# Implementation plans for the iSCAPE living labs

**D2.2**
May/2017

*This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689954.*

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| **Project Name and Acronym** | Improving the Smart Control of Air Pollution in Europe - iSCAPE | |
| **Grant Agreement Number** | 689954 | |
| **Document Type** | Report | |
| **Document version & WP No.** | V. 05 | WP2 |
| **Document Title** | **Implementation plans for the iSCAPE living labs** | |
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| **Release date** | May 31, 2017 | |



| **Document Control Page** | |
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| **Short Description** | This report summarizes the iSCAPE approach to living labs. It describes the main considerations we made to establish our living labs and presents the implementation plans for each iSCAPE living lab. In addition, it discusses the key elements we considered to design our living lab pilot projects. The approach described in this report, especially the key elements used to describe the living lab projects can be used to design future projects and living lab |

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| | activities.<br>This report has been produced as part of the WP2 and forms the deliverable D2.2. | | |
| **Review status** | **Action** | **Person** | **Date** |
| | Quality Check | Anja Maerz (FCC, WP2 lead)<br>Francesco Pilla (UCD) | May 23, 2017 |
| | Internal Review | Guillem Camprodon (IAAC)<br>Ines Vaittinen (ENoLL) | May 16, 2017<br>May 15, 2017 |
| **Distribution** | Public | | |

| Revision history | | | |
|---|---|---|---|
| **Version** | **Date** | **Modified by** | **Comments** |
| V0.1 | April 27, 2017 | Santa Stibe | First draft |
| V0.2 | May 5, 2017 | All | Revision of the living lab implementation plans |
| V0.3 | May 9, 2017 | Santa Stibe | Consolidated version for the internal review |
| V0.4 | May 22, 2017 | All | Revision of the report, integration of the comments and feedback from the internal reviewers |
| V0.5 | May 23, 2017 | Santa Stibe | Final version for the quality check and submission |

# Table of Contents



# List of Tables



# List of Figures

# List of abbreviations

**ARPAE** - AGENZIA REGIONALE PER LA PREVENZIONE, L'AMBIENTEE L'ENERGIA DELL'EMILIA- ROMAGNA

**DCC** - DUBLIN CITY COUNCIL

**ENoLL** - EUROPEAN NETWORK OF LIVING LABS

**FCC** - FUTURE CITIES CATAPULT LIMITED

**FMI** - ILMATIETEEN LAITOS

**IAAC** - INSTITUT D'ARQUITECTURA AVANCADA DE CATALUNYA

**LBW –** LOW BOUNDARY WALL

**PCS** – PASSIVE CONTROL SYSTEMS

**PURETI** - NANOAIR SOLUTIONS S.L.

**TCD -** THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN

**TUDO** - TECHNISCHE UNIVERSITAT DORTMUND

**UCD** - UNIVERSITY COLLEGE DUBLIN, NATIONAL UNIVERSITY OF IRELAND, DUBLIN

**UH** - UNIVERSITEIT HASSELT

**UNIBO** - ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA

**UoS** - UNIVERSITY OF SURREY

**WP** – WORK PACKGE

# 1 Executive Summary

This report summarizes the iSCAPE approach to living labs. It describes the main considerations we made to establish our living labs and presents the implementation plans for each iSCAPE living lab. In addition, it discusses the key elements we considered to design our living lab pilot projects. The approach described in this report, especially the key elements used to describe the living lab projects can be used to design future projects and living lab activities.

This report has been produced as part of the WP2 and forms the deliverable D2.2. Activities that have contributed to the development of this report include:

- Assessment of infrastructural and behavioural interventions, as well as identification of city challenges and opportunities that have been carried out as part of the WP1 activities.
- Direct involvement of the project partners and learning from their previous experience and knowledge.
- Engagement workshops with both internal and external project stakeholders (organized by FCC), including information reported in the Deliverable 2.1 “Stakeholder analysis and risk assessment”.
- Living lab literature review and examination of several case studies.

The living lab activities described in this report are interrelated with other project activities. For example, stakeholders have been analysed and risks and barriers to the implementation of living labs and their interventions have been assessed as part of the Deliverable 2.1. This assessment has been considered and integrated into the implementation plans that are further detailed in the report. The stakeholder management plan will be presented in the Deliverable 2.4. This report provides a strong foundation for developing management strategies to effectively engage different stakeholders throughout the implementation of living lab projects. Furthermore, the WP3 and WP4 build upon the implementation plans for each living lab that are presented in this report. For example, the Deliverable 3.3 will focus on the iSCAPE interventions and provide the assessment of Passive Control Systems (PCS) in greater detail. Behavioural interventions will be further assessed in the Deliverable 4.1. Intervention monitoring activities and the assessment of the environmental and socio-economic impact are included in the scope of WP5. Task 5.4 is dedicated to the sustainability of living labs. Knowledge developed by our living labs is gathered and further exploited as part of the Task 7.5 activities. Work progress oversight and quality assurance is part of the WP9 – Management and Coordination.

# 2 Introduction

The potential for societal and innovative development through co-creation in all sectors of society is widely recognised and the current socio-economic context, despite many difficulties, provides for manifold opportunities to fully exploit it (European Commission, 2017). For example, Horizon 2020, the biggest EU Research and Innovation programme ever with nearly EUR 80 billion of funding available over 7 years (European Commission, 2017), widely incorporates open innovation, citizen involvement, and real-life experimentation and piloting with users in talking social challenges and addressing cross-cutting issues. Even more so, specific calls of the H2020 programme directly recommends living labs as an experimentation and innovation instrument for application in such areas as smart cities, urban development, and international cooperation to encompass societal and innovative development opportunities within public-private-people partnerships.

Today, there are over 150 active living lab members in the European Network of Living Labs (European Network of Living Labs, 2017) representing the following thematic areas:

