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Author:
Alena Bartonova
UIA Expert



The Urban Lab of Europe !

The HOPE project Journal N° 1

Project led by the City of Helsinki



AIR
QUALITY



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Région
Hauts-de-France

The HOPE project

The main purpose of **HOPE** project is to empower citizens to develop their own districts and help them plan their lives based on empirical data and science-based information concerning air quality.

In-depth knowledge of the kind of exposure individuals from different backgrounds go through in their daily lives will be offered through a comprehensive sensor network and development of air quality index 2.0 which offers more health oriented and user centric approach than the existing AQ index. A platform will gather all the data triggering new innovative solutions while supporting a participatory budgeting model to involve users co-designing and co-developing, co-choosing AQ interventions. The expected intervention will be investments for new equipment as well as actions to facilitate individual and collective behavioural changes. The project final ambition is to create a feedback loop between high resolution hyperlocal air quality data and actions of individuals and communities through co-design and participative budgeting.

Partnership:

- City of Helsinki;
- University of Helsinki - higher education and research institute
- Vaisala Plc - private enterprise
- Helsinki Region Environmental Services Authority - regional public authority
- Finnish Meteorological Institute - national public authority
- Useless Company Ltd - SME
- Forum Virium Helsinki - innovation center

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1. EXECUTIVE SUMMARY

This is the Journal #1, aiming to inform about HOPE (Healthy Outdoor Premises for Everyone),

what it is, does and why, and where it is now, 16 months after its start.

1.1 Why HOPE

HOPE is a project of The City of Helsinki. The City recognizes that while the current EU standards for air pollution are largely met, these are not offering enough health protection. If we wish to enjoy a level of protection increasingly in line with recommendations of the World Health

Organization (and save considerable ill health and suffering), we must increase the efforts: the “easy” solutions for cleaning the air are already in place, a result of several decades of dedicated work.

1.2 What will HOPE deliver

HOPE works to deliver comprehensive air quality knowledge to support further mitigation of air pollution. HOPE is built upon understanding that any successful and long-term sustainable pollution mitigation needs to consider environmental, social and economic dimension.

HOPE has embarked on building an infrastructure and gathering knowledge to connect the three dimensions, ultimately delivering to Helsinki the knowledge and the tools for long-term sustainable air quality management.

1.3 How HOPE teams up with inhabitants

HOPE is teaming up with inhabitants of three of Helsinki’s districts with a typical but distinct air pollution challenges. The Vallila district is an old densely built-up residential district at the edge of the inner city, with major traffic routes passing through. Jätkäsaari is a new large waterfront development at a former harbour area, with a busy passenger port. Pakila is an older suburban housing area, mostly single-family housing, with two highways passing through. (Fig. 1)

The inhabitants carry out their daily routines in environments with widely varying pollution, but all should be able to enjoy healthy environment they view with pride. One way to achieve this is by including them in the air pollution

mitigation team – the “Air quality troops”. In HOPE, they have the role of pollution surveyors. The surveyors are recruited using social and traditional media campaigns and existing local activities, including a long-functioning living lab. They contribute as partners with their views, attitudes and preferences for solutions, and they generate valuable data. Since data, knowledge and information are at the heart of any informed decisions, the HOPE team provides the surveyors state-of-the art tools to assess their environment and to choose less polluted walking or biking routes.

1.4 What tools will HOPE use

The tools in the HOPE toolkit include models, apps and surveys, and air quality monitors. The models are state-of-the-art high-resolution atmospheric pollution models developed over the past decades by partners known for their scientific and technological excellence. The model results are available to the HOPE partnership – and citizens at large – using the latest innovations in visualisation and social media communication. The participants can use the latest innovations

in air quality measurements and monitoring. To ease the participation, the pollution surveyors are supported by professionals with long experience in working with the public towards objectives of common interest. This multi-layered collaboration will allow for the user experience and results to be satisfactory for all interested parties – for the local inhabitants, the City of Helsinki, the project partners, and all the external stakeholders of the project.

1.5 What has HOPE done to date

The first 16 months were dedicated to development of the complex infrastructure that will ultimately fully deliver HOPE, comprising of monitoring, modelling, information delivery tools and support to pollution surveyors.

