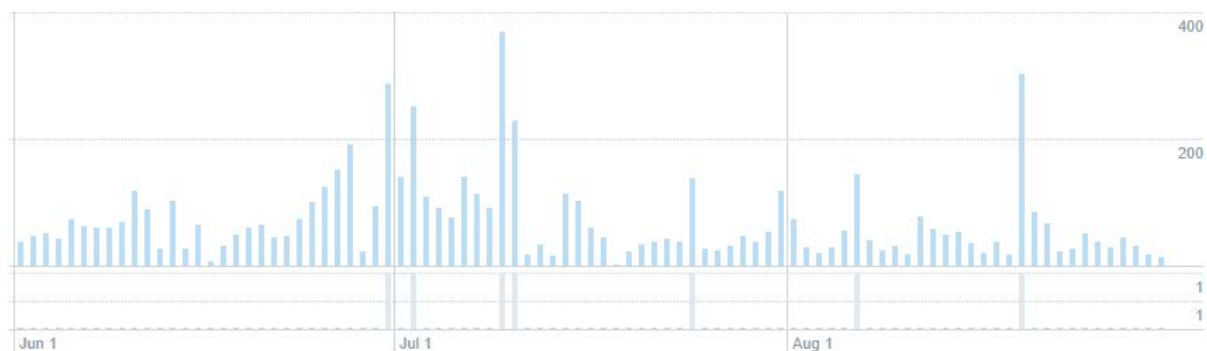
March 2020 – May 2020


Your Tweets earned **5.5K impressions** over this **91 day** period



June 2020 – August 2020

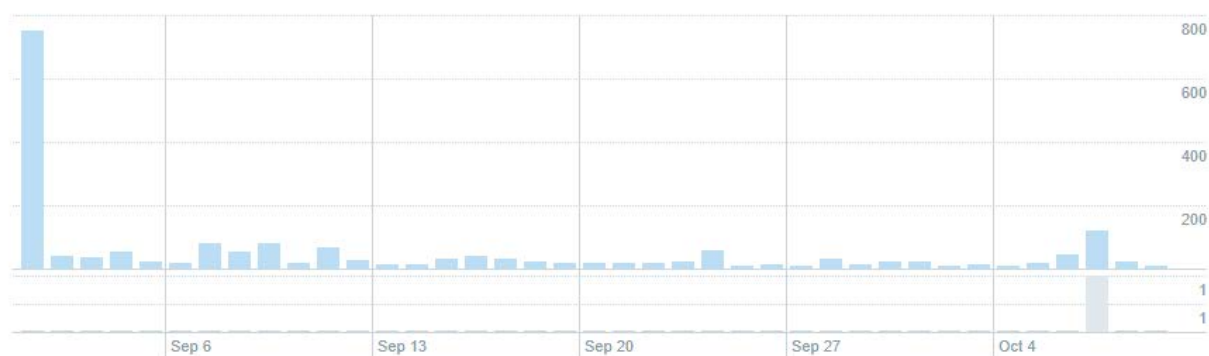
Your Tweets earned **6.5K impressions** over this **91 day** period



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September 2020 – October 2020