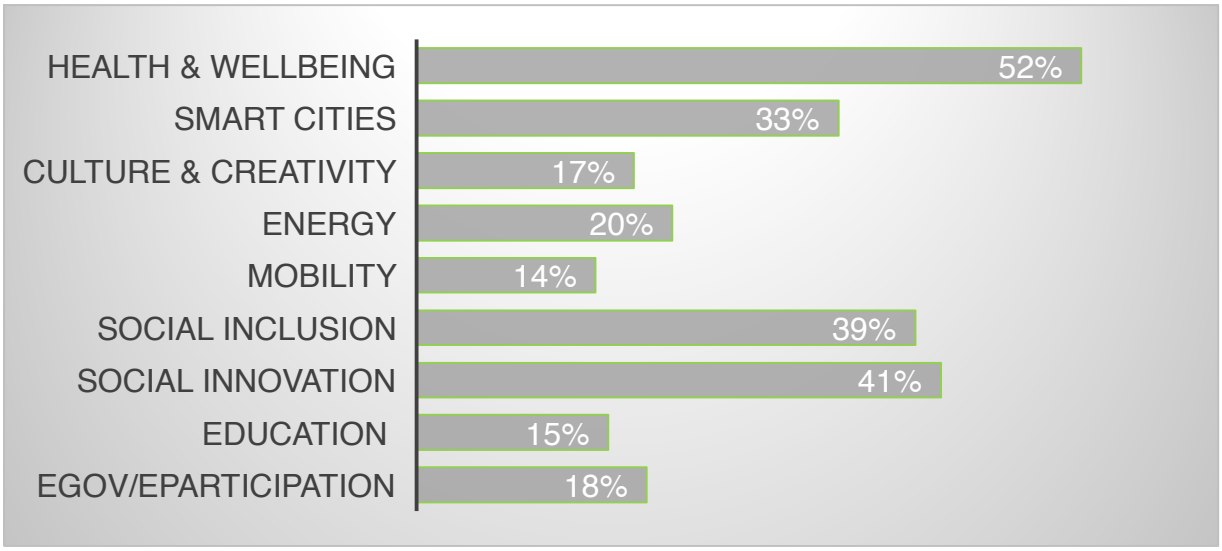


*Figure 1: Thematic areas of the active ENoLL members, 150 (European Network of Living Labs, 2017)*

Living labs acting in a domain of healthcare and wellbeing, for example, focus on innovative socio-technical systems and solutions for health and wellbeing. Smart city living labs, among other activities, aim to boost the urban agenda by using citizen-driven innovation processes and facilitating strong collaboration with public bodies, bottom up and grassroots movements. There are also a great number of living labs that deliver innovative, co-created solutions aimed at tackling social challenges through social innovation. These initiatives are socially inclusive and facilitate value co-creation with local stakeholders. (European Network of Living Labs, 2017)

Even though there are many examples of living labs aiming to enhance the quality of life and wellbeing through a wide range of activities, there are only a few living lab initiatives aiming to improve human health and wellbeing by improving air quality and reducing carbon footprint. It can't be stressed enough that air pollution is a major environmental risk to health (World Health Organization, 2016).

Intel Collaborative Research Institute Living Labs' initiative (ICRI) is one of the examples where the living lab approach has been used to monitor air quality. The ICRI Living Labs are working with the London Borough of Enfield to monitor air quality and collect real-time information at badly-polluted junctions (London City Hall, 2017). This information then is used by the council to develop new programmes to improve air quality across the area. One of these programmes, for example, provides information to local drivers to help them avoid these pollution hotspots.

iSCAPE, however, exceeds any of previous living lab efforts aimed at improving air quality in terms of the ambition, scale, and complexity of the project. Compared to the previously mentioned living lab activities, iSCAPE aims at reducing urban pollution and climate change negative impacts by leveraging passive control systems, behavioural change, and living lab approach. Seven living lab projects in the six European cities are being created to achieve iSCAPE's objectives.

This report summarizes the iSCAPE approach to living labs. It describes the main considerations we made to establish our living labs and presents the implementation plans for each iSCAPE living lab. In addition, it discusses the key elements we considered to design our living lab pilot projects. The approach described in this report, especially the key elements used to describe the living lab projects can be used to design future projects and living lab activities.

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# 3 iSCAPE approach to living labs

The overall objective of iSCAPE is to develop an integrated strategy for air pollution control in European cities that is grounded on evidence-based analysis. iSCAPE aims at reducing urban pollution and climate change negative impacts by leveraging passive control systems, behavioural change, and living lab approach.

***Passive Control Systems:*** these include physical interventions such as low boundary walls, trees, hedge-rows, green walls and roofs, photocatalytic coatings, green urban spaces, and road geometry interventions.

***Behavioural Change:*** this set of interventions include (1) actions to promote changes in transport mode choice for EU citizens and (2) actions to promote changes in activity patterns.

*Figure 2: iSCAPE living labs*

These interventions will be assessed in the following ***living labs*** across the EU:

- Bologna, Italy
- Bottrop, Germany
- Dublin, Ireland
- Guilford, UK
- Hasselt, Belgium
- Vantaa, Finland

In research and practice, a lot of different definitions have been proposed for what a living lab is. Living labs have been described as a methodology, an organization, a system, an arena, an environment, a systemic innovation approach (Bergvall-Kåreborn and Ståhlbröst, 2009).

ENoLL defines living labs as:

> User-centred, open innovation ecosystems based on a systematic user co-creation approach, integrating research and innovation processes in real life communities and settings. (European Network of Living Labs, 2017)

According to Leminen:

> Living labs are physical regions or virtual realities, or interaction spaces, in which stakeholders from public-private-people partnerships (4Ps) of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products and systems in real-life contexts. (Leminen, 2013)

Schuurman (2015) describes living labs as an organized approach (as opposed to an ad hoc approach) to active user involvement by means of different methods involving multiple stakeholders, as is implied in the Public-Private-People character of living labs.

Bergvall-Kåreborn and her colleagues have proposed the following definition:

> Living lab is a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values. (Bergvall-Kåreborn et al., 2009)

However there exists no coherent definition, living labs are driven by two main ideas: involving users as co-creators on equal grounds with the rest of participants and experimentation in real-world settings (Almirall, Lee and Wareham, 2012).

Even more so, we see these definitions being rather complementary than contradicting, and therefore conclude that living labs are both practice-driven organisations that facilitate and foster open, collaborative innovation, as well as real-life environments or arenas where both open innovation and user innovation processes are studied and new solutions are co-created (European Network of Living Labs, 2017).

Considering complexity of living lab activities and relationships between different stakeholders, we further distinguish between three different levels of analysis within the living lab phenomena. The levels of analysis as suggested by Schuurman (2015) are: macro, meso and micro level.

| Level | Description | Research Paradigm |
|---|---|---|
| Macro | Living lab constellation consisting of organized stakeholders (PPP-partnership) and/ or infrastructure | Open Innovation: knowledge transfers between organizations |
| Meso | Living lab innovation project | Open & User Innovation: real-life experimentation, active user involvement, multi-method and multi-stakeholder |
| Micro | Living lab methodology consisting of different research steps | User Innovation: user involvement & contribution for innovation |

*Table 1: Living lab levels of analysis by Schuurman (2015)*

To fully embrace the living lab approach, we have considered and assessed our action plans following these three interrelated levels of analysis. First, in this report, we present our living labs as seen from the macro perspective. Then, we summarize our living lab pilot projects considering both meso and micro levels.

In the next chapter, we discuss the living lab elements that we have considered to design our pilot projects.

## 3.1 Common living lab elements

In iSCAPE we have considered the following characteristics as essential and defining for our living lab activities:


*Figure 3: Common elements in living labs (European Network of Living Labs, 2017)*

***Active user involvement***

The engagement of users is fundamental in living lab activities in order to develop products and services that meet user needs and desires. In iSCAPE we aim to design our solutions not only *for* citizens but also design these solutions *with* them. This way, user involvement is not limited to passive feedback, gathered through different voice-of-the-customer methods. Our approach is rather co-creative and we encourage all relevant stakeholders to work together.

