

Citizen science in practice: Centre for Participatory research and Citizen Science projects at Jozef Stefan Institute



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Citizen Science in Environmental Epidemiology

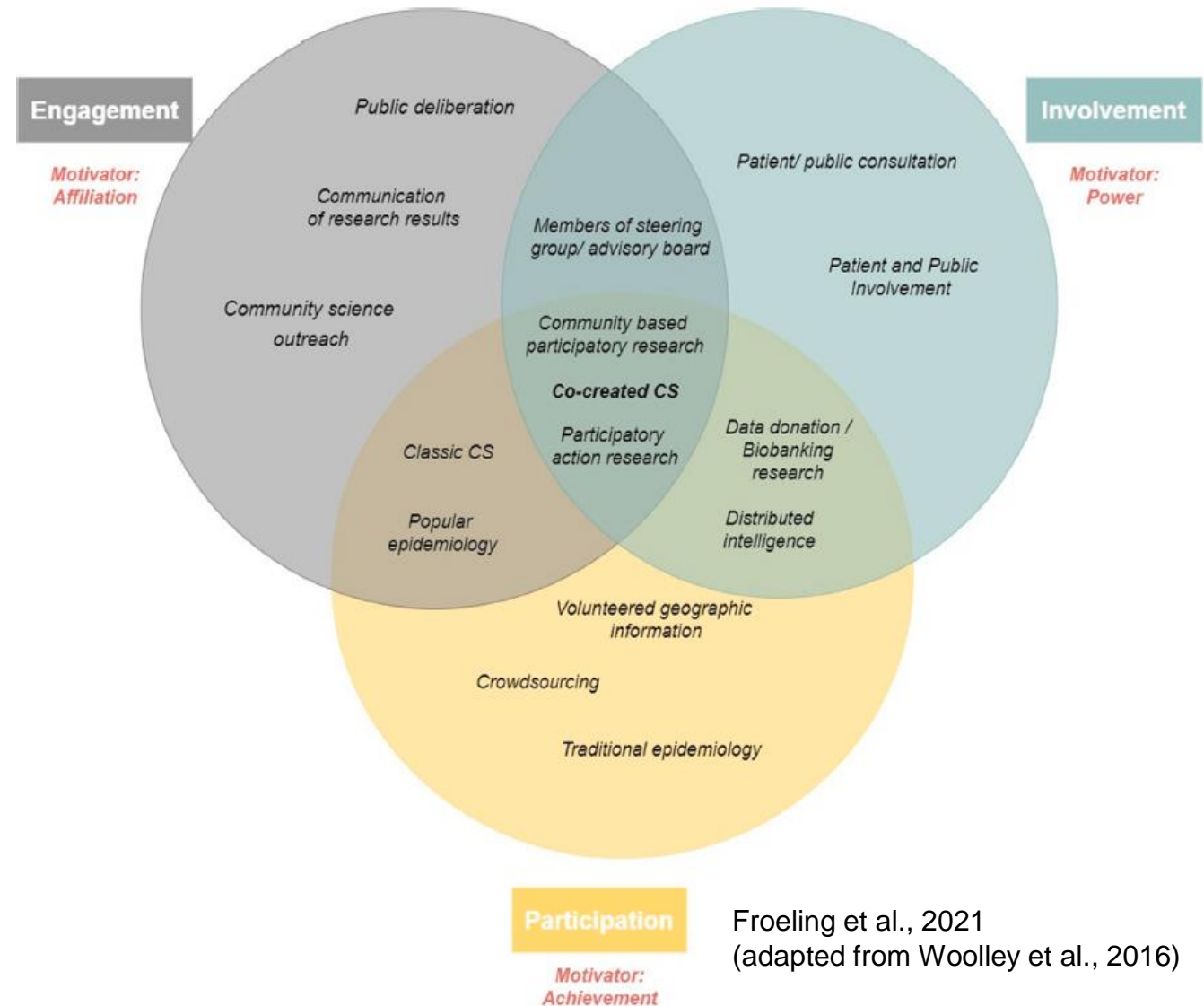
...engagement of the general public (non-professionals) in scientific research activities...

Rationale for researchers

- Performing more socially relevant research;
- Fostering interpretation of problems and results;
- Strengthen the dissemination of the findings;
- Other: *increased research capacity, improved recruitment process and quality of participation*

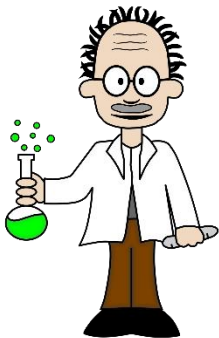
Rationale for citizens – Motivational drivers

- sense of community (*Affiliation*)
- enhanced scientific literacy (*Achievement*)
- ability to advocate for policy change (*Power*)



Involvement

Researchers

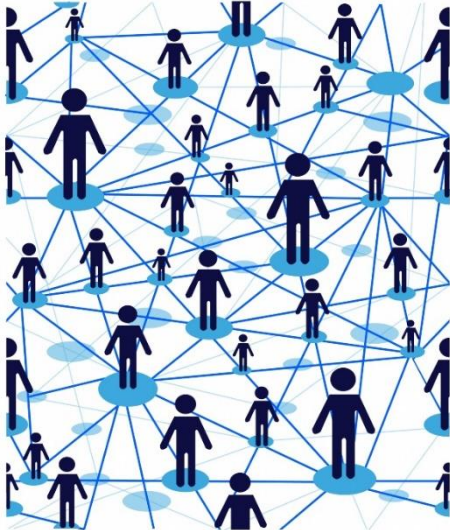


Citizens



Levels

Community level



Individual level





Tools
testing &
evalaution
(2012-16)

Participatory
approaches
in exposure
assessment
(2016-20)

Co-creation in
Environmental
Epidemiology
(2019-22)

Co-creation in
Environmental
Epidemiology
(2022-27)

Co-creation &
City-scale &
personal
interventions
(2021-25)

**Centre for
participatory research
CPR-IJS**





CITI-SENSE - Development of sensor-based citizens' observatory community



*Development of new tools and approaches in AQ monitoring and decision-making, based on **active public participation** and with the use of **new sensor technologies** to improve the quality of life.*



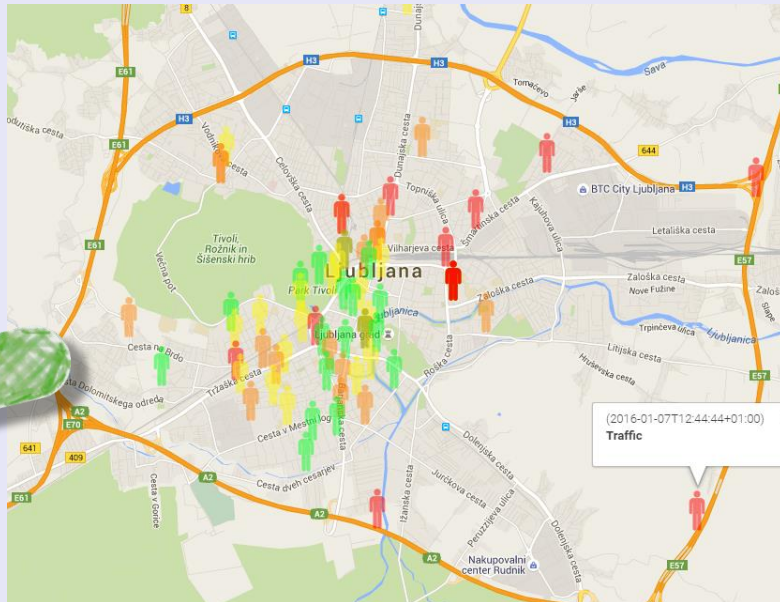
EMPOWERMENT

- ✓ Empower stakeholders
- ✓ Increase knowledge about air quality and their health effects
- ✓ Improve quality of life