Your Tweets earned **1.9K impressions** over this **39 day** period




Total number of followers: **374**

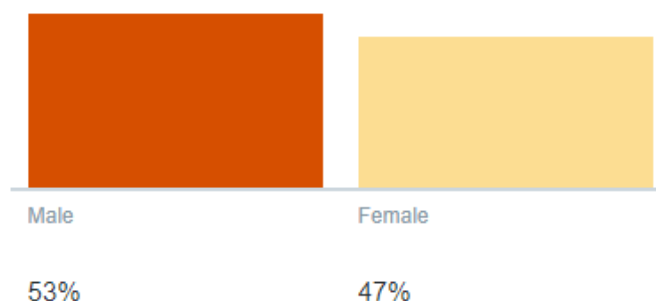
Twitter Demographics

Country

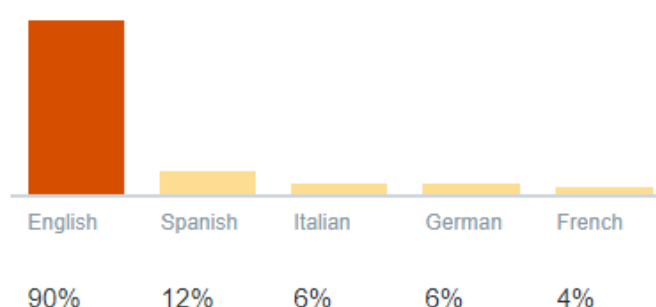
Country name	% of audience
United Kingdom	19% 
Spain	9% 
United States	9% 
Italy	8% 
Germany	7% 
South Africa	7% 
Greece	5% 
France	4% 
India	3% 
Belgium	3% 

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Gender



Languages




As the analytics of the various communication channels media of the ICARUS project showcase, the webpage of the ICARUS project along with its Twitter account have proven to be its strongest representatives in terms of outreach.

In the last two years the ICARUS webpage has been visited by 3,403 users and the number of page views was 14,297 with most page visits from users across Europe, with India being the only Asian country to have made it to the top 10. Accordingly, most users that visited the webpage did so from European countries, especially those involved in the project.

Twitter on the other hand proved to be extremely effective, gathering up more than 20,000 impressions every quarter for the better part of the last 2-year period summing up to ca. 170,000 views in the last 24 months. It is well worth noting here that the number of views was significantly reduced since March 2020, around the time the coronavirus pandemic reached Europe. This is also attributed to the fact that the number of tweets in this period were reduced.

The Facebook profile of the ICARUS project also proved successful due its activity and regular posting, however due to the fact that it is a profile and not a page, no analytics are available. Its outreach however was lower than that of the Twitter account and the webpage.

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3 ICARUS key messages and main impacts

Through a very aggressive large-scale scientific dissemination strategy in the last phase of the project, our findings and key messages were successfully communicated and shared with a wide range of stakeholders both scientifically inclined and not. This allowed us to contribute towards closing the gap between compartmentalized urban policy studies and cross-disciplinary research that produces findings on key interactions between policy and sustainable city futures. In this context special attention was paid to climate change, air quality and inclusive and socially equitable policies and measures. This highlights the interaction between urban sectors, as well as the need for linking urban policy and governance studies to health, transport and air pollution issues and findings, and moreover how sustainable urban visions can be function as a policy tool to bridge the gap in compartmentalized policy making. This was also reflected in the scientific papers published or submitted to journals and currently in press.

The discussions we had during the several dissemination and communication events described in this report were successful in enhancing significantly the ICARUS visibility and in raising awareness about atmospheric pollution and the associated health effects as well as in illustrating the methodology developed by ICARUS and the key outcomes obtained to support air quality and climate change governance in EU Member States towards the implementation of appropriate abatement strategies to improve the air quality and reduce the carbon footprint in European cities.

A wide range of issues related to mitigation of air pollutants and greenhouse gases emission and exposure through both more environmental-aware behaviors and more effective policies/measures were discussed and clarified reinforcing the energy needed to face the great challenges we will need to address in the close future.

In all of these interactions with the scientific community at large, citizens and other communities the integrated approach of ICARUS and the key findings derived have been received very positively paving the way for future collaborations and increasing awareness among citizens about their important role towards healthier, greener and smarter urban environments.


In this light the main key messages and the main impacts produced by the ICARUS work are described in the next paragraphs.

3.1 Linking environmental policies and human health

ICARUS has increased quantitative understanding of how urban environmental policies can impact on people's health and wellbeing. Research has connected five selected policies in each ICARUS cities identified in close consultation with local stakeholders with improved population health. Cost-benefit analysis was also carried out to comprehensively assess the costs and benefits linked to the selected policies/measures.

