CHANGE

CITIZEN ACTIONS ON CLIMATE CHANGE AND ENVIRONMENT

Fostering Environmental Awareness Through Innovation: The I-CHANGE project

Contents

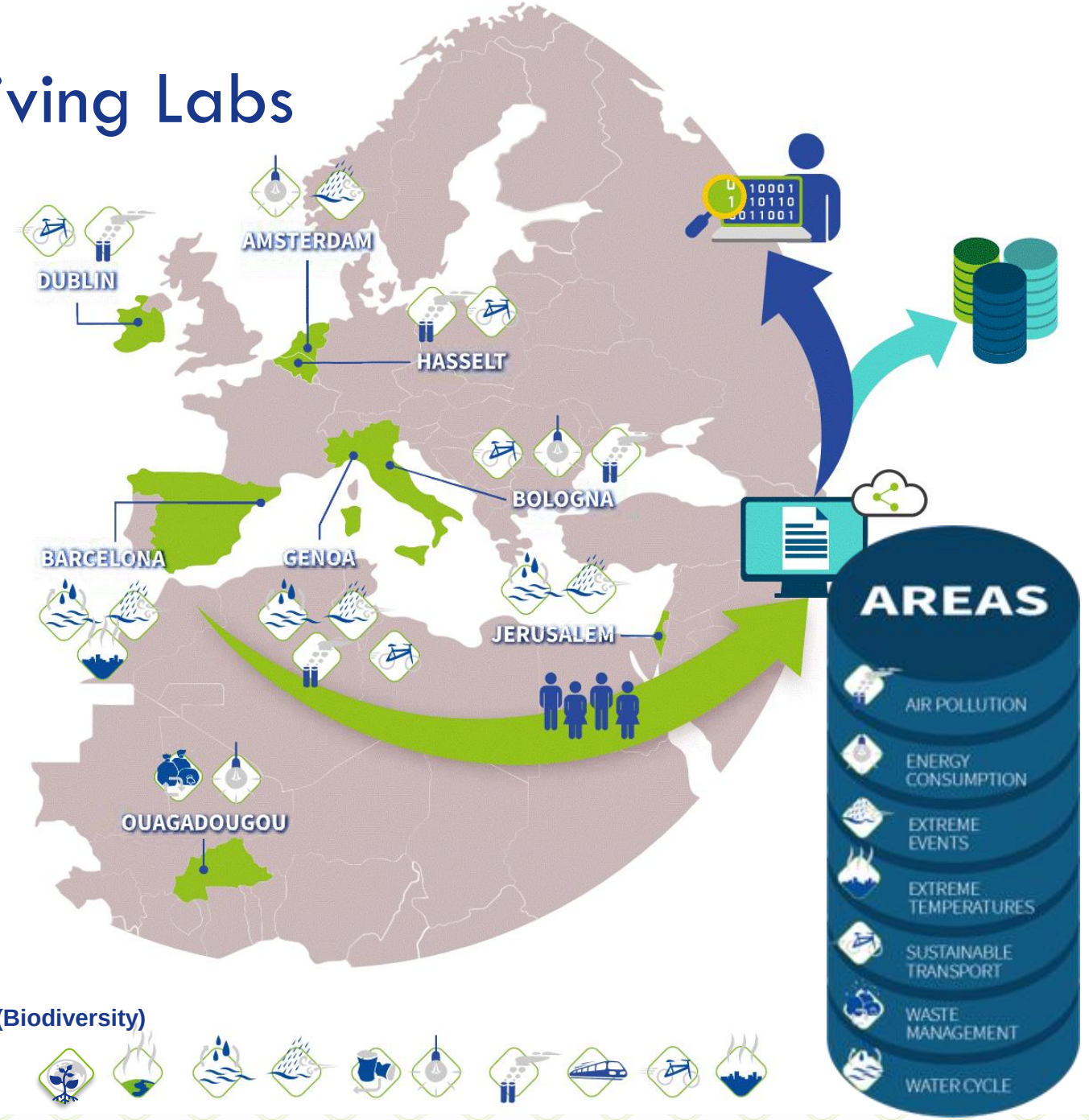
- Overview of the Living Labs (LLs) activated by I-CHANGE
  - Presentation of the LLs activities and main achievements
- I-CHANGE LLs network and concluding remarks