To keep users motivated and engaged, however, it is important to know what drives users to participate and contribute to living lab activities as living lab efficiency is based on the creative power of user communities (Bergvall-Kåreborn and Ståhlbröst, 2009).

Ståhlbröst and Bergvall-Kåreborn (2011) based on their literature study argue that there is a notable difference between motivational factors within different categories of innovation communities. For example, in brand communities, the motivators are *interest in innovation activities*, *creative personality*, and *wish to be recognized by the firm*. In beta- test communities, they are *altruism, curiosity, making a difference, being a forerunner, and satisfying a specific need*. *Monetary rewards* and *recognition for ideas* are the motivators in innovation intermediaries. The study conducted in the Botnia Living Lab that is further presented in the same article, demonstrates that *learning something new, testing innovative products and services, curiosity, winning something*, and *being entertained* are important factors that keep members of Botnia Living Lab motivated to participate in their living lab activities.

What we can learn from the research described above is that users have different expectations, engagement, and intentions with their participation in different communities; hence, it is important to understand what is important for the users in that specific context (Ståhlbröst and Bergvall-Kåreborn, 2011).

***Real-life setting***

Living labs indicate activities that take place in a “real-life” environment as opposed to a laboratory setting. Both researchers and practitioners have recognized the importance of evaluation and testing of products or services in such environments. As outlined by Veeckman et al. (2013), users should be studied within a real-life context, which implies a familiar context that reflects users’ natural environment as much as possible.

Coorevits and Jacobs (2017) suggest to consider several dimensions of context when designing living lab projects: temporal context (described as the user interaction with the system in relation to time), physical context (described as the apparent features of a situation or physically sensed circumstances in which user/ system interaction takes place), technical/ information context (described as the relation to other services and systems relevant to the user’s system), social context (described as - other persons present, their characteristics and roles, the interpersonal interactions and the culture surrounding the user systems interaction), as well as task context (described as the tasks surrounding the user interaction with the system). When applied, the contextual dimensions and their properties provide more comprehensive insights into factors that influence user experience.

***Multi-stakeholder participation***

In living labs users and other partners from academia, businesses, and public sector work together creating products and services in a way they match users' needs. Living lab projects connect a great variety of different actors by facilitating collaboration and knowledge sharing between them. Multi-stakeholder participation provides opportunities to align different interests and expectations, as well as brings together multidisciplinary expertise and experience. Developing an innovation is a process of understanding, learning and sharing among the involved stakeholders (Ståhlbröst and Holst, 2017).

When creating a living lab ecosystem, it is important to create and share value within the ecosystem. As stated by Veeckman et al. (2013), there should be an added value for all partners involved, in order to create a long-term stakeholder engagement and identification with the living lab.

Partnerships and collaboration networks are important aspects related to the sustainability of a living lab (Bergvall-Kåreborn et al., 2009). Successful collaboration builds on trust and takes time to build on. It fosters the sense of consensus and ownership of outcomes across the living lab community.

***Multi-method approach***

Living labs involving different partners as co-creators in the innovation processes face challenges arising from different knowledge, expertise, and needs of involved actors. Thus, methods and tools used by living labs for co-creation, collaboration and communication are substantial. Even more so, living lab effectiveness is directly related to the capacity of methods employed in mediating user insights and participation (Almirall and Wareham, 2008).

There is a broad variety of methods and tools used to support innovation processes in living labs. According to Leminen and Westerlung (2017), more experienced living labs tend to use standardized tools but emerging living labs on contrary follow a more customized approach. In their paper, Leminen and Westerlung (2017) propose a framework for categorizing living labs based on their innovation process (incremental vs linear) and tools (standardized vs customized).

They further argue that:

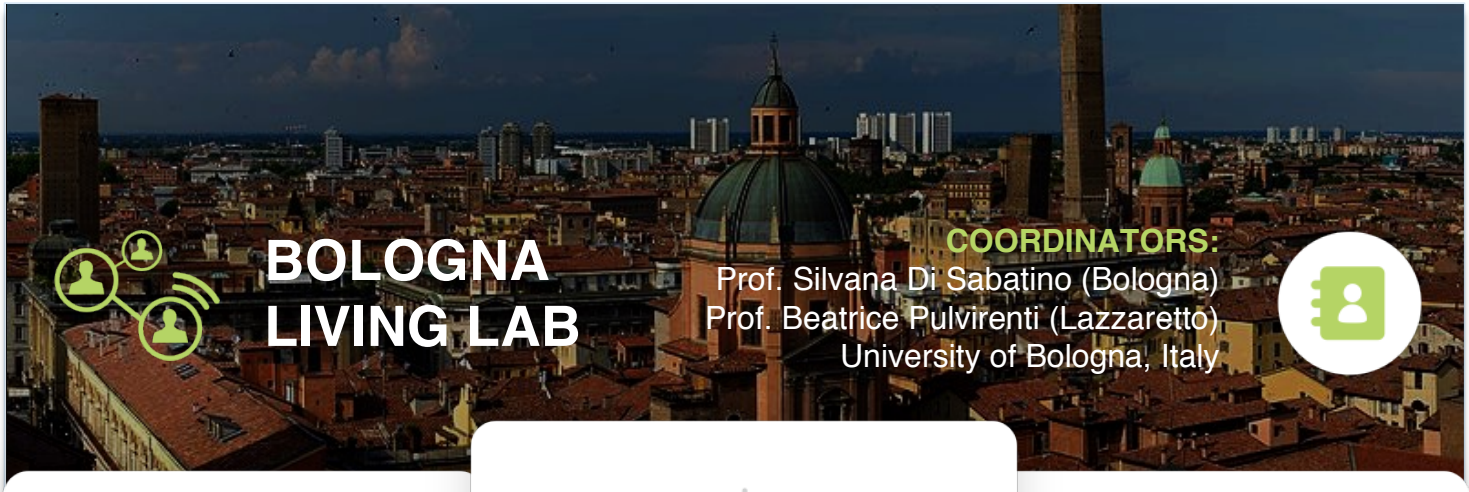
1. Standardized tools decrease the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes in living labs.
2. A predefined linear innovation process decreases the complexity of innovation activities, and decreasing complexity leads to predefined incremental innovation outcomes.
3. Adopting an iterative, non-linear innovation process and customized tools for innovation activities increase the likelihood of an undefined and a novel innovation outcome. (Leminen and Westerlung, 2017)

***Co-creation***

Co-creation is the central process for value creation in living labs. Different stakeholders have different value perceptions and propositions, creating heterogeneity across their value spectrum (Hagy, Morrison and Elfstrand, 2016). Co-creation however, links distributed sources of knowledge and creates value for the mutual benefit of stakeholders involved (Veeckman et al., 2013).