The atmospheric monitoring comprises of urban monitoring reference and research stations with high quality instrumentation. This provides reliable data for quality control of the data generated using mid-cost stationary air quality monitors (to be placed on buildings) and lower-cost portable devices (to be carried on top of a backpack). The atmospheric models of real-time super-local information require operational steady flow of a multitude of inputs and outputs. Pollution surveyors in two areas have already completed their first engagement with HOPE.

Monitoring, modelling and surveyor activities are supported by the management team that oversees implementation, outreach and exploitation and strives to identify and manage risks. They also aim to harvest suitable opportunities, with the aim to successfully deliver and upscale HOPE.



Figure 1: Main characteristics of the three project localities.
From the top: Jätkäsaari, Valila and Pakila.
Source: the HOPE project

2. THE STATE OF HOPE

HOPE aims to empower citizens to develop their own districts, and to help them plan their lives based on empirical data, and on science-based information. HOPE develops participatory budgeting model that will involve users in co-designing, co-developing and co-choosing measures to improve air quality. In order for users to be able to make informed decisions, HOPE will provide science-based information about the status of air quality, and on individual's exposure to air quality, and will encourage users to measure air quality and contribute their data for the purposes of better high-resolution air quality and individual exposure models.

To date, HOPE was active in the following areas,

- Air Quality Monitoring
- Developing AQ Data Analysis

2.1 Delivering HOPE

HOPE is above all, about people (Fig. 2). They have the right to healthy environment, but their activities, and nearly all that is needed to ensure them adequate shelter, food and social condition, presents pressures on the natural environment and leads to increased levels of pollution. Thus, it should be a matter of personal choice: *what mitigating measures do I wish to prioritize to reduce the environmental consequences for me personally? And what am I willing to do to reduce air pollution for all?*

- Academic and Applied Research
- Air Quality Index 2.0
- Preparation of the Participatory Budgeting Exercise
- Innovation Competition for companies
- Data Visualization Applications
- Informing on Best Practices for Urban Planning
- Creating Awareness on Air Quality Issues
- Development of an end-user Green Path routing tool.

For better overview, these activities are described in four groups: Delivering HOPE, Sensing HOPE, Network of HOPE and Visualizing HOPE.

While the questions may seem obvious, the answers are all but simple. The air, a shifty substance, changes all the time. *How am I to know what is what? How do I know if I am in the harm's way right now, as for the most, air pollution does not smell too much anymore, and I cannot see it by naked eye? What can the City do about it? And what can I do?*

And for HOPE, how do we find the people who are interested in these questions?



Figure 2: Preparing for engagement with Pollution Surveyors in the Jätkäsaari area. Source: the HOPE project.

2.2 Sensing HOPE – surveyors in field

Volunteers are an indispensable part of the HOPE team. The HOPE researchers, in collaboration with other projects related to air quality active in the Helsinki area at the same time, have created an Air Quality Force tool for recruitment of volunteers to assess air quality. Addressing the public can easily create a public confusion and feel somewhat disrespectful, and thus three research projects funded from H2020 (Mobility Urban Value – MUV, SELECT for cities and Synchronicity), one project co-funded through the European Institute of Innovation and Technology and City of Helsinki) and HOPE are now using the same recruiting infrastructure¹.

Pollution surveyors from Jätkäsaari have already been involved. Twenty-five of 300 people recruited have used the sensor device (Fig. 3) over a period of three months ending in September 2019,

User feedback shows that 80% of surveyors in Jätkäsaari feel that air quality is good or satisfying, and based on their data, it was possible to generate a high-resolution map of average concentrations of pollutants including fine particles.

A group of 40 surveyors from Pakila is using the devices throughout January 2020, and Vallila residents will join later in 2020.

The surveyors are enabling a large field testing of the units (developed by University of Helsinki) while they are already contributing valuable data: the units are connected to a mobile phone, and several functionalities need to still be optimized for ease of user operation, and to optimize the connectivity of the collected data to models and other data sources.