I-CHANGE Living Labs

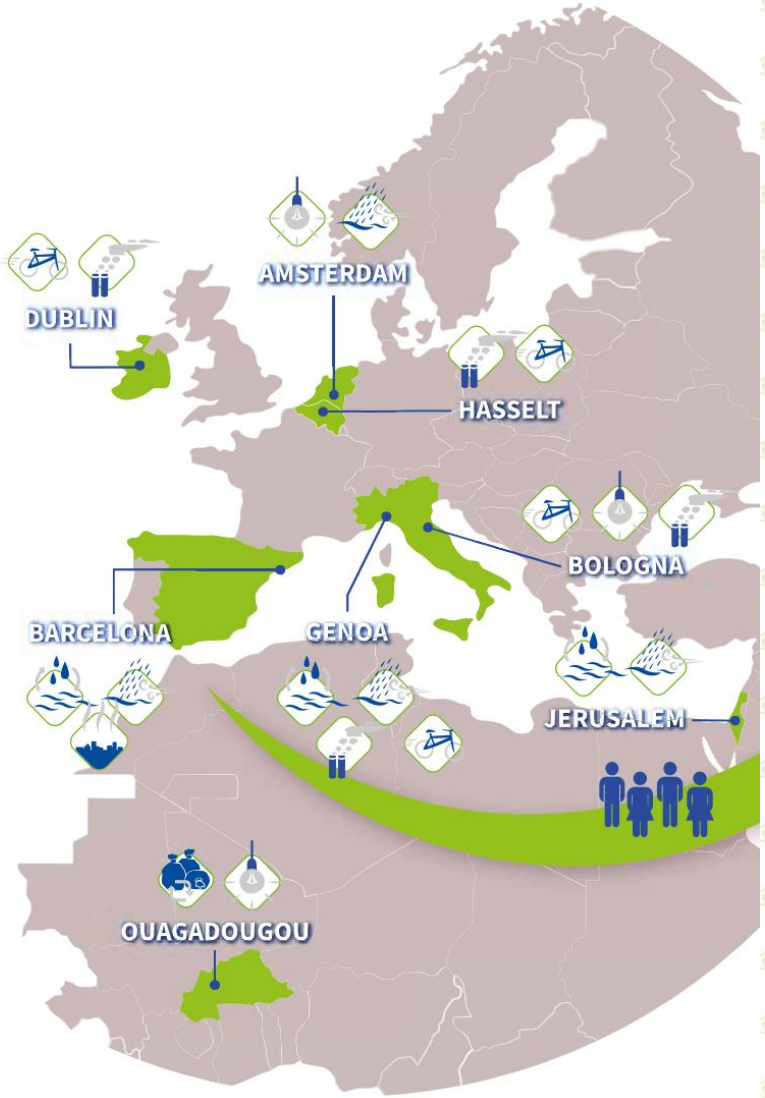
A total number of **8 Living Labs** in Europe, Middle East and Africa, initially focused on 6 action domains that were later expanded.

Citizen Science including data collection and analysis through low-cost sensors

Environmental Impact Hub, collecting data, tools and initiatives for citizen engagement



I-CHANGE Living Labs



GELL – Genova
Leader: CIMA Research Foundation (CIMA)

BOLL – Bologna
Leader: University of Bologna (UNIBO)

BALL – Barcelona
Leader: University of Barcelona (UB)

HALL – Hasselt
Leader: University of Hasselt (UHASSELT)

JELL – Jerusalem
Leader: Tel Aviv University (TAU)

DULL – Dublino
Leader: University College Dublin (UCD)