Greve and her colleagues have identified a list of factors that can facilitate co-creation based on their literature review (Greve et al, 2016). They include attitudal factors, willingness to co-create, social context, perceived relevance to the service/ product, capabilities, skills and motivation, type of service/ product, participation and involvement, expected benefits, dialogue and relationships, resources and facilities.

# 4 Bologna Living Lab



## BOLOGNA LIVING LAB

**COORDINATORS:**
Prof. Silvana Di Sabatino (Bologna)
Prof. Beatrice Pulvirenti (Lazzaretto)
University of Bologna, Italy

### FOCUS

Air quality mitigation based on urban vegetation & trees

Assessment of solutions against climate change

Microclimate modelling

Sensing and monitoring through new technologies

### VISION

Bologna Living Lab aims to raise awareness about air quality and **impact of passive control systems** to reduce air pollution.

### PILOT PROJECTS

Street canyons (Bologna)

Photocatalytic coating (Lazzaretto)

## 4.1 Street canyons

### MOTIVATION & CHALLENGE

Green infrastructure as one of the passive control measures provide a number of benefits to cities and their residents. Trees, in particular, reduce carbon footprint, remove pollutants, release oxygen, as well as are aesthetically enjoyable. However, there are also some disadvantages. Trees in street canyons can amplify pollutant concentration at street level, they might contribute to the accumulation of traffic-related pollutants, as well as might reduce ventilation, pollutant dispersion, and dilution.

We believe that awareness about air quality and effectiveness of trees to reduce air pollution could be increased by providing evidence-based data and actively involving and informing citizens, local city stakeholders, and policy makers.

### ACTION PLAN, TOOLS & METHODS

We will address this challenge by:

1) Gathering data and assessing the role of trees on atmospheric circulation and pollutant distribution in a real urban environment.

   Two experimental campaigns in the real street canyons will take place. These campaigns will last for 2-3 weeks.

   To measure pollutant concentration (O3, NO2, $NO_x$, PM10, PM2.5, CO), we will use a van equipped with instruments measuring the concentration and vehicular fluxes. A tower equipped with thermocouples, thermos-hydrometers, radiometers, LI-COR analysers and anemometers will be used to measure the wind circulation, temperature and humidity inside and above the canyon. Thermal camera and ceilometer will provide instant measurements of the radiative temperature from buildings exposed to direct sunlight while demonstrating the boundary layer height and other conditions. This includes, for example, the immediate layer of the atmosphere where typically pollutants are released and dispersed.

2) Involving city stakeholders.

Regular meetings and consultation with city stakeholders have been planned. City stakeholders are well-informed about the project activities and have contributed to the project design.

3) Engaging with local citizens.

Several citizen engagement activities have been planned to inform and educate citizens about air quality. They include the sharing real time data about air pollution in these streets and organizing informative pop-up events. These events are planned prior to, during and after the experimental campaigns. In addition, potential collaboration and synergies with Urban Center Bologna have been considered to organize larger citizen engagement initiatives aimed at increasing their awareness about air quality and pollution.

***SOLUTION & VALUE PROPOSITION***

Evidence-based data on impacts of green infrastructure and trees, in particular, will be gathered in a real urban environment. We will not only disseminate research results of our comprehensive study to citizens and policy makers but also actively engage them in activities to solve air quality issues in Bologna.

***TIME & IMPLEMENTATION SCHEDULE***

1st campaign: July – August, 2017

2nd campaign: February - March, 2018

City stakeholder engagement: November 2016 – ongoing, regular meetings

Citizen engagement:

- Prior the campaign: publicity and educational workshop;
- During the campaign: real-time data sharing;
- After the campaign.

***LOCATION & PHYSICAL INFRASTRUCTURE***

Street canyons in Bologna considered for the campaigns:

- Marconi street (tree-less canyon)
- Laura Bassi Veratti street (canyon with trees)

***STAKEHODLERS & COLLABORATORS***

University of Bologna

ARPAE

City Hall

Urban Center Bologna

## 4.2 Photocatalytic coating - Lazzaretto

***MOTIVATION & CHALLENGE***

The photocatalytic coating is an environmentally friendly technology that can positively contribute to reducing air pollution. There is a variety of applications and benefits associated with this technology, for example, air and water purification, odour elimination, and self-cleaning effect. A lot of these applications have made their way to commercial products already. However, to facilitate adaption of the technology, awareness about the impact and effectiveness of this technology should be increased.

We believe that awareness about air quality and impact of the photocatalytic coating to reduce air pollution could be increased by providing evidence-based data and actively involving citizens and local city stakeholders and policy makers.

***ACTION PLAN, TOOLS & METHODS***

To achieve this, we will adopt the following steps:

1) Application of the photocatalytic coating

   Photocatalytic coating will be applied to the buildings located in the campus of Engineering and Architecture Department of the University of Bologna – Lazzaretto. We will use the products of PURETI that aim to catch pollutants through chemical reactions that are facilitated by the special

coating.

2) Data gathering and impact assessment based on extensive testing in a real-life setting

3) Citizen engagement activities

Considering the specific location of our test site, we plan to engage with students and employees of the university. This will be achieved by organizing informative and interactive events for example, environment-oriented movie projections and educational sessions. In addition, potential collaboration and synergies with an existing Living Lab in Bologna and Urban Center Bologna have been considered to organize larger citizen engagement initiatives aimed at increasing their awareness about air quality and pollution.

4) City stakeholder engagement

Regular meetings and consultation with city stakeholders have been planned. City stakeholders in particular are interested in the project results to consider the application of this technology on a wider scale inside and outside the campus.

***SOLUTION & VALUE PROPOSITION***

Evidence-based data will be gathered to demonstrate the effectiveness and eco-sustainable value of the photocatalytic coating to reduce pollutant concentration in urban areas. The implementation of this environmentally-friendly solution in the city of Bologna will provide a benchmark and dataset for other European cities aiming to reduce air pollution.

***TIME & IMPLEMENTATION SCHEDULE***

Application of the photocatalytic coating: it will be decided together with PURETI - May/ June, 2018.

Data gathering: 6 months before and 6 months after the application of the photocatalytic coating

Citizen engagement: November 2016 – ongoing, regular meetings

City stakeholder engagement:

- Prior the campaign: publicity and educational workshops;

- During the campaign: real-time data sharing;
- After the campaign.

| | |
|---|---|
| ***LOCATION & PHYSICAL INFRASTRUCTURE*** | Lazzaretto – campus area of Engineering and Architecture Department of the University of Bologna |
| ***STAKEHODLERS & COLLABORATORS*** | University of Bologna<br>ARPAE<br>PURETI<br>City Hall<br>Urban Center Bologna<br>Terracini in transizione Living Lab |

# 5 Bottrop Living Lab


## FOCUS

Urban planning & design

Urban greening

Citizen involvement in spatial planning

## VISION

Bottrop Living Lab aims to **involve citizens** and local stakeholders in **city greening** initiatives. The objective is to improve **air quality**, as well as enhance **wellbeing** of local citizens.