Figure 3: HOPE lower-cost sensor system unit for monitoring of fine and respirable particles ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, carbon monoxide, temperature, barometric pressure, humidity, light and motion. Source: the HOPE project.

2.3 Network of HOPE

The Surveyors collect data while moving through the city. These data would in themselves not be enough to give an accurate picture of the state of the city air – we all move as it suits us without regard of systematic data collection. Thus, HOPE is also implementing a network of static state-of-the-art monitors for air quality (Fig. 4), supported by the local reference air quality monitoring stations and research air quality measuring activities. To be able to compare all the data

coming from different monitoring and measurement instruments, a quality system that is capable of tracing each observation system must be installed, and each monitoring instrument calibrated, either using procedures prescribed for reference stations, or using scientifically-based approaches there, where routines are not yet defined. In all, 30 mid-cost air quality monitoring instruments will be installed in the HOPE localities.



Figure 4: Static air quality monitors to be used in the HOPE network. From left: Vaisala AQT420, Pegasor AQ Urban. Source: the HOPE project.

2.4 Visualising HOPE

While much air quality information is already provided to the citizens of Helsinki, by the Helsinki Region Environmental Services Authority HSY² or even by the European Union³, this information is not easy to relate to daily activities of the inhabitants. HOPE will thus provide the surveyors specialized apps where they will be able to see the data they collect themselves, and data about their exposure such as individual exposure profiles (Fig. 5) or a map of cumulative exposure in the area during the project period (Fig. 6). This, however, is mostly work in progress.

Visualising real-time air quality for citizens and guiding them to take healthier routes in their daily travel is also part of the HOPE project. University of Helsinki is developing a Green Path

routing tool that recommends paths with less air pollution and traffic noise in Helsinki. The users may compare routes from the shortest to the healthiest and find their own optimal way. In the current stage of development, the tool shows the best walking paths and exposure times to real-time air quality (Air Quality Index, modelled by the Finnish Meteorological Institute) and average traffic noise classes (City of Helsinki data). In the next stages, it will cover also cycling network, its spatial scope will include full Helsinki Metropolitan Area, and the user interface will be adapted for Finnish users. The Green Path routing tool is publicly available from <https://green-paths.web.app/> (Fig. 7).