OULL – Ouagadougou
Leader: WASCAL

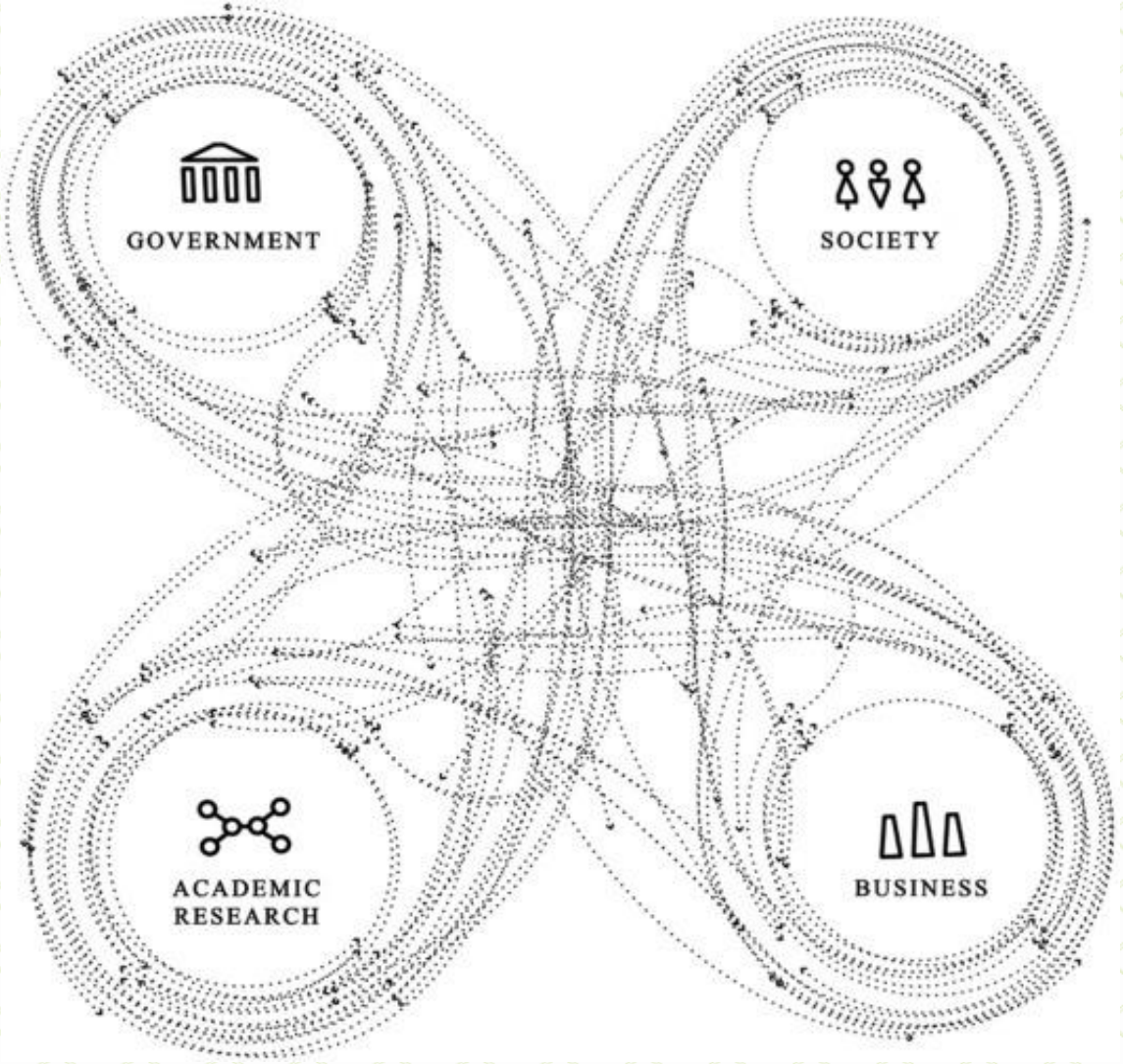
AMLL – Amsterdam
Leader: Wageningen University (WUR)

I-CHANGE Engagement Strategy

Quadruple helix engagement is a central factor in Living Labs activity. It brings together stakeholders from all sectors:

- citizens,
- city level public institutions,
- private organisations (companies, start-up, SMEs, corporations),
- as well as academia (researchers, universities, research organisations).