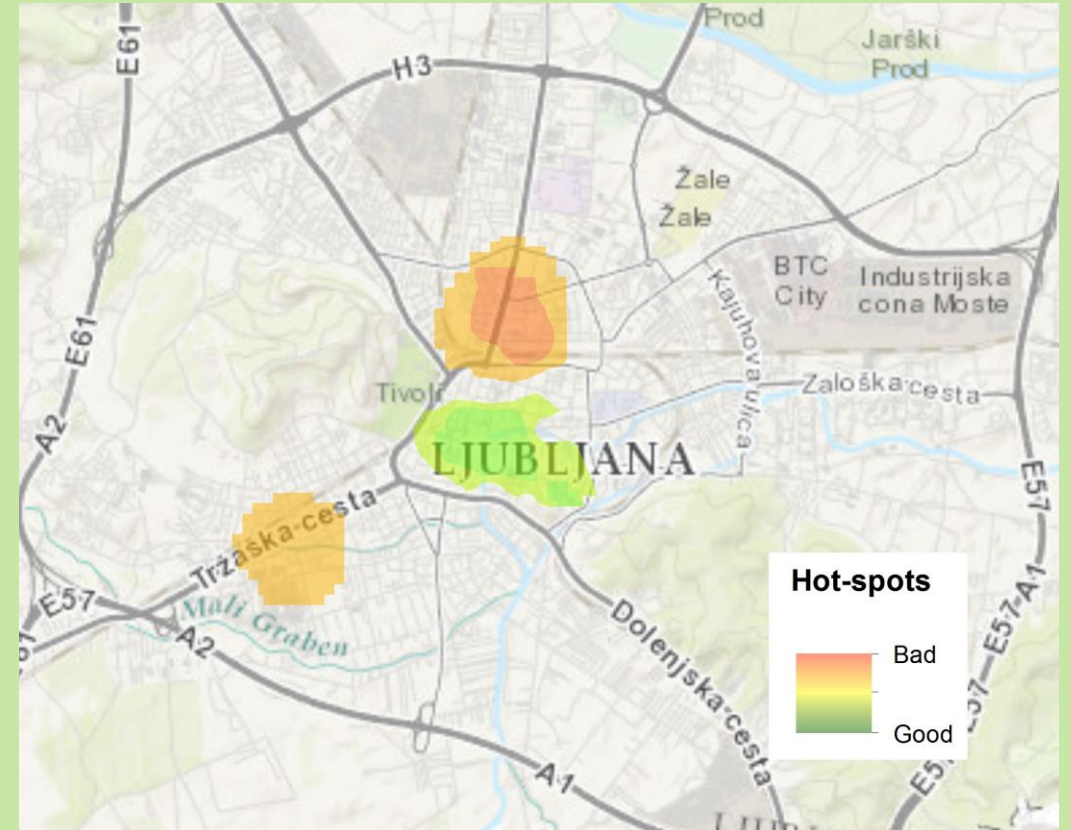
Roles/Involvement:



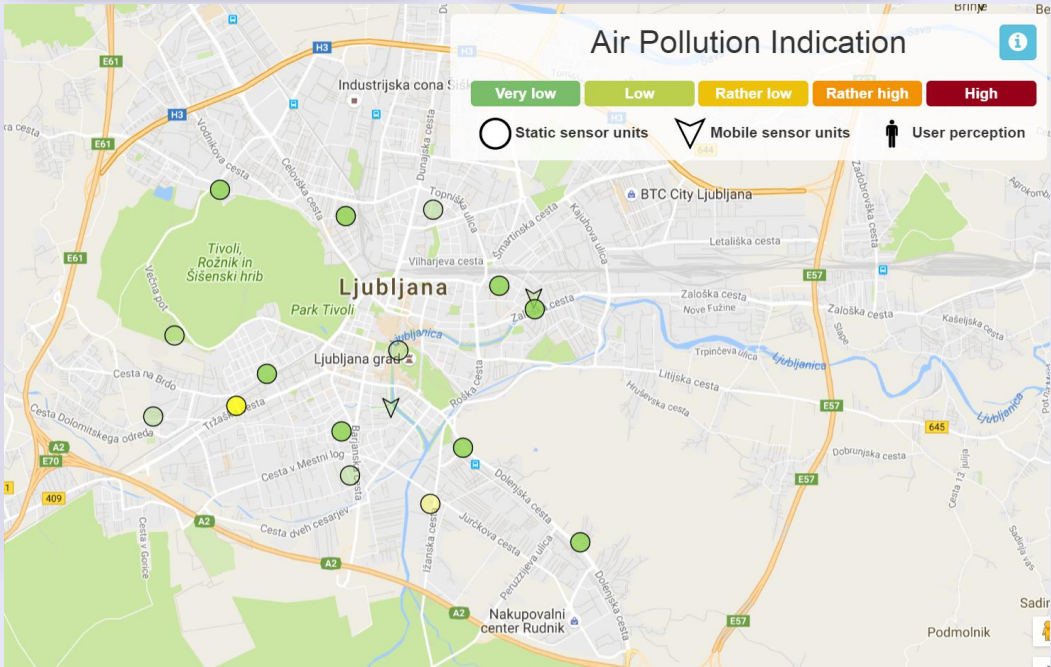
AQ perception



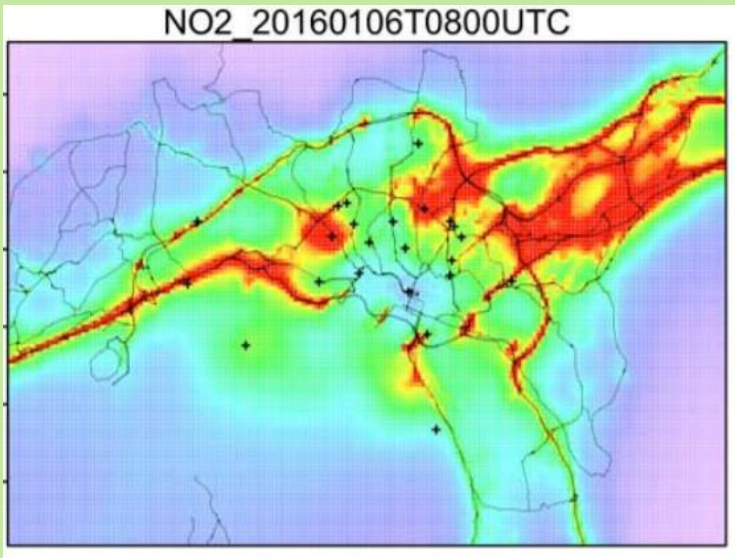
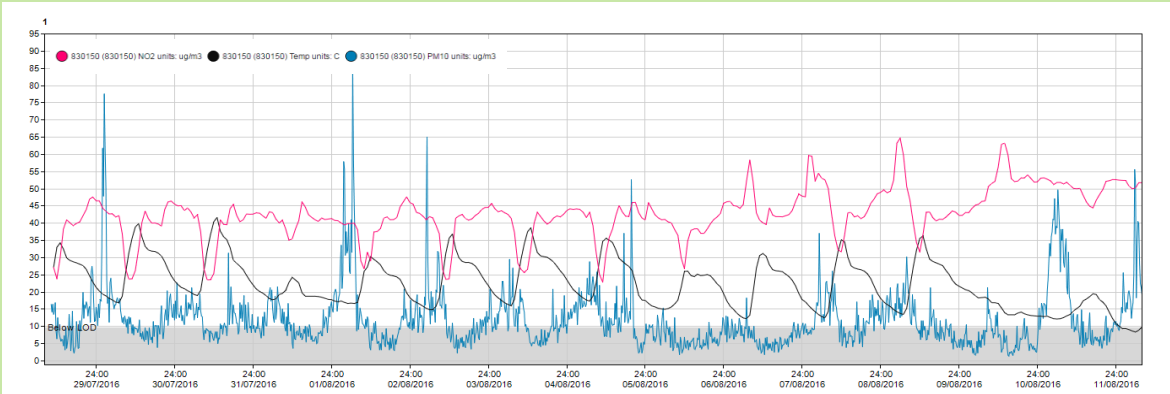
Science outcomes & benefits:



Roles/Involvement:

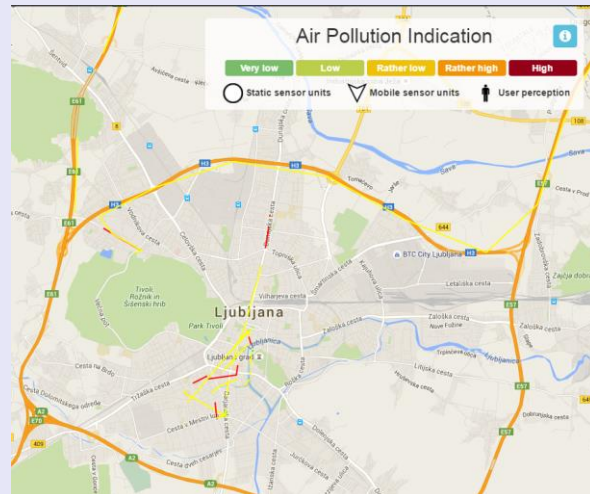
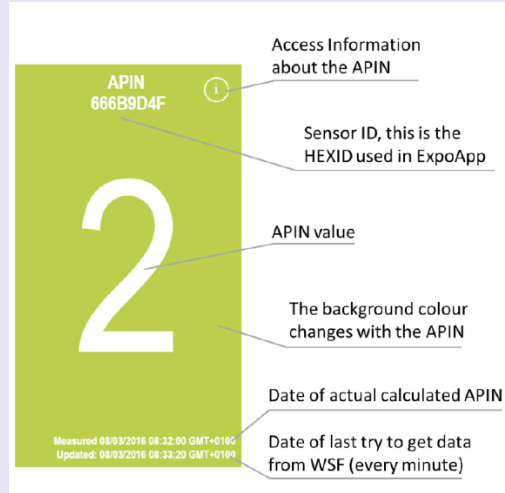
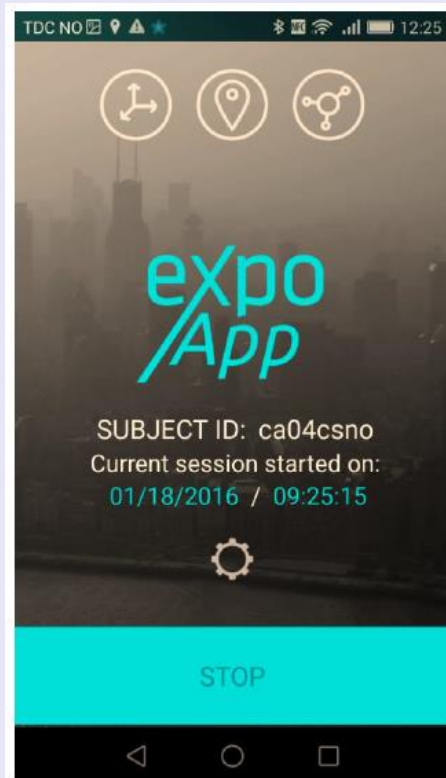


Science outcomes & benefits:



Schneider et al.,
Environment
International
2017, 234-247.

Roles/Involvement:



Science outcomes & benefits:



Robinson et al.,
Sensors 2018,
18(11), 3768

- Positive about the general idea
- Not user-friendly, inconvenient
- Issues: complicated, bulky, difficult to use, connection problems, data loss...
- Not ready for the public