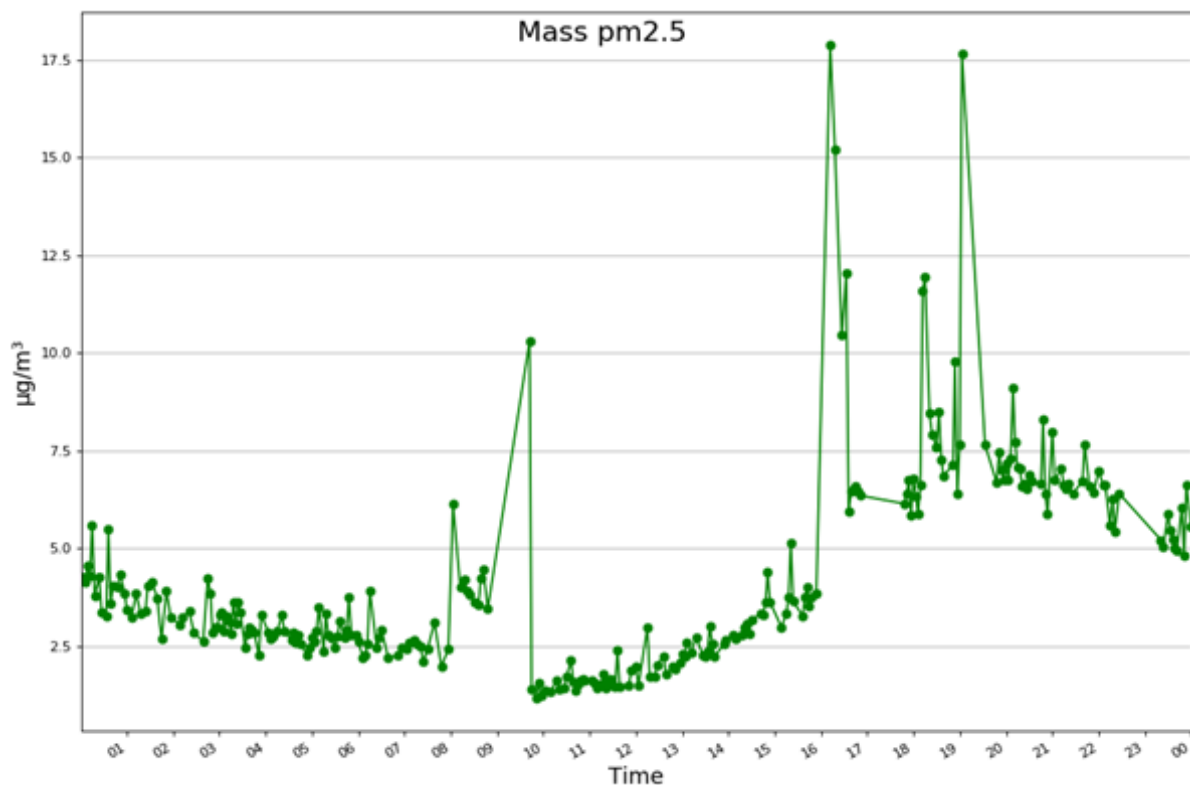


Figure 5: Exposure profile for fine particles ($PM_{2.5}$) of a participant on 18.11.2019. The peaks represent time when the person was outdoors or in traffic. Source: the HOPE project.

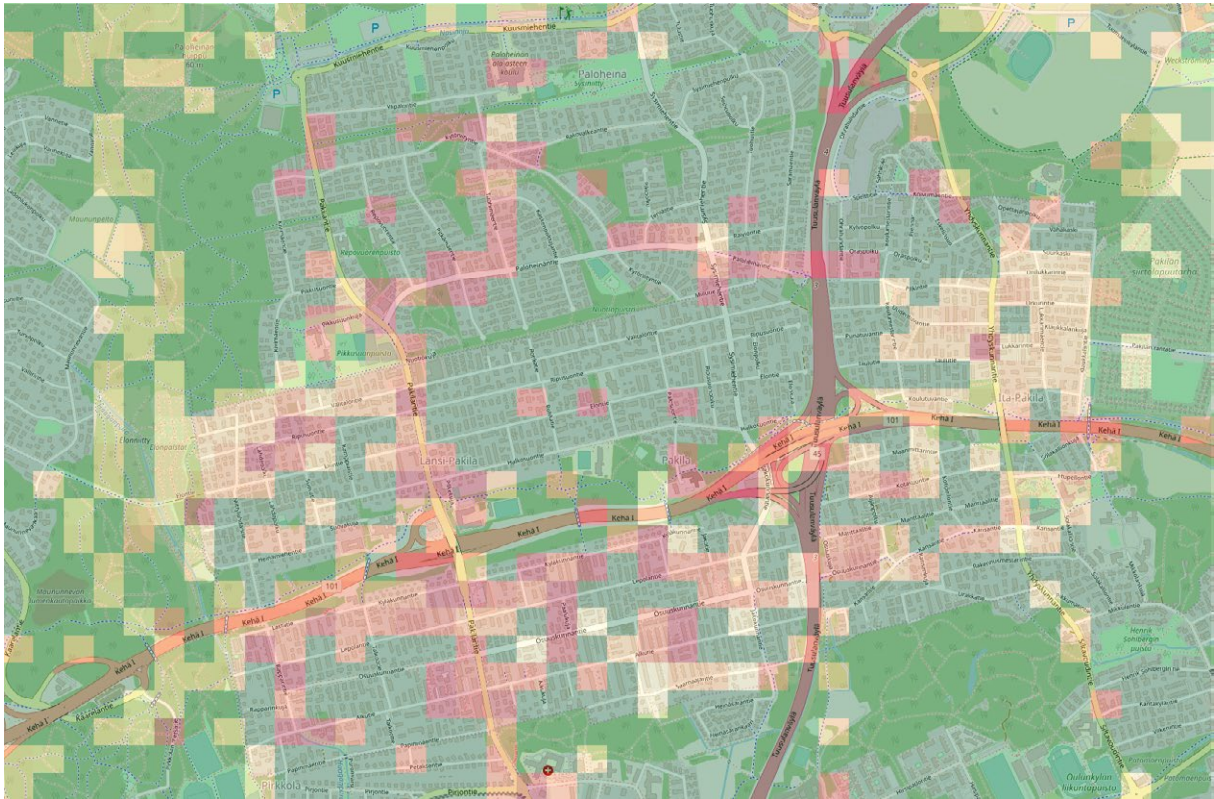


Figure 6: Map of exposure in the Pakila area during the three months November 2019-January 2020. Source: the HOPE project.