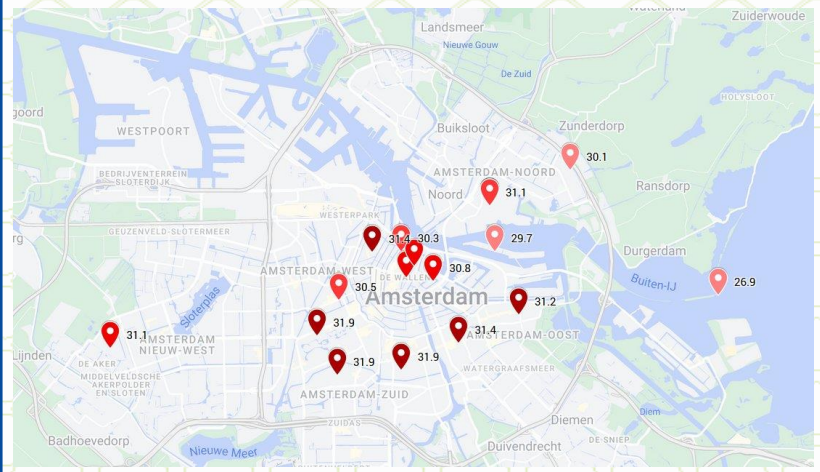
I-CHANGE Living Labs have a specific focus on the citizens, however using the multi-stakeholder inclusion creates sustainable results from which all involved actors can benefit



Presentation of the LLs activities and main achievements

Amsterdam Living Lab (AMLL)

Heat



Extreme Events

Energy Consumption

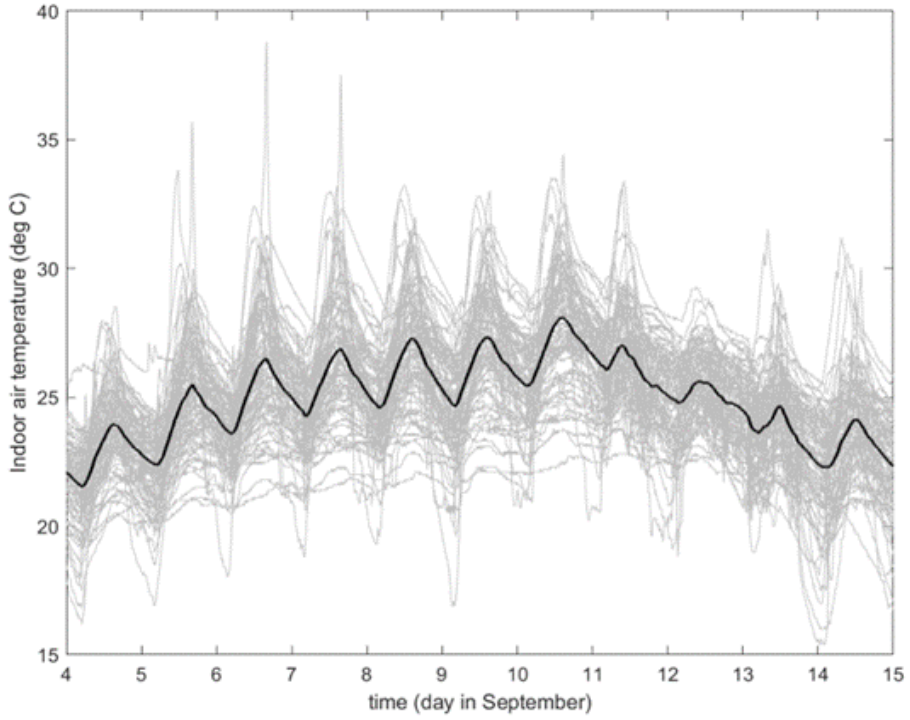
Main stakeholders involved in the I-CHANGE AMLL