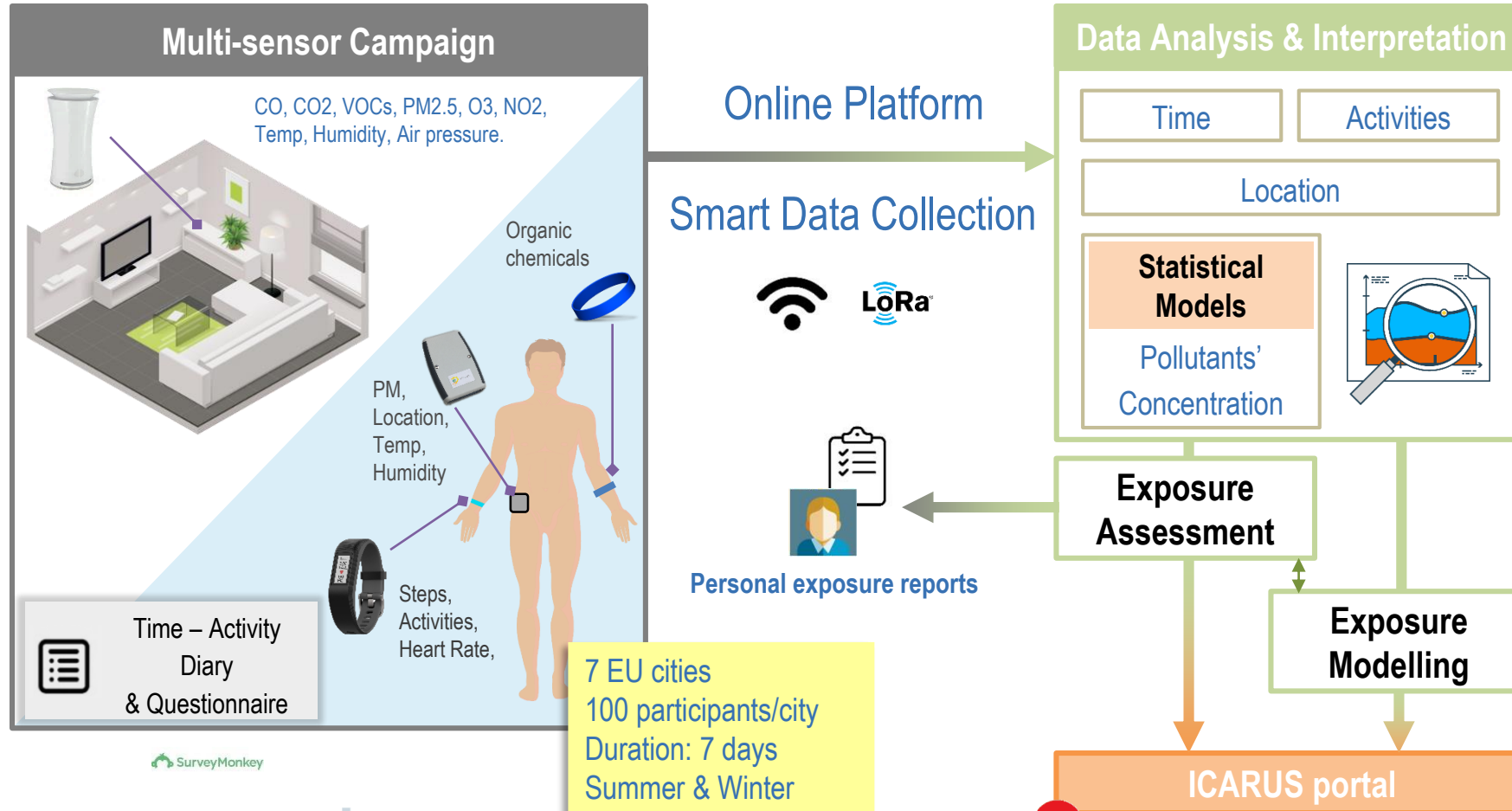


ICARUS - Integrated Climate forcing and Air pollution Reduction in Urban Systems

...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.

The results of the policy analyses allowed to determine the most sustainable GHG mitigation and air quality (AQ) improvement strategies. The latter were proposed to the authorities competent for atmospheric pollution and climate protection management and to the main industrial end-users as guidance for decision-making that would lead towards maximizing the net public health and wellbeing benefits while taking into consideration the costs associated with air pollution and climate change in the EU.


PARTICIPATORY SAMPLING CAMPAIGN



- **Exposure assessment at individual level** (*location, activity, AQ in microenvironment*)
- **Support/validation of models**
- **User experience**

Roles/Involvement:



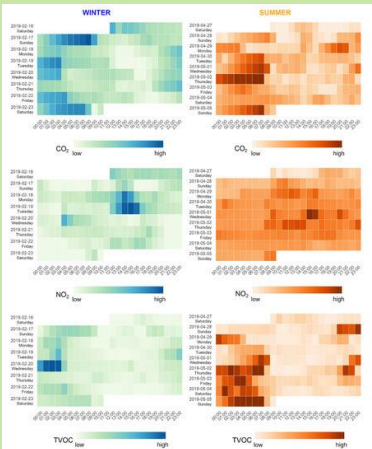
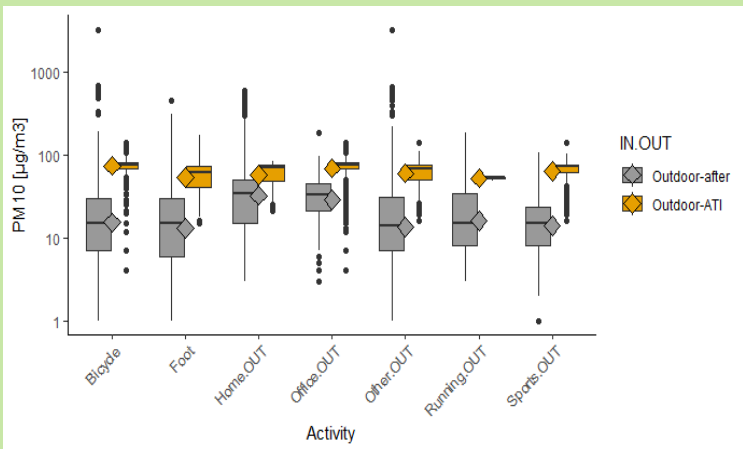
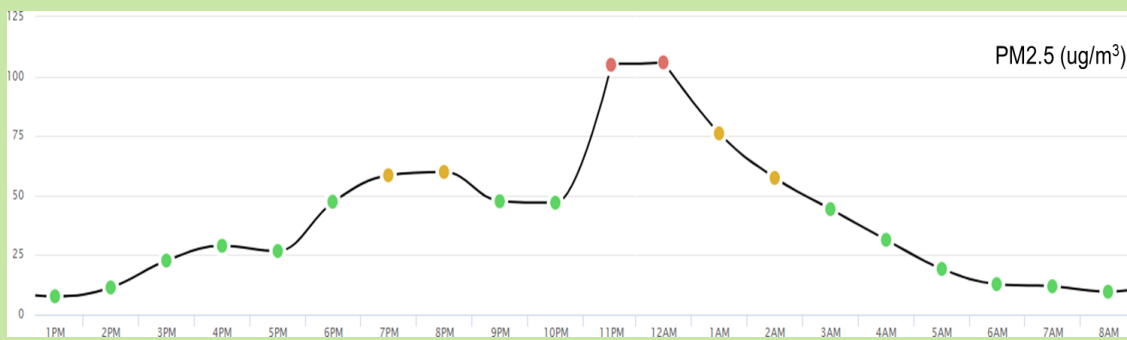
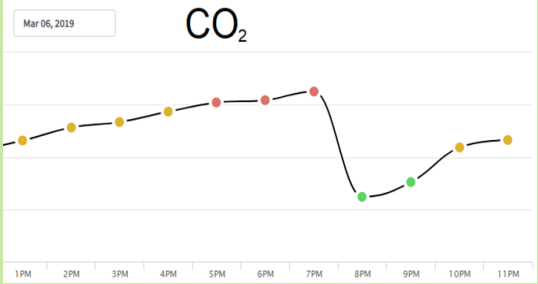
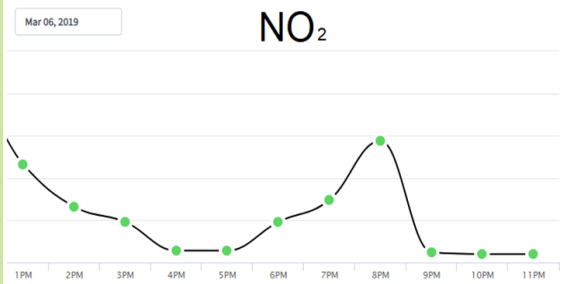
 **Questionnaires
& Time Activity Diary &
User experience**