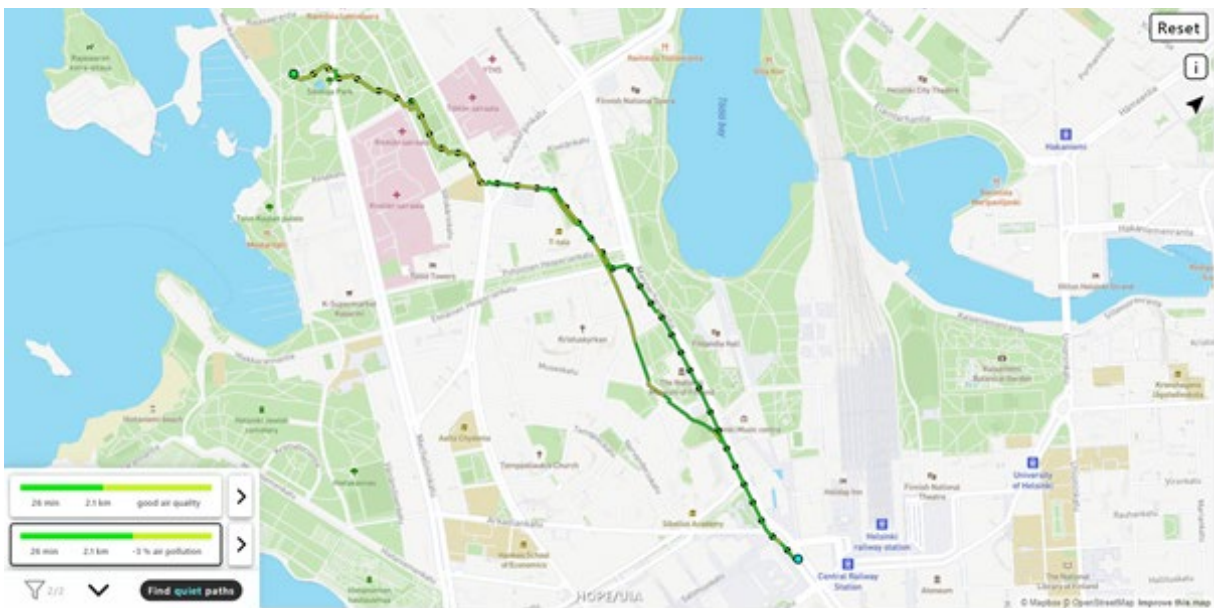


Figure 7: Green Path routing tool that is showing fresh air and quiet paths through Helsinki, and exposure times with walking speed. Source: the HOPE project.

3. WHY HOPE NOW

Air quality is an area with strong European legislation, and lately, also receiving interest of global organizations under the United Nations (UN), the World Health Organization, the World Meteorological Organization and the UN Environment Program. Air quality is also related to several Sustainable Development Goals⁴. It seems thus quite clear that maintaining good air

quality is one of the main priorities, further highlighted also by the connection between air quality and climate change: many sources of air pollutants are also sources of climate gases, and the same atmospheric processes influencing air quality also affect climate change. Combating air pollution and maintaining healthy air thus has multiple well documented benefits.

3.1 Air quality – a type of regulated goods

Air quality, and air pollution, has been regulated in Europe starting from the 1980s, with many ongoing efforts by the EC and the member states (https://ec.europa.eu/environment/air/index_en.htm). The regulations follow three tracks: there are source specific emission standards, national emissions ceilings, and air quality directives. As a result, the quality of air in Europe has much improved^{vi}. However, in cities, the air is not so clean: vehicular and other transport as well as local heating are the most important contributors

to reduced air quality. The European governance system mandates often cities with guardianship of air quality, but often does not connect cities to the national policy-making. This puts cities often in a difficult position, where they must find solutions themselves. To facilitate such work, the cities are forming powerful alliances (such as under the Covenant of Mayors, or within ICLEI). However, it is up to the individual cities' own ingenuity to address air quality, and UIA is one mechanism available for trying innovative solutions.