Key messages emerging from the analysis of the policies/measures considered in the different ICARUS cities include:

- Measures such as large scale/city-wide sustainable mobility interventions covering synergetic effects of public transport, walking, cycling focusing on all population groups combined with clean vehicles, combined with greater use of alternative fuels, have shown the greatest potential for significant reductions in pollutant emissions and consequently health effects.


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These measures showed in addition the higher potential to be easily upscaled to address the needs of a larger share of users in the city.

- Additional air pollution reduction advances could be reached through policy measures that encourage cycling, either by improving cycling infrastructure or increasing the availability of bike-sharing systems and especially through their further integration with public transport.
- Efficient logistics and freight distribution are policy measures that have shown significant environmental improvement potential – although their impact on air pollution is relatively small, they contribute to the quality of life and wellbeing in cities. In most cases, up-scaling might help to maximise their potential benefits
- In the energy sector, significant air pollution and health-related improvements are only evident from a large-scale implementation, such as the enhancement of district heating, which could be further increased by addressing the fuel technologies behind them.
- The results concerning the economic dimension are promising as the majority of the measures analyzed have shown a positive cost-benefit ratio. However, we need to underline that some economic impacts included in some of the measures have not been included in other measures, due to the lack of reliable data. Thus, further work in this area is needed to gather good and complete cost data, and to fill in the gaps in understanding the costs of some carbon mitigation options.
- Results showed that different strategies in different cities may be appropriate and hence demonstrated the need for policy at an appropriate scale (the urban level) to address pollution mitigation including GHGs emission reduction.
- Results confirmed the importance of the inclusion of health co-benefits in economic analysis of mitigation strategies. Options that may appear costly in terms of the financial cost may become viable in many cases when co-benefits are considered.
- Public acceptance of policies/measures is an important factor for their successful implementation. Citizens living in ICARUS cities have so far demonstrated a positive attitude towards proposed policy interventions. There were, however, a few measures dealing with pricing and restrictions or changing of behaviour (transport modes, changing heating technologies, insulation in buildings), which are usually quite sensitive in terms of public acceptance, but have nonetheless generated positive reactions (Stuttgart, Milan, Brno, Madrid)
- Even measures that are traditionally considered controversial can be implemented successfully, if they are built on stakeholder engagement from the initial phase of the planning process.

With regard to socioeconomic differences citizens with low socioeconomic status (SES) are generally more likely to be exposed to higher levels of air pollution and they are less likely to take up new technologies which may be developed to improve life quality. Furthermore, they are less likely to participate in cultural activities and sport and generally travel shorter distances. On the contrary high SES groups travel by car more than low SES groups but this is not always the case and that mode choice does depend on local circumstances.

Thus, in order to create healthy cities particular and to reduce health inequalities in cities attention will need 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.

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3.2 The ICARUS campaigns

Two different types of field campaigns were organized in the frame of the project to provide scientific evidence of environmental quality in urban settings and support the modelling work:

1) **Source apportionment campaigns** were organized in six ICARUS cities to measure the concentration levels of PM_{2.5} in three different locations (urban background, traffic and rural) for a period of one month during both the winter and summer seasons. The samples were analysed for 27 PAHs, 24 trace elements, anions, elemental and organic carbon to finally derive quantitative information about pollution sources and the amount they contribute to ambient air pollution levels based on the composition or fingerprints of the sources through source apportionment models. Key messages which can be drawn include:

- Traffic-related sources and biomass burning prevail in terms of PM mass contribution.
- The contribution of traffic exhausts source to PM_{2.5} concentration was on average 23.3% at traffic sites, 13.3% at urban background sites and 8.8% at rural sites.
- The average contribution of traffic non exhausts to PM_{2.5} concentration led to similar levels at traffic (12.6%) and urban background (13.5%) sites while being lower (6.1%) at rural sites, which means that even zero-emission cars would still aggravate the air quality inside the cities. Nevertheless, a reduction of the road traffic would have a positive impact in the public health as the incomplete combustion of fossil-fuels produces elemental carbon whose particles act as a carrier for other toxic compounds.
- The contribution of fuel oil combustion to PM_{2.5} concentration did not reveal a clear predominance in a specific type of areas (13.8% at traffic, 11.6% at urban background and 18.7% at rural sites).
- Biomass burning contribution was on average 22% at traffic sites, 30% at urban background sites and 28% at rural sites. Regarding soil dust, a remarkable difference between traffic /urban background and rural sites is noticed, as average contribution was twofold in the latter (5% and 8% at traffic and urban background sites; 16% at rural sites). Sea salt contribution was the lowest (1–4%) while secondary particles accounted for the 16–34% of PM_{2.5}
- Around 40 % of the sources of PM_{2.5} emissions are coming from the regional background.
- Aerosols are mainly produced by traffic, industry and agriculture. Its stability and transformations depend, among other parameters, on the availability of other chemical species and the temperature.
- Waste treatment and disposal as well as non-road transport do not play an important role as sources of PM_{2.5} as their contributions for all the cities are lower than 3 % for the former and lower than 2 % for the latter.
- Only in Thessaloniki the non-road transport showed slightly higher contribution (3 %) due to the shipping activities.

2) The ICARUS **multi-sensor campaigns** have been carried out in 7 ICARUS cities to collect primary data on environmental exposure and exposure determinants at individual level. The sensor campaigns lasted 1 week both in the winter and summer period to account for behavior seasonality. Measured data included personal exposure to PM, a wide range of organic chemicals (PAHs), indoor air quality, temperature, humidity, location, distance, type of activity, heartbeat and sleeping patterns. Potential

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subjects were recruited in several ways across the ICARUS cities paying attention to a uniform spatial distribution within each city and within the different age and gender classes. A promotional leaflet was designed in English and was then translated in the local (country specific) languages to be used in city-scale recruitment campaigns. Recruitment was mostly based on advertisement through online sites, social networks, local magazines and via word-of-mouth. Overall, more than 600 participants, and more than 250 households participated, combining both seasons (winter and summer). Adults represented the majority followed by children and elderly with different percentage according with the city. Gender ratio in the sensor campaigns in both seasons remained, more-or-less, the same, except in Milan, Thessaloniki and Brno where female participants is little more than others.


A data collection platform has been designed and implemented to collect and store data of various formats from each device (Garmin, ICARUS Portable PM Sensor, uHoo). Data treatment has been performed in order to harmonize the data derived from the different data sources. Harmonization was achieved by converting each variable of all the datasets to 1-min measurements.

In addition to the devices described above, we also used 3 different questionnaires i.e. time activity diary (TAD); and Survey monkey forms, that helped us better understand the participants' habits and their personal and living conditions including socio-economic conditions.

Data were analyzed and results were distributed to each participant following a common template and translated in all the country languages. The report consists of three parts: Part A which has general introduction to the report; Part B which has the household level analysis and Part C where the full assessment of exposure at individual level is provided. In addition, recommendations on how to reduce exposure have been included. At the same time the ICARUS team in each city collected feedback from the participants which allows us to identify strengths and weaknesses for potential improvement of future sensors campaigns.

Key recommendations given to the participants to reduce personal exposure include:

- Avoid physical activity in high polluted areas.
- Be aware of local outdoor AQ levels and pollution forecasts. Follow advice from air quality regulators in relation to outdoor pollution levels. The use of the ICARUS app was recommended.
- Carry out physical activity in the early morning before rush hour and prior to higher ozone levels that occur in afternoon. Activities should be at least 400 m from main roadways to lessen pollution exposure.
- Keep microclimate conditions in homes under control by avoiding high temperature and humidity.
- Clean the rooms several times a day to avoid a build-up of pollutants, both gaseous and in the particulate phase (open the windows for short periods at least 2-3 times a day for 5 minutes.
- Always use hood/fan suction when cooking and open windows to avoid increasing humidity. Clean the kitchen after cooking regularly.
- Always carry out proper and periodic maintenance of air conditioning systems especially if they are not functioning properly, because in this case they do not guarantee an adequate air exchange, allowing the penetration of pollutants from outside; maintenance must also include the replacement of filters thus preventing the cultivation of mold and bacteria.
- Immediately remove mold using bleach, in case they appear.