## PILOT PROJECTS

Wandering trees ("Wanderbäume")

© Su Gin Ong, „walking tree alley"; Green City e.V. Munich

## 5.1 Wandering trees

### MOTIVATION & CHALLENGE

General awareness about climate change in the city is high with the creation of 'Modelstadt Bottrop' within the initiative 'Innovation City Ruhr'. As part of this initiative Bottrop has worked with its citizens on a vision for their city for 2030. Nevertheless, the citizens are not informed very well about the specific topic of air pollution. As the city of Bottrop has the last active coking plants in the Ruhr Area, the invisibility of air pollution nowadays – compared to the very dirty air in the city when coal mining was still in operation – is the main challenge to cope with. In addition, frequent car usage adds to this contamination.

We aim to increase citizen's awareness on how greener cities can improve air quality and reduce air pollution and at the same time improve the city's attractiveness. We believe in empowering citizens to generate ideas and come up with solutions that tackle these challenges and make their city greener.

### ACTION PLAN, TOOLS & METHODS

During our project, "Wandering trees" – 15-20 trees in pots (mobile trees) will be moved from the city centre to the surrounding districts of Bottrop. The intervention enables the citizens to experience the advantages of city trees first-hand for a certain amount of time. This project implementation requires:

1) City stakeholder engagement

City stakeholder engagement is pivotal to the project success. The city administration provides additional funding to the project implementation by sponsoring the trees. Additionally, the city administration is actively engaged in co-creation activities to generate ideas and develop solutions for the greener city. Regular working group meetings and insight activities with the city stakeholders are planned.

2) Parades of "Wandering trees"

The parades will be organized involving local citizens and the urban gardener's association – Verein GemeinSinnschafftGarten. The success of the

"Wandering trees" parade depends on comprehensive participation processes. We plan to organize workshops throughout the project where the citizens develop the routes of the trees throughout the city. Furthermore, the citizens should be activated to escort the trees on their way, water them when needed and experience the advantages of a greener city. The parades should also raise the citizens' awareness of green infrastructure's impact on air quality.

3) Ongoing co-creation activities and research

We plan to engage with the local citizens, communities and city administration in co-creation activities to generate ideas on how to keep these events feel new and interesting. In addition, we aim to investigate citizens' motivation and willingness to participate in city greening and urban planning processes.

***SOLUTION & VALUE PROPOSITION***

A similar "Wandering trees" project is already implemented in Munich, Germany since 1992. The City of Bottrop is able to learn from their experience and knowledge in engaging citizens and local communities into such a project.

"Wandering trees" will use active citizen involvement as a vehicle to increase the citizens' awareness of air pollution in the city and raise their acceptance of urban green. It is anticipated that this acceptance will result in the permanent planting of some of the temporary "Wandering trees" like in Munich. "Wandering trees" motivate citizens to take part in creating the city's future.

***TIME & IMPLEMENTATION SCHEDULE***

City stakeholder engagement:

- City stakeholder workshop: February, 2017
- Ongoing involvement: bimonthly meetings

Citizen engagement and participation research: September - October, 2017

Ongoing co-creation & research: September, 2017-February, 2018

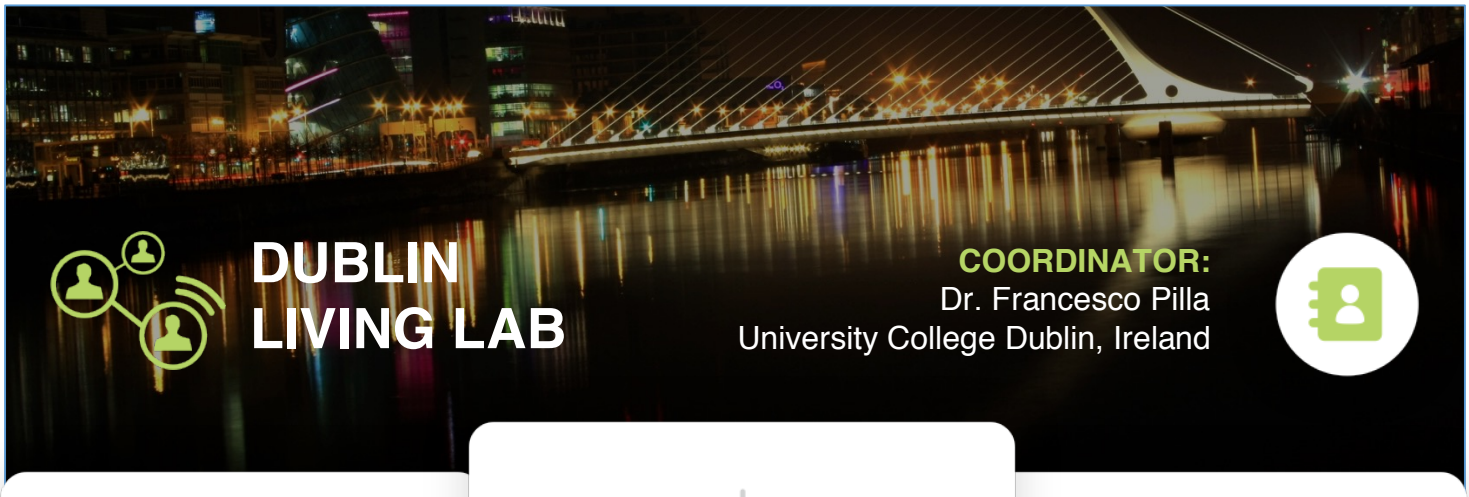
Purchase of wandering trees & organization of

parades: March - May, 2018

Parades of “Wandering trees”: May - September, 2018, every 4-6 weeks

| | |
|---|---|
| ***LOCATION & PHYSICAL INFRASTRUCTURE*** | Bottrop City - Parades of "Wandering trees” are planned to move around the entire city |
| ***STAKEHODLERS & COLLABORATORS*** | Technical University of Dortmund<br>City administration – Department for Environment and Green<br>Urban Gardener’s association – Verein GemeinSinnschafftGarten<br>Local residents |