3.2 Air pollution in Helsinki

Helsinki air is clean quite often: the city lies in an open landscape by the sea, considers itself the natural capital of the world⁵ and enjoys generally better air quality than most capital cities of Europe⁶. So why should we address air pollution still? The “problem” is all of us: breathing is not the only thing we do, and air is not the only thing we need to survive: we need to be warm, to eat and to shelter ourselves from the elements, and thus we need to work, we travel around for work and family, we cater to our wellbeing (Fig. 8), and the list goes on and on. All these activities put pressure on the air – they generate emissions in a multitude of different ways. And while the wind

can blow these emissions away, the same wind can also blow into the city emissions from near and afar. The sun that shines so enjoyably can play us some serious tricks, well aided by other natural elements: the emissions can change on their way to our city, and as a result, in the city, we enjoy a cocktail served to us by nature using the ingredients we supplied. For Finland⁷, the consequences are 2% of attributable burden of disease and about 2000 premature deaths annually. Helsinki, among the top cities on the national air pollution statistics and the most populous place, of course stands for a fair share.



Figure 8: A public sauna – an example of a local air pollution source. Source: The HOPE project.

3.3 What does the City already do – and what should it do – to reduce air pollution?

The City of Helsinki is already deploying many interventions to improve air quality, especially to reduce levels of particulate matter (local heating and traffic) and traffic-related pollutants, such as nitrogen dioxide. They include various methods of street washing, dust binding, and use of friction-enhancing materials, individual mobility

measures and promotion of public transport, or interventions related to reducing emissions from local heating and promotion of using renewable energy. These measures, most of them with documented positive effects, are subject of discussion by the public, and will form a basis for participatory budgeting exercise.

4. ADDRESSING MAIN IMPLEMENTATION CHALLENGES OF HOPE

A large project with many (internal and external) stakeholders having to perform complex tasks over a limited period certainly faces many challenges. In order to succeed, all involved parties need to share a common vision and have the room to contribute to the best of their ability. There is also a considerable logistics to bring all

4.1 Leadership

The City's strategies (<https://www.hel.fi/helsinki/en/administration/strategy/strategy>) provide a clear guideline for the project and a leadership vision. In HOPE, the City of Helsinki executes clear leadership of a project, built on long-term partnerships for research and innovation, utilizing ground-breaking achievements of the local knowledge and technology partners.

The city is developing a hub of health and life sciences, innovative campuses and urban research platforms with several projects related to the challenge of air quality. HOPE is one of projects of the portfolio:

“Hope project is an excellent example of how the collaboration between different actors from business to scientist and to citizens can be built. At the same time, it showcases the possibilities of data utilization to create higher quality services that meet the individual needs of the users.” Anni Sinnemäki, Deputy Mayor for Urban Development of the City of Helsinki.

The leadership vision is translated into HOPE as a knowledge and learning organization. It is led with the help of frequent scheduled and

elements where they are useful at the right time. This generates a need for internal information in the team and in the participating organizations, to participants and for a general media presence (in the end, the project will serve citizens). The main challenges, as they appear near to the mid-term of the project, are described below.

unscheduled interactions of the project team, with the collaborating public, and with other stakeholders.

The knowledge partners (University of Helsinki and Finnish Meteorological Institute) are world leaders in assessment of local air pollution, recognized by the scientific community for their achievements. They have a long tradition of supporting the City in air quality management, which is supported by the mandated activities of the Helsinki region environmental services authority HSY.