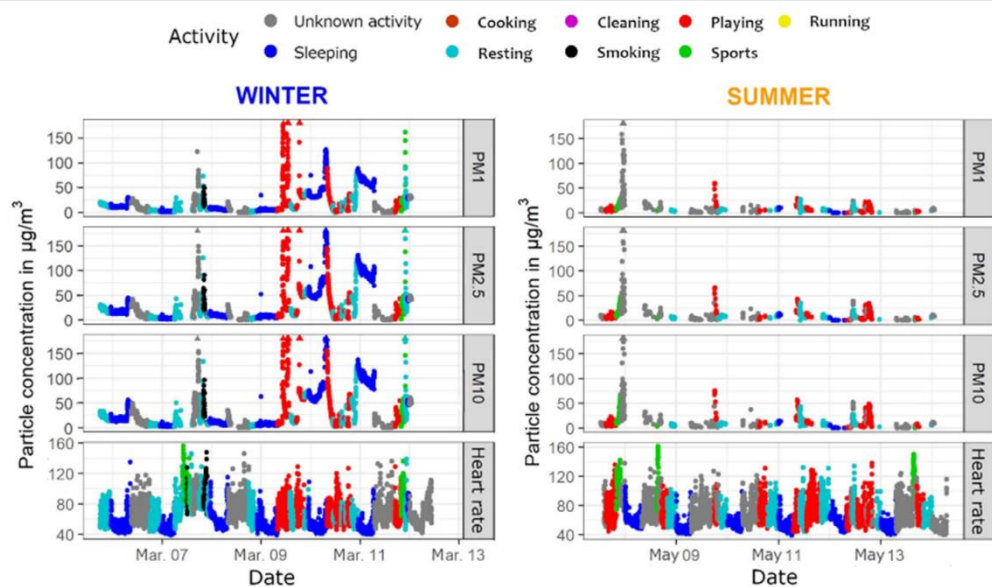
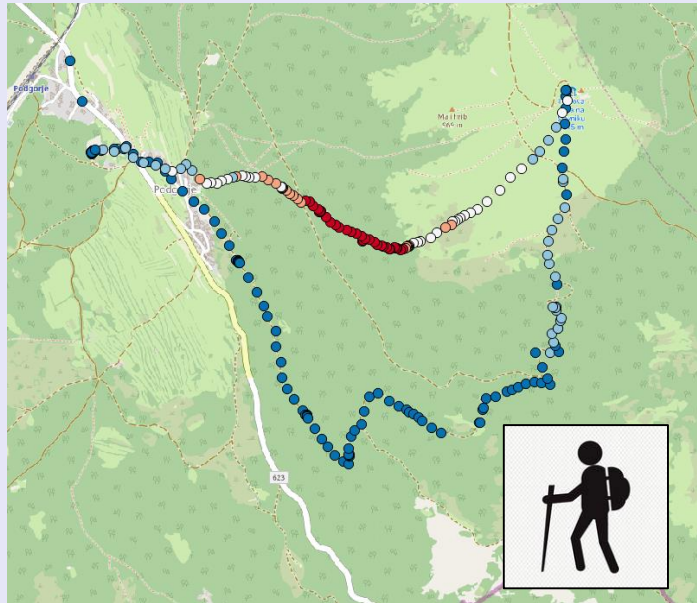
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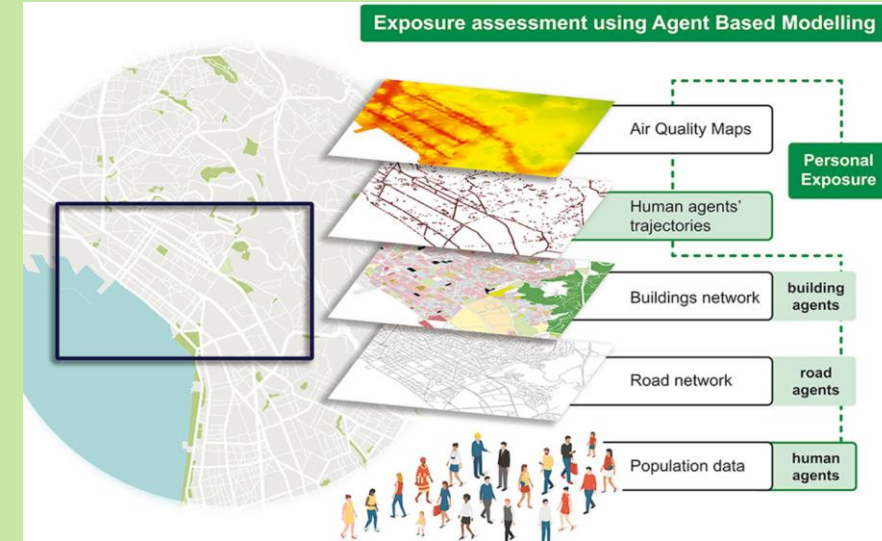
Scientific outcomes & benefits:



Roles/Involvement:



Scientific outcomes & benefits:



Chapizanis et al., Environ. Research, 192, 2021.



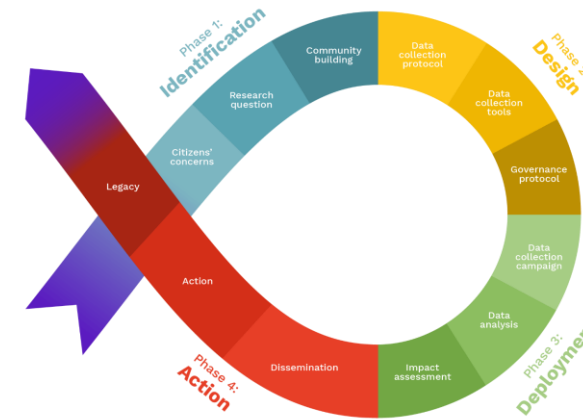
"Now when I started to measure, I started to think".
"I don't have an opinion. Only now I started to think about what kind of environment I live in and that I can also improve it myself".



CITIES-HEALTH - Citizen Science for Urban Environment and Health (Co-creation in Environmental Epidemiology)

...aims to put citizens' concerns at the heart of research agenda on environmental epidemiology

- › **Identification:** mapping of concerns and interests of citizens → forming research questions.
- › **Design:** co-design of data collection protocols
- › **Deployment:** overall data collection and analysing; reflection on the findings.
- › **Action:** participants work together to propose courses of action.



Barcelona: Air pollution

Utrecht: Biomass burning

Ljubljana: Noise

Lucca: Industry pollution

Kaunas: Physical activity

Roles/Involvement:

Q1. What is noise?

- a) I don't know
- b) A loud pleasant sound
- c) A sound, that is loud or unpleasant or that causes disturbance

Q 2. Do you think your school is in a noisy environment?

- a) Yes
- b) No

Q 3. If you answered "Yes" to the previous question, specify one or more sources of noise outside your school.

- a) Cars
- b) Train
- c) Airplanes
- d) Factories
- e) Other: _____

Q 4. Do you think it is noisy inside your school?

- a) Yes
- b) No

Q 5. If you answered "Yes" to the previous question, specify one or more sources of noise inside your school.

- a) Door creaking/rattling
- b) Rumbling in the kitchen/dining area
- c) Children screaming
- d) Loud speaking
- e) Buzzing of ventilation system and electronics
- f) Walking, running down the hall
- d) Other: _____

Q6. In the picture below, indicate how much does noise bother, disturb or annoy you, when you are here at school.