# 6 Dublin Living Lab



## DUBLIN LIVING LAB

**COORDINATOR:**
Dr. Francesco Pilla
University College Dublin, Ireland

### FOCUS

Urban interventions both physical & policy-based

Sensing and monitoring technologies

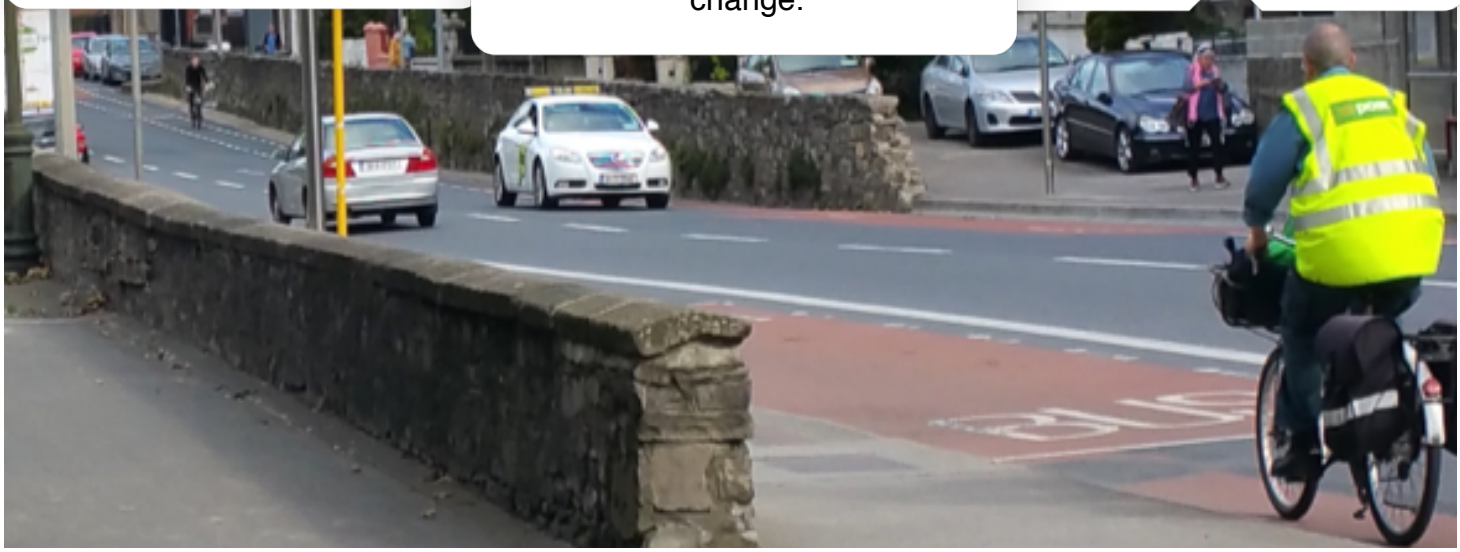
Modelling

### VISION

Dublin Living Lab aims to enhance the **dialog** between different stakeholders and ensures that **people's voices** are heard to generate **solutions** that address such **wicked problems** as air quality and climate change.

### PILOT PROJECTS

Low Boundary Wall



## 6.1 Low boundary wall

***MOTIVATION & CHALLENGE***

We believe that low boundary walls (LBWs) could provide a low-cost solution to reduce exposure to air pollution for pedestrians. Such an intervention could be designed in a way that it serves multiple purposes and the benefits of a low boundary wall provided to all, especially vulnerable populations, surpass concerns.

Thus, by conducting this long-term study, we aim to provide evidence on the effectiveness of a low boundary wall. Our goal is to clearly communicate these benefits to the general public and city planners, in addition to the scientific community already involved in air pollution research.

***ACTION PLAN, TOOLS & METHODS***

We will approach this challenge from 3 directions:

1) We will consult city stakeholders to identify limitations and their concerns as regards design and implementation of LBWs.

   City stakeholder workshops and ongoing insights activities will be carried out to identify their concerns and discuss potential risks and limitations – legal, technical, administrative.

2) We will engage the general public to assist in aesthetic and functional design of a LBW trough participatory events and playful approaches.

   We will organize series of outdoor events where citizens will be invited to “design” their own LBW using large lego-like bricks. In addition, studies, including online surveys and feedback sessions will be carried out to gain deeper understating of public perceptions and to consider aesthetic and emotional aspects of the design.

   During these events, we will also showcase our Smart Citizen kits and involve the public in citizen science initiatives aimed at demonstrating the benefits of LBWs. In real-time, citizens will be able to assess the reduced exposure on a footpath by comparing the measurements from their own Smart Citizen kit with the measurements collected by a project sensor mounted

on the other side of the low boundary wall.

3) We will deploy a sensor network to assess the impact of an already existing LBW on dispersion of air pollution to inform the design of a new LBW.

The LBW's performances in terms of reducing exposure at a local level will be assessed in a rigorous scientific setting using existing LBWs in different urban configurations and for a wide range of weather conditions to provide solid and scalable results.

***SOLUTION & VALUE PROPOSITION***

By combing the insights from the public and city stakeholders, as well as research data, we will present a new type of LBW. This LBW will not only achieve the desired impact on air pollution dispersion and meet the technical limitations, but also will fulfil the public desires and address concerns provided by the city stakeholders.

***TIME & IMPLEMENTATION SCHEDULE***

City stakeholder workshops and ongoing insights activities:

- City stakeholder workshop: March, 2017
- Active consultation and feedback gathering: March, 2017 – December, 2018

Public engagement activities: August, 2017 – December, 2018

Existing LBW research:

- Test site selection – June, 2017
- Sensor network deployment and LBW monitoring: July/August, 2017- September 2018
- Data analysis: September – December, 2018

Report on an optimal LBW: January – May, 2019

***LOCATION & PHYSICAL INFRASTRUCTURE***

A number of locations in urban street canyons and in residential areas have been identified and one suitable test site for each urban typology will be selected together with Dublin City Council. Selection criteria include type and characteristics of street canyon for

example, open on one or two sides, low rise buildings, as well as the impact of a low boundary wall on day-to-day activities in the selected areas.

***STAKEHODLERS & COLLABORATORS***

University College Dublin (UCD)

Dublin City Council (DCC)

Department of Housing, Planning, Community and Local Government

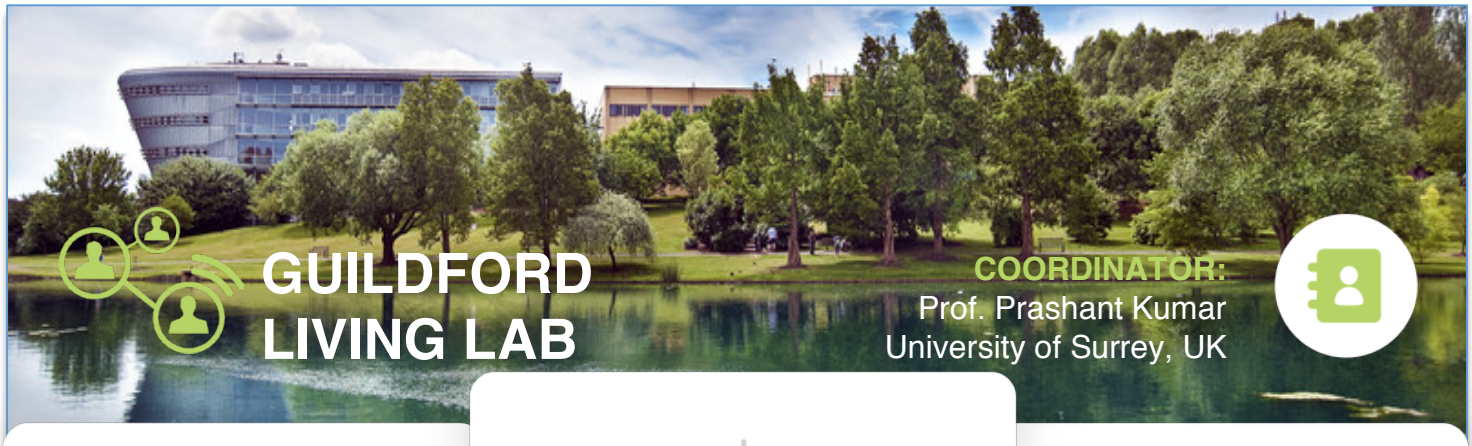
Trinity College Dublin (TCD)