The project has three technology-oriented partners. Vaisala are a global supplier of high-quality instrumentation, with decades-long tradition of high quality monitoring instrumentation development in the field of atmospheric observations. “UseLess Company” is a Finnish impact start-up that will encourage people to consume less and invest the money they save in a sustainable way. For HOPE, “UseLess” develops a platform and model, which encourages individuals to make actions that improve air quality, shows their impact in the environment, and enables participating in local

air quality efforts. Forum Virium Helsinki is the City of Helsinki innovation company. It co-creates urban futures with companies, universities, other public sector organizations and Helsinki residents. Forum Virium Helsinki's (FHV) mission is to make

Helsinki the most functional smart city in the world. FVH is responsible for recruiting residents and implementing innovative solutions through test beds.

4.2 Public procurement

HOPE benefits from a thoughtful consortium make-up: all the main necessary elements that could be subject of public procurement under other circumstances are provided by the project partners, many of them having a long tradition of collaborating with the City. When the project

implementation requires public procurement, as is the case for example, for specific services in app development, HOPE management team has provided procurement guidelines for all partners to relate to.

4.3 Organisational arrangements with the urban authority (cross-department working)

A dedicated project manager and project coordinator are embedded within the Helsinki City Administration, Department of Economic Development, <https://ilmanlaatu.eu/briefly-in-english/>. They are professionals trained in communication, social sciences and management,

and provide a firm management framework and appropriate tools to achieve the common objectives with common document repositories, monthly or bi-monthly consortium meetings and a number of working sessions for each work package.

4.4 Participative approach for co-implementation

New approaches to change in urban areas almost always require public participation, along with an active contribution of all project partners, and project owners or customers. HOPE is no exception. Through its "Delivering" activities, and well helped by the common recruitment platform, it engages inhabitants of three areas of Helsinki that between them cover the most typical urban situations in terms of land use – transport, built areas, and blue-green areas.

The volunteers in the project areas, the "pollution surveyors", are recruited to co-implement the project, and as part of their participation, receive information, instructions and training. They are however more than just vehicles of implementation: they are also asked for advice in terms of priorities for implementation of measures to be adopted by the City of Helsinki, and are participating in development of the HOPE tools.

4.5 Monitoring and evaluation

As part of the management system that is in place, HOPE dedicates a significant effort to project monitoring and evaluation. In addition to monthly follow-up of deliverables and milestones, this is done by identification of risks present in all

types of activities, and actively managing these. Because of this, HOPE has experienced only minor delays in the internal deliveries to be used in the next phase of the project.

4.6 Communication with target beneficiaries and users

Apart from the local communities, addressed in section Delivering HOPE, the project has a number of stakeholders, both internally in the organization of the City of Helsinki, and outside. These include scientific and technological organizations, SMEs, educational actors, NGOs and many other.

4.7 Upscaling

The City of Helsinki strives for their inhabitants to actively participate in the development of their local communities. HOPE is one of several activities and projects the City promotes and supports, that have the potential to empower the citizens for such participation. The tools, however, are of general nature: many require much input information not generally available, and for those, HOPE partners are developing approaches that would overcome this shortage⁸.

HOPE has developed a comprehensive dissemination and communication plan that will provide the first information about the project. In addition, HOPE will organize three Open Events for Business Community with the aim to promote creation of products based on air quality data and tools developed by the project.

Several tools are readily transferable, suitable for take-up by the industry and business community. The project has organized a Business community event (Fig. 9) and plans to repeat this activity. Thus, there are solid plans, and good potential, for HOPE to have impact beyond the three small neighbourhoods in Helsinki.



Figure 9: Presenting project to the Finnish business community at a dedicated event. Source: The HOPE project.

5. LESSONS LEARNED

After the first 16 months of the project, it is clear that the project partnership with clearly defined roles and meticulous preparations in the project development phase have paid off.

Firstly, the vision of the City of Helsinki leading to a development of an innovation ecosystem of the City of Helsinki allows to build a necessary critical mass of activities and long-term partnerships that have already invested much effort into learning how to work together, how to collaborate and how to deliver to the City results that can be used by the administration towards their goals on air quality and sustainability.

Secondly, the make-up of the partnership has made it possible to internalize the costs of the different technological tools rather than to embark on a often-difficult public procurement process which in many similar cases has been seen as taking more time and resources than planned and thus delaying all activities.