Mobile apps: questionnaires, cognitive-tests, TAD
Outcome: self-reported levels of stress, mood, sleep quality and activity



SmartWatches & SmartPhone sensors:
Outcome: measured physical activity, heart rate, stress level, noise, activity adjusted dose in time and space

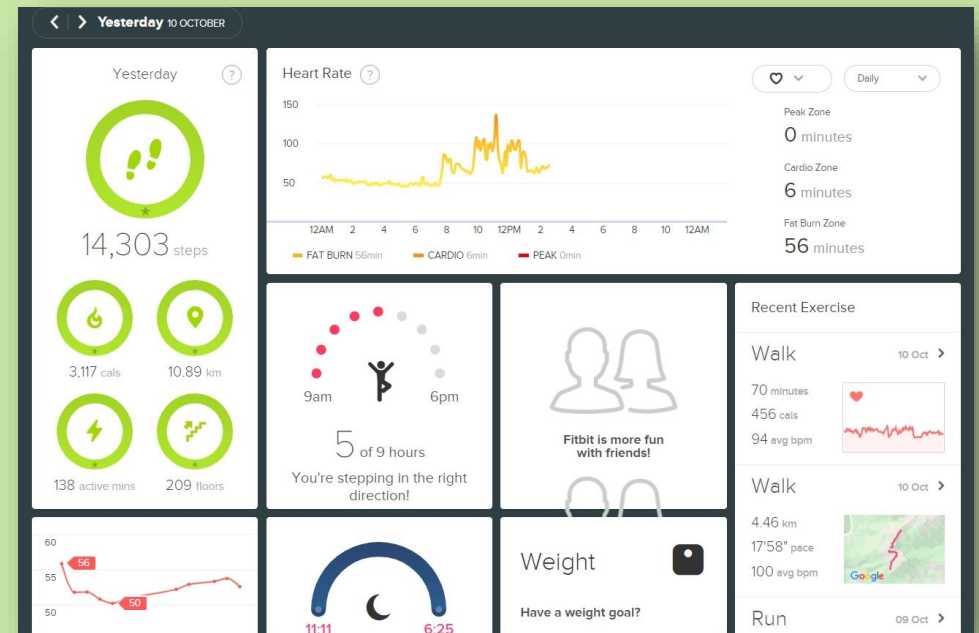


(Low-cost) environmental sensors and health devices:
Outcome: detailed information on exposure and health parameters

Scientific outcomes & benefits:



How do the
quality of the living environment
(with an emphasis on noise) and
living habits
affect the *(mental) health and well-being*
of individuals?



Roles/Involvement:

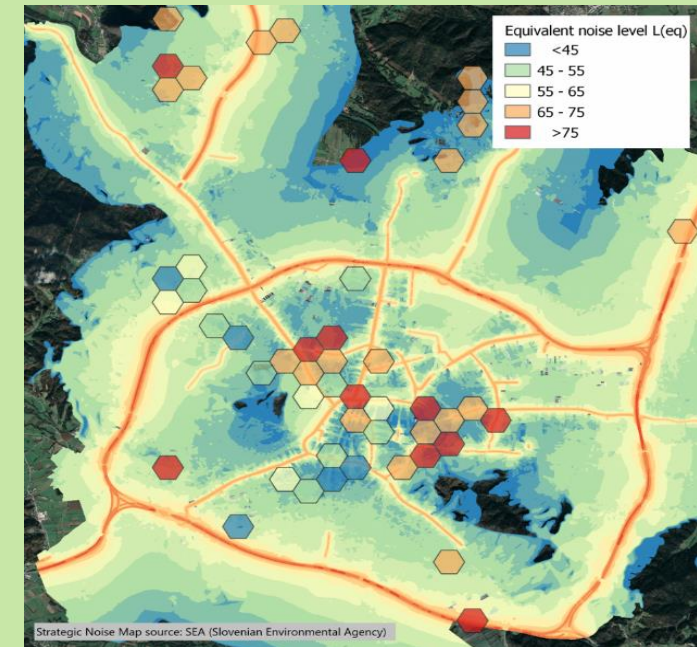
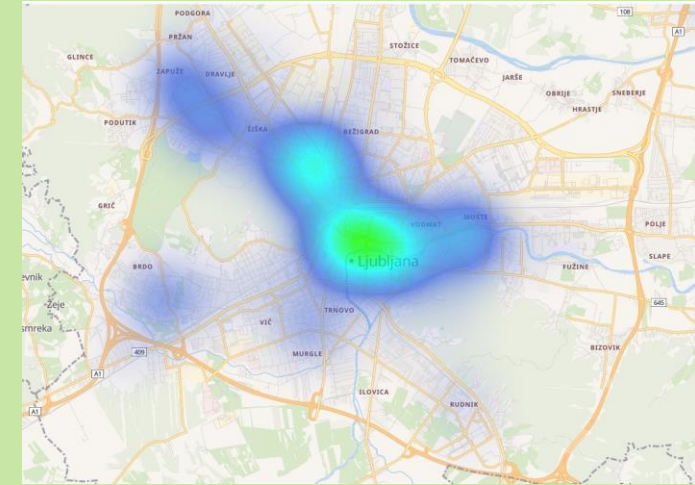


General statistics:

- 50 participants
- October 2020 – April 2021
- Individual involvement: 7-14 days
- 75 different variables
 - Mood
 - Location characteristics
 - Cognitive performance
 - Sleep quality
 - Noise environment (measured & perceived)
 - Physical Activity tracking
- 50.000 data points



Scientific outcomes & benefits:





INQUIRE - Identification of chemical and biological determinants, their sources, and strategies to promote healthier homes in Europe

...aims to protect citizen health by providing knowledge, tools, and measures to substantially improve indoor air quality (IAQ)

= zero pollution in homes

- research on hazardous determinants and their sources, risk factors and effects
- focus on infants and young children up to 5 years old.
- results will be used for evidence-based recommendations for industry and policymakers.
- the work will include non-invasive sampling and monitoring of over 200 homes in eight countries over the course of 1 month



- INQUIRE will comprehensively advance our understanding of the determinants of IAQ in homes by implementing innovative, low-cost, non-invasive sampling strategies (sensors, indoor/outdoor passive sampling, urine biomonitoring) to characterize determinants of household IAQ and their importance to human exposure.
- Chemical and biological screening techniques and wide-scope holistic characterisation of hazards will provide a comprehensive assessment of the determinants of IAQ.
- Multifaceted data analysis techniques (including machine learning, exposure modelling, geospatial analysis), will link chemical, biological and toxicity profiles with drivers of IAQ to identify sources and prioritize pollutants.
- Source identification will feed directly into the testing of both novel technologies and readily deployable strategies to improve IAQ, resulting in evidence-based recommendations and a draft of policy strategy for developing IAQ standards.
- Open Science approach and generated FAIR data on hazardous determinants, their effects, risk factors and sources will endorse continuous exploitation of results. Open dissemination of generated knowledge will raise citizen awareness while exploitation by industry and policy makers will endorse a transition towards homes with zero pollution.

Rationale

To protect citizen health by providing knowledge, tools and measures to substantially improve IAQ

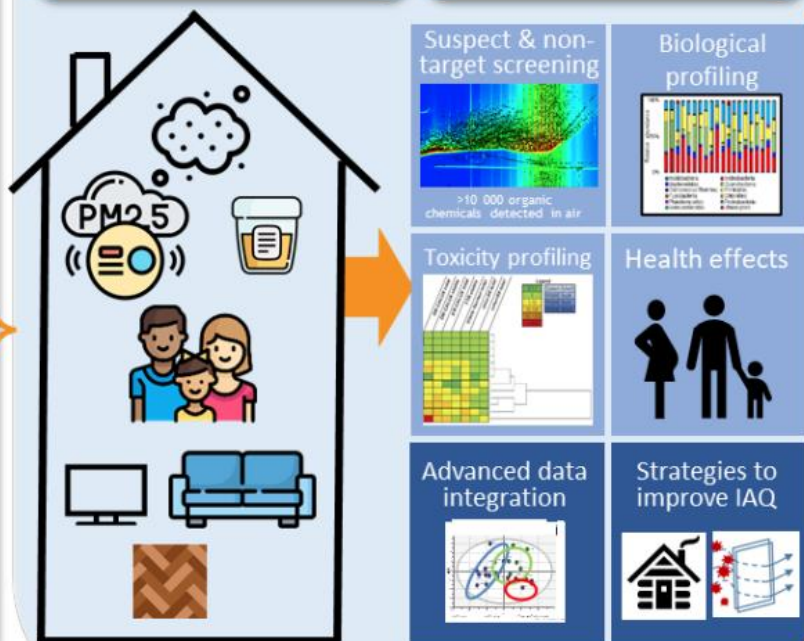
Drivers of indoor air quality



INQUIRE

Cost-effective Sampling indoor/outdoor air, dust, products, materials, urine

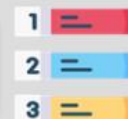
Advanced chemical & biological analysis, and toxicity models. Data integration & modelling