Currently, 100 households have been recruited to host two indoor thermometers to monitor indoor urban heat during heatwaves. Number of citizens involved: ~150 citizens hosting a sensor (1 count 1.5 person per household), ~10 per CATS (~60 so far)

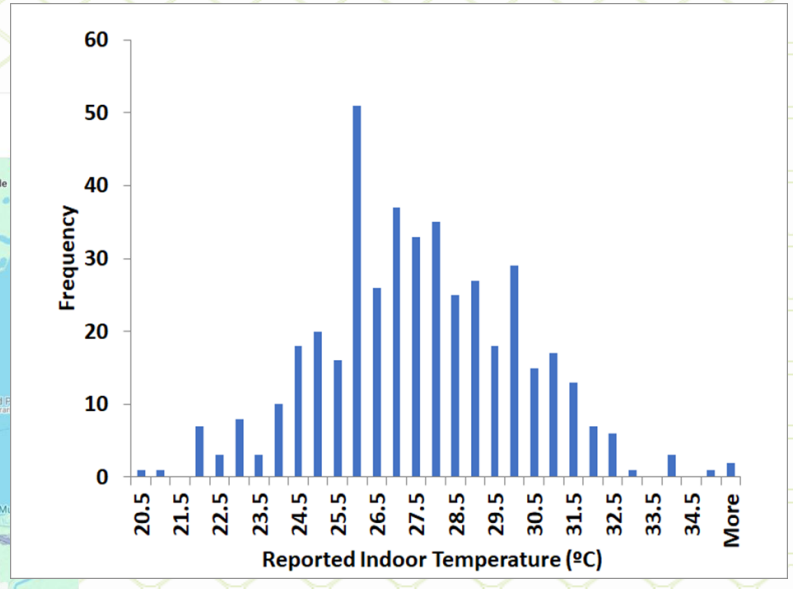
Government	Academic Research	Civil Society	Business
Municipality Amsterdam	AMS-Institute Wageningen University Ruisdael Observatory TU Delft, Urbanism group	100 households	Witteveen & Bos Royal Haskoning/ DHV, Nelen & Schuurmans

Key activities on data collection and analyses

100 households with indoor heat sensor in bedroom and living room



Crowdsourcing event with general public



Amsterdam TV channel item: https://www.at5.nl/artikelen/222354/wetenschappelijk-onderzoek-naar-hitte-in-amsterdam

Key activities for raising citizen knowledge and awareness

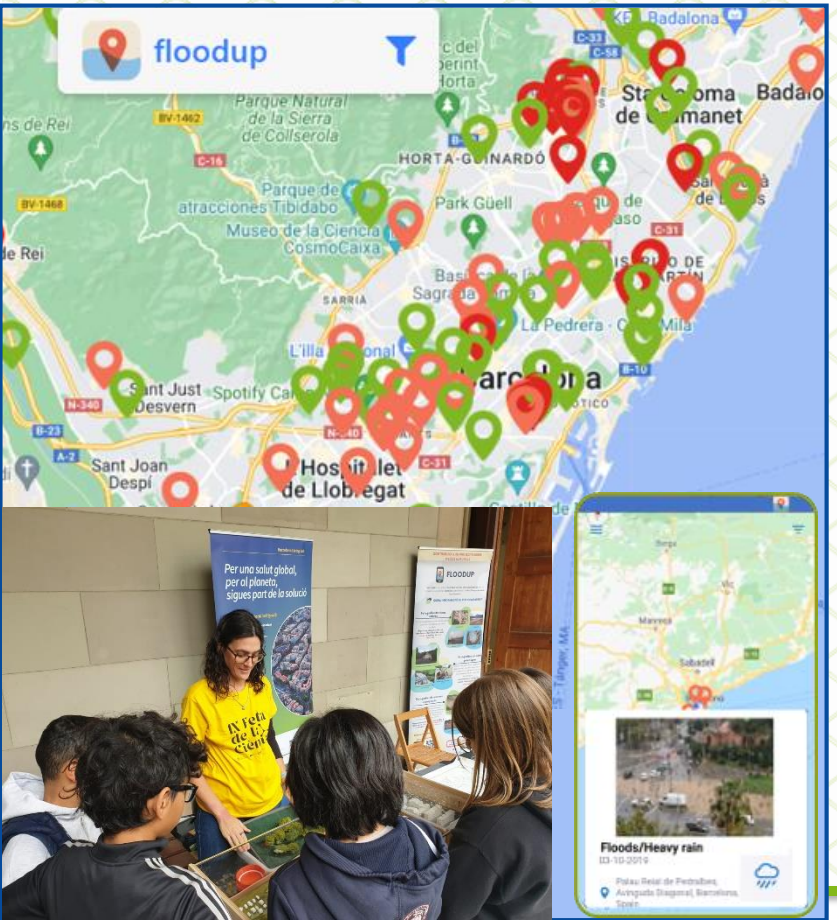
- CATS (4x, with AMS-Institute, and MSc students)
- TV items Amsterdam AT5 channel and AVROTROS, omroep HUMAN (national TV) and Red Cross
- Three newsletters sent to LL participants