Local communities

Irish Environmental Protection Agency

Met Eireann – Irish National Meteorological Service

# 7 Guildford Living Lab



## GUILDFORD LIVING LAB

**COORDINATOR:**
Prof. Prashant Kumar
University of Surrey, UK

### FOCUS

Air quality & air pollution

Green infrastructure

Sensing and monitoring technologies

### VISION

Guildford Living Lab aims to raise **citizens' awareness** about **air quality** and impact of **green infrastructure** to reduce air pollution and improve **health** and **well-being.**

### PILOT PROJECTS

Interactive display for greener cities

# 7.1 Interactive display for greener cities

## MOTIVATION & CHALLENGE

It is important to control air pollution, especially in and around cities, since a majority of the world's population lives in urban areas where the pollution levels are also typically much higher than those in rural areas. Deploying green infrastructure such as trees and hedges near busy roads has been proposed as a promising solution for reducing the exposure of urban dwellers. Therefore, the living lab at Guildford is aimed for spreading awareness to citizens and city stakeholders about combating air pollution exposure by deploying green infrastructural interventions.

## ACTION PLAN, TOOLS & METHODS

To achieve our aims, we will:

1) Monitor the concentration of different air pollutants in several locations in Guildford using a sensor network to demonstrate the impact of green infrastructure on air pollution control.
2) Display information of pollutants at those locations, and inform citizens about air quality through playful interactions.
3) Develop an interactive display to visualize information gathered by sensors in an engaging and playful way. In addition, citizens will be informed and educated about air pollution through social media and organizing informative events.
4) Engage citizens from surrounding neighbourhoods in the project activities.
5) Establish a strong dialog with city stakeholders and policy makers to discuss the project results and impact of green infrastructure on air quality.

## SOLUTION & VALUE PROPOSITION

By demonstrating the effect of the green infrastructure on air pollution control, we aim to share knowledge with citizens, city stakeholders, and planners about benefits of city greening, as well as raise citizen's awareness about air quality.

Deployment of sensor network: July, 2017- onwards

Interactive display development:

- Requirement analysis: April – July, 2017
- Software design: July - October, 2017
- Implementation: August - November, 2017
- Testing: November – December, 2017
- Deployment: December, 2017 – September, 2019

Engagement activities and events: January, 2018 – September, 2019

City stakeholder engagement: Ongoing continuously

***LOCATION & PHYSICAL INFRASTRUCTURE***

The air pollution sensors will be deployed at several locations in Guildford such as busy traffic intersections, road-side pedestrian paths with and without green infrastructure.

The interactive display will be placed at a location, where we can effectively engage with the citizens and spread our message about controlling air pollution through green infrastructural interventions. The final deployment location for the display will be finalised at a later date, and depends upon getting the required permissions from the location owner and/ or manager. The potential places for setting up the display include:

- Royal Horticultural Society, Wisley
- St Saviour's Church, Guildford
- Royal Grammar School, Guildford

***STAKEHODLERS & COLLABORATORS***

University of Surrey (UoS)

Institut d'Arquitectura Avançada de Catalunya - FabLab Barcelona (IAAC)

Future Cities Catapult Ltd. (FCC)

Local councils, citizens from Guildford and surrounding boroughs

# 8 Hasselt Living Lab


## FOCUS

Behavioural change

Integration of travel behaviour and air quality models

## VISION

Hasselt Living Lab aims to encourage **pro-environmental behaviour** among city residents by designing **informational strategy-based behavioural interventions**

## PILOT PROJECTS

Changing travel behaviour for greener cities

# 8.1 Changing travel behaviour for greener cities

***MOTIVATION & CHALLENGE***

We believe that information and increased awareness about pollutant exposure could influence and change citizen travel behaviour. Informational strategies based behavioural interventions have been widely investigated for promoting pro-environmental behaviour in recycling and energy consumption contexts. For example, individuals have been informed about the benefits of using separate bins/containers for glasses, plastic, paper products, as well as other general garbage.

We aim to design an effective behavioural intervention to change citizen travel behaviour using a smart phone application. Our intervention will consider social norms such as providing information about behaviour of peers for encouragement. This has been found important in changing individual behaviour.

***ACTION PLAN, TOOLS & METHODS***

During our pilot project, we will estimate the individual's exposure to pollutants in different micro environments by recording participant activity travel patterns. Smartphone-based Android app SPARROWS will be used for data collection. Based on recorded travel behaviour in space and time, the following customized information will be processed for every participant:

- Individual's exposure to different air pollutants
- Car-use and individual's contribution in $CO_2$ emissions
- Physical activity level

The pollutants concentration data will be obtained from the existing nation-wide network of air quality sensors and available high resolution interpolated concentration maps.

Two experiments are planned during this study:

- Experiment 1: observations of GPS–based trajectory information of daily activity-travel pattern collected before and after behavioural intervention using a smartphone app.

Participants will complete an activity-travel diary.

- Experiment 2: Stated Preference (SP) Choice conducted in conjunction with the 1st experiment. Participants will be required to state their choices in a website-based survey. Individuals will be asked to select travel options by providing information related to the following:
  - Usual travel characteristics such as travel time and travel cost based on transport mode and time of travel
  - Air quality at the time of travel in the form of pollutant concentration
  - Contribution to GHG emission ($CO_2$)
  - Indication about increase or decrease of physical activity level

The project will be implemented by following these steps:

1) City stakeholder engagement activities that include introductory workshop, participant recruitment events, and dissemination work.
2) Test study involving university students to fine tune the behavioural intervention instrument. Both Experiment 1 and Experiment 2 will be carried out.
3) Citizen travel behaviour study. Prior to conducting Experiment 1 and Experiment 2, citizens for these studies will be recruited.
4) Assessment of the behavioural intervention. Based on the collected data, the effectiveness of behavioural intervention will be examined. The same data will also be helpful in extending the travel behavioural models. These models will be used for testing impacts of a variety of policies.

**SOLUTION & VALUE PROPOSITION**

By involving citizens and studying their activity-travel behaviour, we aim to assess the efficacy of such mobility-based interventions in promoting pro-environmental behaviour.