Outputs

Indoor solutions toolbox

- Priority list of hazardous determinants in homes
- List of key sources of hazardous determinants



- Technical, building structure, and behavioral solutions to improve IAQ and reduce chemical and biological hazards in homes
- IAQ monitoring tools (sensors, models)



Regulatory gain

FAIR data and databases on IAQ in homes

INQUIRE Action Plan for Promoting Healthy Homes in Europe

Guidelines, materials & proposals for policies for health-promoting homes



Societal gain

Increased awareness among citizens on IAQ and health issues and strategies to improve their IAQ

Case study: 25 households/families in Celje, Slovenia

URBANOME - Urban Observatory for Multi-participatory Enhancement of Health and Wellbeing

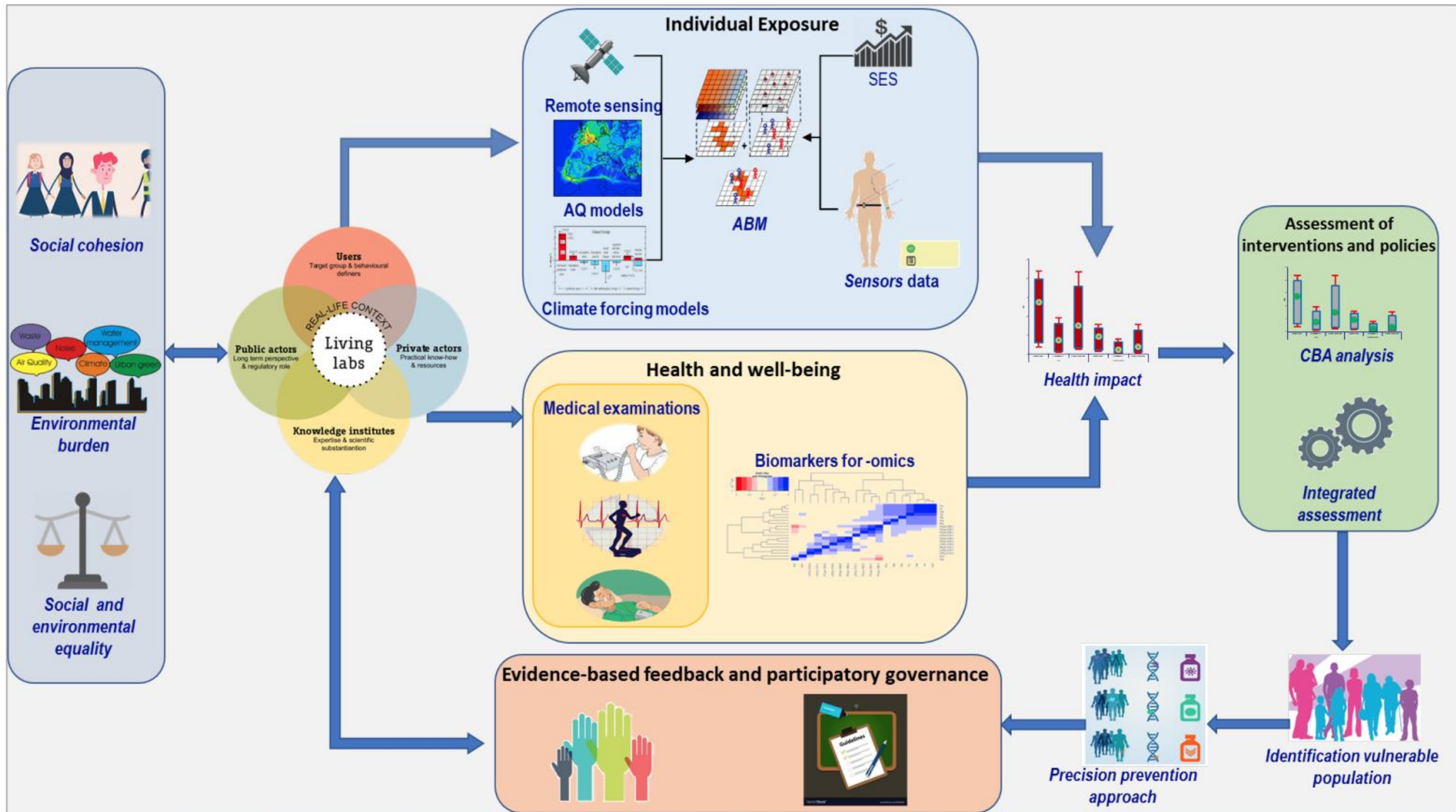
...to promote urban health, wellbeing and liveability, through systematically integrating health concerns in urban policies and the activities of urban citizens...

- *evidence on environmental health determinants*
 - *spatial distribution*
 - *social distribution*

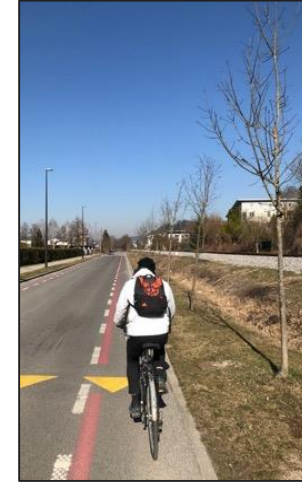
LIVING LAB APPROACH:

...to study experiences of urban health and wellbeing, to critically and comparatively explore approaches and methods, and to act as an integrating mechanism for the research strands related **to exposure to urban stressors, physical and mental health and sleep quality**, development of sustainable policy and governance (environment, health, wellbeing).





Case study: individual level exposure & implementation of the green cycling corridors