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- Household cleaning products (including indoor deodorants and air fresheners) in indoor environments should be used with great restraint because they contain organic volatile compounds that are released during their use. It is therefore advisable to use products that are less harmful to our health and the environment, such as vinegar and baking soda, for daily cleaning; it is advisable to never mix different products and to carefully read the instructions on the labels before use.
- Remove the carpets from the dwellings that are receptacle of powder, especially in case children or people prone to allergies.
- Use good quality vacuum cleaners that do not release dust when using.
- The burning of wood in fireplaces or stoves, without pollutant reduction systems, is a major source of emissions of air particulates and harmful compounds and there is no doubt that biomass domestic heating contributes a substantial share to the air pollution people breathe.
- Comply with the rules on smoking bans in all public settings, including workplaces and avoid smoking in homes and cars, especially in the presence of children and women in the city; limit the use of candles especially scented candles and the use of incense sticks.

In general, participants were happy to receive personalized feedback on their home/personal air quality measurements and were willing to provide their feedback.


Key feedback collected from the participants include:

- Most of the participants were satisfied about the way the study was organized and would be keen to participate again in the future
- Many participants actively shared pictures on social media enhancing the visibility of the project and contributing to raise awareness about the environmental issues
- They were very interested in getting back results / personal reports
- The duration of the study (1 week in winter and 1 week in summer) was considered appropriate
- The custom-built PM sensor was well accepted. Few complaints were reported about its size.
- In a few cases, participants forgot to charge the PM sensor
- For many participants filling in the Time Activity Diary was a time-consuming process

3.3 ICARUS long-term visions and transition pathways

Through employing a foresight approach, combining participatory workshops with local stakeholders, literature review and horizon scanning, we developed long-term visions (up to 2050) of smart, green and healthy cities. Drawing together the visions and other materials, it was possible to identify three distinct visions of future cities that would be broadly sustainable, smart and healthy:

- Smart Tech City – has more emphasis on technology as a solution to environmental and health issues, with individualistic values being important.
- Sharing Smart Communities – takes the community at the centre and considers interconnection to be an important driver for improved societies;
- Connected Cobweb City – considers a more dispersed, individualistic society, with more of a balance between technology and socially contingent solutions to the challenges facing our cities.

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For the transition pathway the focus has been on the steps that need to be taken now to start moving towards the vision in the various ICARUS cities. In this regard the key message is all city visions need a strong governmental actor that provides regulation, coordination financing and incentives.

Differences between the ICARUS cities in 2050 concern the key strategies supporting the transition. While the Smart Tech City mainly relies on technical solutions for environmental problems, the Sharing Smart Community puts more emphasis on the behavioural shift necessary for smart, green and healthy cities. A reliance on technical solutions requires strong efforts in innovation and R&D sectors, as well as targeted incentives to push market forces towards environmentally friendly solutions. On the other hand, the Sharing Smart Community is based on decisions taken by individuals and relies strongly on soft measures and the encouragement of participative approaches. In contrast to these two visions, government, market and citizens do not drastically change in the Connected Cobweb City. Therefore, this city requires for rapid changes in urban planning and infrastructure on the road towards a sustainable city.


To avoid problems of acceptance and legitimacy would complicate or even prevent these transition we believe it is particularly important to start immediately with implementing respective visions.