Our experimental approach can be easily extended by integrating the different components of the intervention in a single application. This can be then implemented on a larger scale such as big cities and can bring significant positive change in air quality.

**TIME & IMPLEMENTATION SCHEDULE**

City stakeholder engagement:

- City stakeholder workshop: February, 2017
- Ongoing involvement: March, 2017 – December, 2018

Test study: April - May, 2017

Citizen behavioural intervention study: June - July, 2017

Data Analysis & Results compilation: August, 2017

Report on optimal behavioural intervention and repetition of similar study in other iSCAPE target cities: September – December, 2018

**LOCATION & PHYSICAL INFRASTRUCTURE**

City of Hasselt – citizens of Hasselt will be recruited for this study

**STAKEHODLERS & COLLABORATORS**

Transport Research Institute (IMOB) of the Hasselt University

Citizens of Hasselt

Local communities

Hasselt City Council, including:

- Mobility managers
- Environmental managers
- Communication managers

# 9 Vantaa Living Lab

## VANTAA LIVING LAB

**COORDINATOR:**
Achim Drebs
Finnish Meteorological Institute, Finland

### FOCUS

Urban climatology

Meteorological and environmental modelling

Climate change projections

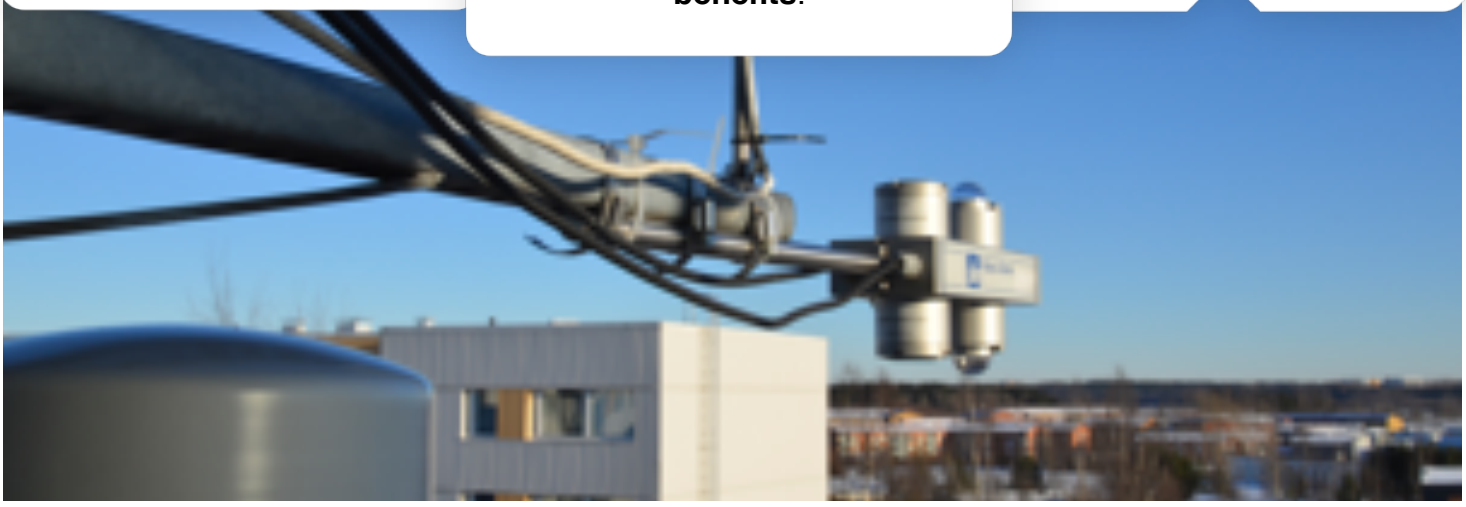
Environmental economics

### VISION

Vantaa Living Lab aims to raise **awareness** of citizens and city stakeholders about **air quality** and **impact of green infrastructure** to reduce air pollution and provide **socio-economic benefits**.

### PILOT PROJECTS

Assessing green infrastructure



## 9.1 Assessing green infrastructure

***MOTIVATION & CHALLENGE***

Green spaces and urban geometry are amongst the most important determinants for the urban micro climate. Green infrastructure not only positively contributes to air quality but also provides other socio-economic benefits.

We believe that awareness about impacts and benefits of green infrastructure of both citizens and city stakeholders could be increased by providing evidence-based data.

***ACTION PLAN, TOOLS & METHODS***

We will achieve our goals by:

1) Monitoring weather at two different sites in Vantaa.
2) Simulating green infrastructure impacts on urban micro climate.

   Location of green roofs and parks to be simulated will be decided by consulting Vantaa city planners and taking into account the Master plan of Vantaa.

   Lessons can be learned, and potential synergies and cooperation options will be discussed with the Climate Street project led by the Vantaa and Helsinki Environment Centres.
3) Conducting research on socio-economic impacts of green infrastructure based on real-life testing results.
4) Organizing citizen engagement activities.

   For this project, vulnerable citizen groups such as students of local schools and residents of nursing homes and children at day-care centre have been considered. In addition, visitors of the Heureka Science Centre and inhabitants involved in the Climate Street project will be approached to co-create and arise the awareness of air quality and microclimatic issues in Vantaa.

   Local newspapers, social media and personal contacts will be used to engage these groups and disseminate the activities.

5) Involving city stakeholders.

City stakeholders are involved in the project activities not only to provide their input to the discussion about air quality but also to ensure the sustainability of project results and impact.

***SOLUTION & VALUE PROPOSITION***

Evidence-based data on impacts and benefits of green infrastructure will be gathered in a real-life setting. We will not only disseminate research results of our comprehensive study to citizens and policy makers but also actively engage them in activities to solve air quality issues in Vantaa.

***TIME & IMPLEMENTATION SCHEDULE***

Weather monitoring: May, 2017 – at least October, 2018

Green infrastructure simulations:

- Location determination: June - August, 2017
- Simulation running: June – December, 2017

Citizen involvement activities: August, 2017 - September, 2018

Events at Heureka Science Centre and involved schools, nursing and day-care centres: periodically

Ongoing city stakeholder involvement: May, 2017 – December, 2018

***LOCATION & PHYSICAL INFRASTRUCTURE***

Weather and air quality monitoring locations in Vantaa:

- Malminiitty (build-up area)
- Heureka, The Finnish Science Centre (open area)
- HSY Air Quality Monitoring Service station

Locations of parks and green roofs: will be decided by consulting Vantaa city planners

**STAKEHODLERS & COLLABORATORS**

Finnish Meteorological Institute

Vantaa City, Planning and Environmental division

Heureka Science Centre

Climate Street Project, Vantaa, European Regional Development Fond (ERDF)

HSY Air Quality Monitoring Service, Helsinki Regional Environmental Services Authority

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