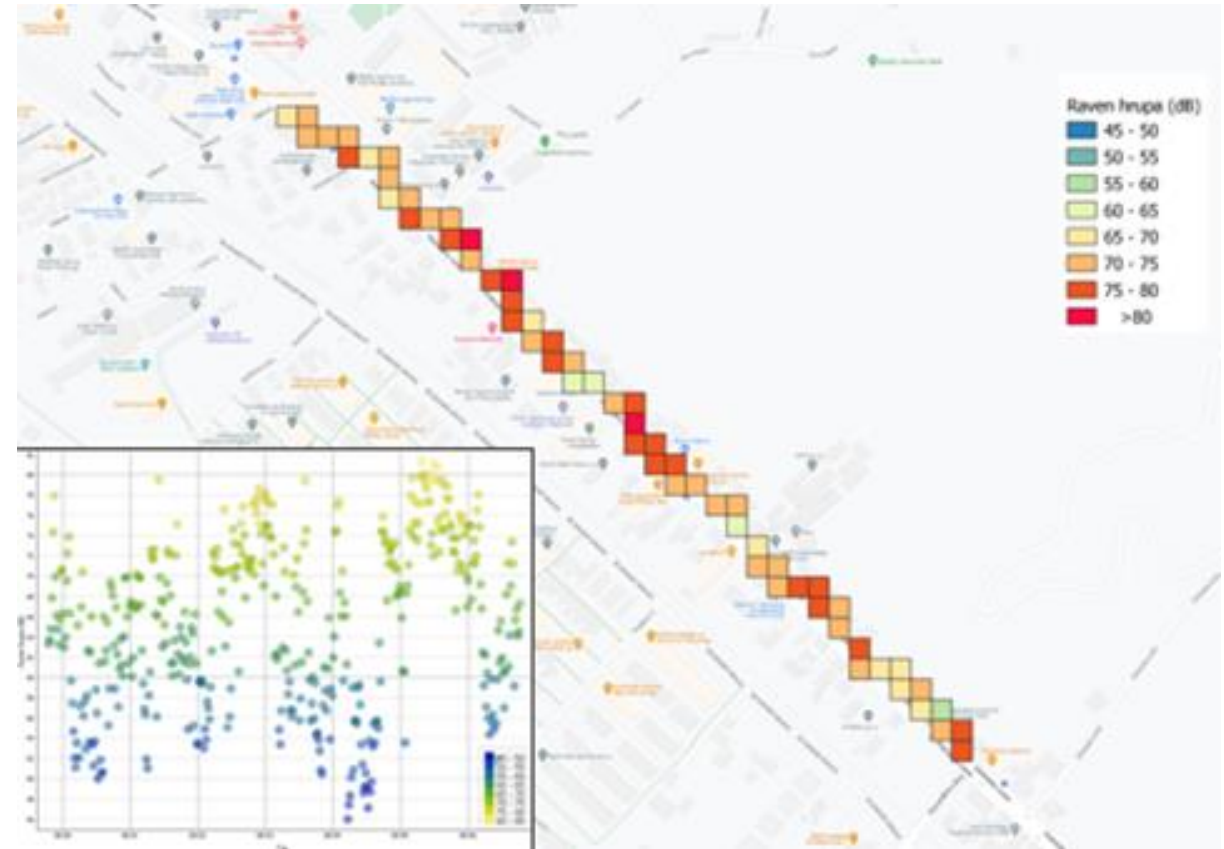
Case study: Dolenjska cesta, Ljubljana

All interested persons who live in the Ljubljana - Rudnik area are invited to participate;
in the future, we will expand the research area to the whole of Ljubljana

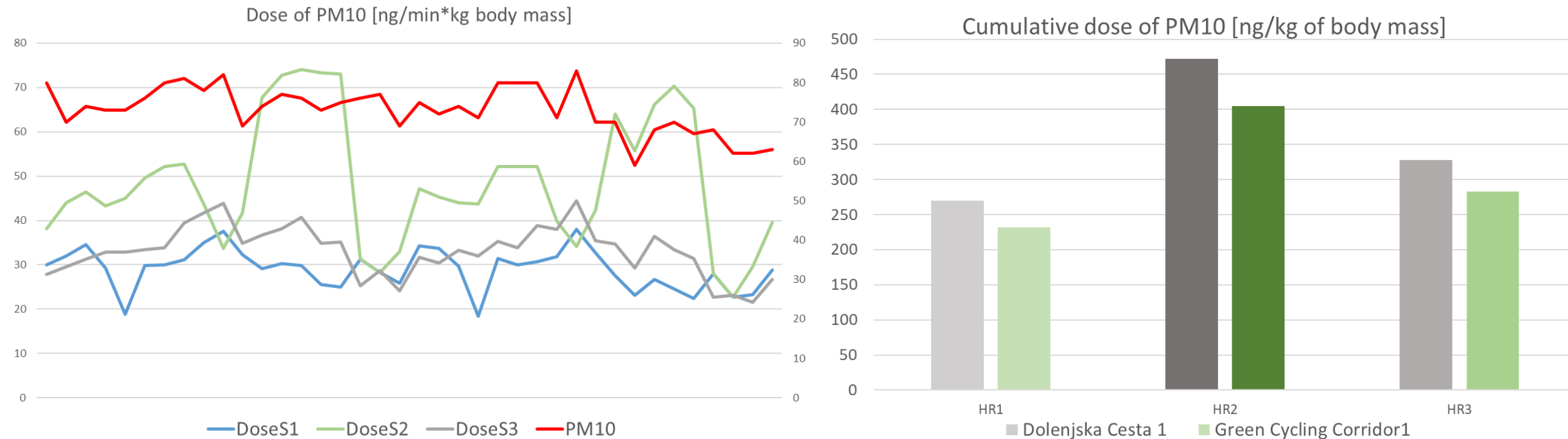
Contact: URBANOME@ijs.si



Case study: individual level exposure

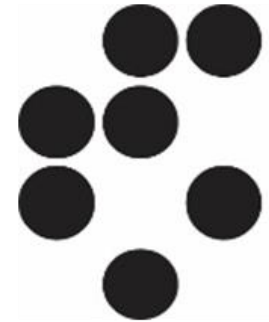


Case study: individual level exposure



Comparison of exposure to PM10 based on the integration of PM & physical activity

Centre for participatory research CPR-IJS



Established in
November 2018

The first science
shop in Slovenia.

Operates within the
Department of
Environmental
Sciences.

Focuses on
environmental issues
in the local
community.

Partnerships
with CSOs, NGOs,
citizens, community
administrators and
others.

Work is conducted
pro bono, i.e. with no
cost for CSOs,
NGOs, citizens.

Students and young
researchers develop
wide communication
skills through
engagement in
problem solving.

CO₂ FOOTPRINT

Two projects concluded in partnership with NGO Greenpeace: (1) carbon footprint of the single-use packaging containers/materials: PET bottles, PE shopping bags; and (2) graveyard candles.

Results have been used for developing a strategy on how to successfully reduce the use of a single use packaging, as well as to promote the alternatives for remembering and honoring the deceased.



WASTE PICKERS

The aim of this study is to investigate the health risks associated with the occupation of waste picking in the selected municipal waste dumpsites in Accra, Ghana.

Currently, the study is at a stage of describing a problem and formulating research questions.

THERMAL ISLAND MITIGATION

An on-going project related to mitigating the effect of thermal islands by greening the roofs in the City of Ljubljana. The pilot case is the BTC shopping center in Ljubljana.

The research is conducted by the students of Landscape Architecture and the Knauf Insulation company.



POWERLINE ALLOCATION

The the project on routing a high-voltage transmission line (from Beričevo to Divača) away from residential settlements, schools and kindergartens.

It is expected that the work on the decision analysis model will help in finding an acceptable solution for all involved parties.

Volunteer motivation and retention

General recommendations:

1. **Clarity of project aims** and as well as **managing expectations** early on in the process are vital elements of success.
2. Recruitment of volunteers and stakeholders should be based on relevance criteria and after thorough collection and **comprehension of their motivations and needs**.
3. Volunteers should be **actively involved in all stages of the project** and its products.
4. **Functional features should match the volunteers' expectations** and for this knowledge gained during their implementation clear feedback should be provided.
5. The **sustainability** of projects is better served when relevant factors are addressed **early in the design phase** and potential exploitation scenarios are foreseen.



Thank you!

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