Key results on climate change understanding and behavioral change promoting actions

- Citizens have changed behaviour by looking at their **own in-house observational data about air quality**.
- An evening of training was given to the citizens on how to use the App and about the interpretation of the readings.
- One Climate Action Training School (CATS) taught the citizens how to determine their house Heat Label and they explored scenarios in behaviour and building properties to improve their Heat label.

Barcelona Living Lab (BALL)

Extreme Events



Heat

Air Pollution

Main stakeholders involved in the I-CHANGE BALL

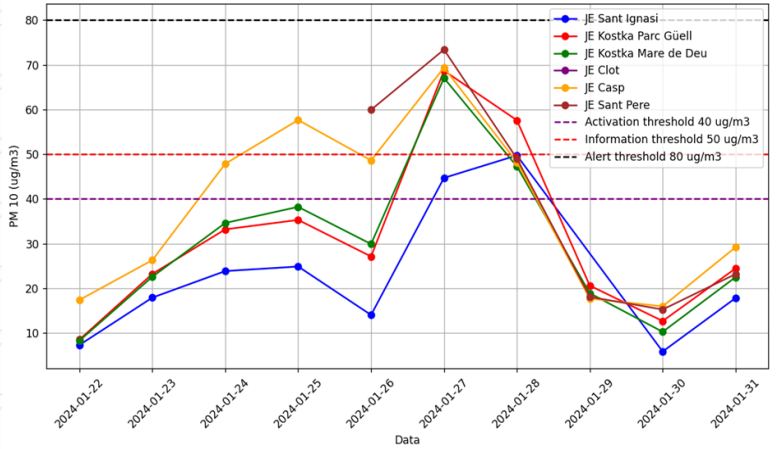
A growing number of stakeholders have been engaged, including different members from all the groups of the quadruple helix. The BALL has engaged directly in the citizen science activities more than one hundred people, but it has had incidence in more than one thousand people that have participated in the different activities.

Government	Academic Research	Civil Society	Business
BCASA Cartographic and Geological Institute of Catalonia (ICGC) AMB CADS Public health (ASPCAT, …) Climate Change Catalan office Civil Protection Office of citizen science in Barcelona TMB SMC, ACA Network of cities for sustainability	University of Barcelona Fundació Bosch i Gimpera Earth Sciences Department, BSC European Projects: Terrifica, Greenscent, Citimeasure, ISEED	Catalan association of weather observers (ACOM) Habitats (ONG) Schools: Kostka, Casp, Sant Ignasi, S. Pere Claver, Clot Sant'Egidi community Mass media (TV3, Betevé, RAC1)	Naturgy Insurance company (CCS) Geoskop