A professional project management and good management tools and procedures are another key factor of success. The large complexity of the project, and the size of the budget, necessitate good procedures and systems for follow-up as well as for internal information sharing. At this point, the procedures have enabled the project to stay on track despite its large complexity.

Any project that strives to include the public as an equal partner will face many challenges. For HOPE however, the project is able to utilize the

critical mass of research and development projects around the topic of air quality in Helsinki now and in the past. In these projects, the partners have developed tools and methods that now can be used by HOPE, and that allow the team to concentrate on the subject matter while the practicalities of implementation are informed by previous experiences.

The project sustainability needs to be considered already from the beginning of the project. The experience of the first 16 months of HOPE shows that being part of a continuum provided by the Helsinki innovation ecosystem provides access to many communication and dissemination channels, internally and externally, and brings in considerable experience on which to build. It makes the communication between the City and the project easier as the City already has experience with using the results coming from the innovation activities. It also allows to address the appropriate business communities using the established communication channels of the ecosystem. And not least, it provides links to activities in areas such as smart cities, digitalization or environmental protection that usually takes years to build. With partners centrally positioned in sustainability and upscaling activities of other projects in the ecosystem, HOPE had a good starting position, and is well on the way to achieve their goals.

6. NEXT STEPS

The project is nearing its mid-term, and most of the infrastructure is in place for testing in the 1st (Vallila) and 2nd (all three localities) round of fieldwork of the Pollution Surveyors, and in new engagement activities. For example, development of air pollution index 2.0, or of the area exposure profiles, offer an exciting opportunity to assess and compare pollution situations across neighbourhoods. As the project manager Jussi Kulonpalo puts it:

“In the first sixteen months we have achieved our first main concrete project milestones by designing our mobile air quality monitor devices and starting the citizen measurements, planned and built the three local stationary measuring networks.”

The next project phase now will have much more emphasis on involving the citizens participation and local companies which will be challenging but we are also much looking forward to the interaction and getting the feedback from the people. We are doing the project for the citizens of Helsinki, after all.”

Being able to see where highest exposures occur, perhaps we will in the future be able to change our behaviour – move differently through the city or generate less pollution from local heating by learning how to fire our stoves more efficiently. Such tools do not exist yet, but offer a great potential. It will certainly be exciting to follow the surveyors’ activities, and to see what new knowledge we all may gain from their results.

Endnotes

¹ <https://forumvirium.fi/ilmanlaadulla-on-merkitysta/>

² <https://www.hsy.fi/en/residents/theairyoubreathe/Pages/default.aspx>

³ <https://airindex.eea.europa.eu/>

⁴ <https://ec.europa.eu/environment/air/policy/index.htm>

⁵ <https://finlandnaturally.com/helsinki-area/>

⁶ EEA (2019) Air quality in Europe – 2019 report. European Environmental Agency

⁷ Lehtomäki, H. et al (2019) *Int J Environ Res Public Health*. 2018 Apr; 15(4): 736. Published online 2018 Apr 12. doi: 10.3390/ijerph15040736

⁸ For example, the Enfuser modeling system, <https://forumvirium.fi/en/5-steps-to-adopt-the-enfuser-air-quality-model/>, is being developed for use in nearly any location.

Urban Innovative Actions (UIA) is an Initiative of the European Union that provides urban areas throughout Europe with resources to test new and unproven solutions to address urban challenges. Based on article 8 of ERDF, the Initiative has a total ERDF budget of EUR 372 million for 2014-2020.

UIA projects will produce a wealth of knowledge stemming from the implementation of the innovative solutions for sustainable urban development that are of interest for city practitioners and stakeholders across the EU. This journal is a paper written by a UIA Expert that captures and disseminates the lessons learnt from the project implementation and the good practices identified. The journals will be structured around the main challenges of implementation identified and faced at local level by UIA projects. They will be published on a regular basis on the UIA website.



Urban Innovative Actions

Les Arcuriales
45D rue de Tournai
F- 59000 Lille

+33 (0)3 61 76 59 34
info@uia-initiative.eu
www.uia-initiative.eu

Follow us on **twitter**
@UIA_Initiative
and on **Facebook**.