3.4 ICARUS assessment tools

The ICARUS Project has produced two specialized IT tools to support public authorities (ICARUS DSS) and to raise awareness of citizens (ICARUS mobile app) towards healthy, smart and green urban environments. The ICARUS Decision Support System (DSS) has been developed to inform policy makers and public authorities how urban policies/measures addressing air quality and carbon footprint affect exposure and human health. In addition, the ICARUS DSS includes a Cost Benefit Analyses module to deliver an economic assessment of policies thus providing an integrated quantitative assessment of potential policy interventions. In this way the ICARUS DSS provides robust and repeatable ways to make integrated assessments and predict changes. The ICARUS mobile app may track and analyse the individual (citizen) daily activities and assess their impact on the air quality and climate change. The ICARUS app offers both detailed and personalized information to end-users to promote environmental-friendly individual behaviour. It allows end-users to gather information about carbon footprint, air quality levels, individual exposure, and consequent health risk/benefit from exposure to urban environment. The ICARUS app has been developed to ill raise awareness among citizens and inform citizens of every participating cities about their life style and the benefit caused by their actions so as they can then explore how the impacts on air quality and climate forcing change if they would alter their behaviour and to provide feedback.

3.5 Other key messages originated from the ICARUS work

- Urban areas are responsible for a large part of air pollution and carbon emissions. It is therefore particularly appropriate to tailor environmental policy measures at the city level. Given the peculiarities of each city, different strategies in different cities may be appropriate.
- It is important to evaluate the impacts of measures aiming at carbon mitigation and air quality enhancement by considering the effect of these measures on as many actors as possible: private citizens, municipalities, the environment, as well as the general population.
- The 'health protection' framework should be as much as possible exploited when designing and implementing air quality and carbon related policies.

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- The Cost Benefit Analysis carried out in collaboration with the ICARUS partners shows that the benefits of air quality measures outweigh the costs in many cases, with most of them achieving a positive Net Present Value.
- Health co-benefits of the general population can be particularly relevant, and, often, measures that appear costly in terms of the financial cost per tonne of carbon reduced become viable when health co-benefits are taken into account.
- With regard to long-term visions key messages include how to enhance modelling of ridesharing services in macroscopic travel demand models and the potential effect car/ridesharing services, especially in combination with autonomous driving, have on the number of cars needed. ICARUS showed that car/ridesharing can reduce the number of cars in cities drastically if no private cars are allowed, which would have a great impact to improve air quality. These results were also discussed in a local podcast and newspaper article about future transport scenarios, advertising and introducing the ICARUS findings to non-scientific communities.
- Cost Benefit Analysis is characterised by a certain degree of uncertainty. First, in the identification and evaluation of the impacts of the selected policies. Second, in the cost data used in the analysis. Third, in the monetary quantification of intangible impacts. To deal with this uncertainty it is important to perform sensitivity analysis. The results of our sensitivity analysis show that analysed measures are hardly sensitive to variations in the inputs.
- With regard to climate change future projections of extreme events of perceived temperature (considering both temperature and humidity) over Europe look different from what we expect for extreme events of temperature only. Northern European regions will be subject to heat stress conditions more than what we expected considering extreme temperature only.

At the academic levels our results highlighted the importance of the humidity in determining future changes in heat stress over many EU regions and the fact that it is not sufficient to investigate extreme events of humidity and temperature separately to derive the composite effect.

At the policy level our findings suggest to take into account adaptation strategies to heat stress conditions also over region never considered before: different maps of future heat stress under extreme conditions are provided under different emission scenarios (CMIP5 RCP4.5 and RCP8.5) in a multi-model contest and compared to maps of extreme temperature only.

More specific recommendations for local authorities and decision-makers suggested by the ICARUS team in some cases on the basis of feedback from citizens across the 9 ICARUS cities included:

- Reduce traffic in favour of public transport and set-up of bicycle and pedestrian lanes.
- Enhance integrated spatial energy planning (e.g. for renewables and district heating).
- Create informative panels close to fixed monitoring stations showing real-time data to increase population awareness.
- Increase monitoring and modelling facilities, for instance through citizen science. Citizen science measurements are an inexpensive way to increase the number of measuring spots in the city and simultaneously increase awareness of air quality.
- Better distribution of traffic flow - including public transport, with a carefully considered plan for location of parking spots.

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- Constitute subsidies for sustainable traffic.
- City authorities need to develop an awareness campaign programs on what citizen can do to reduce environmental impacts of their lifestyle.
- Restrict/ban of all or at least most polluting motorised vehicles from the inner ring area (e.g. city centre).