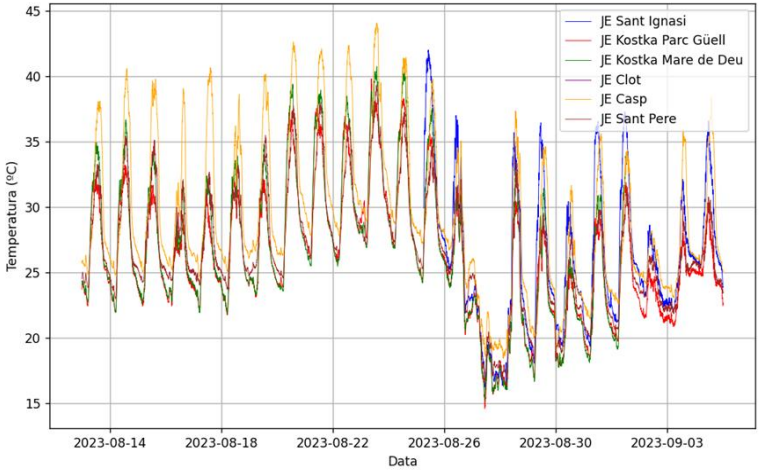
Key activities on data collection and analyses

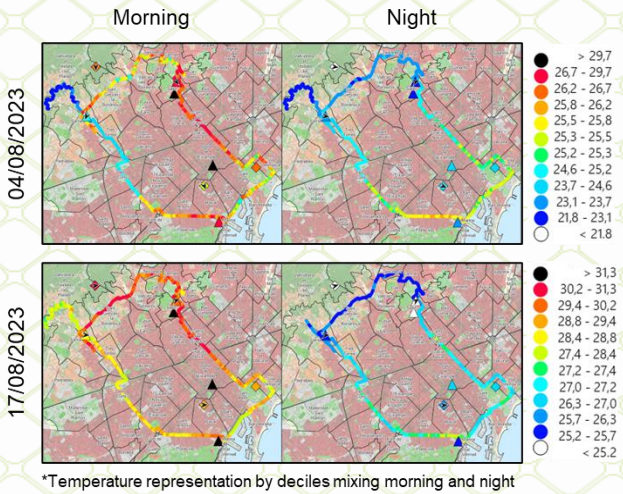
Network of sensors in schools of the BALL

Air quality: PM10 daily averages for Saharan dust intrusion episode vs official Spanish warning thresholds

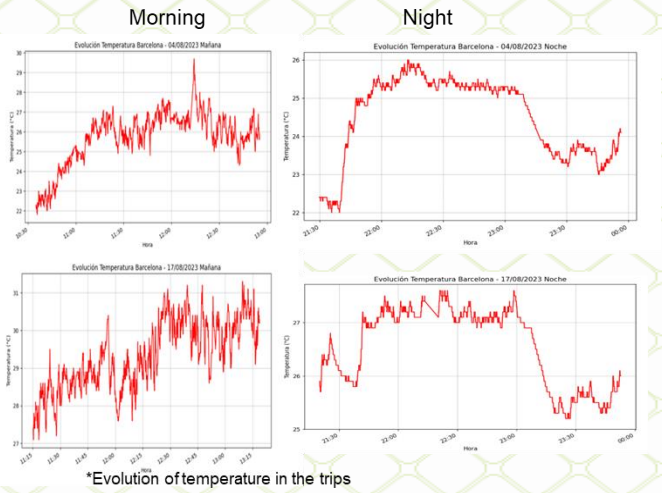


Temperature: heat wave in Catalonia between 18-25/08/23 captured by the SCK in the schools





*Temperature representation by deciles mixing morning and night



*Evolution of temperature in the trips

Master thesis in the University of Barcelona

Study on intense precipitation episodes in Barcelona to improve the city's coping capacity in extreme rainfall events

Author: Biel Cardona Gilabert*
Supervisor: Dr. María del Carmen Llasat Botija, carmell@meteo.ub.edu
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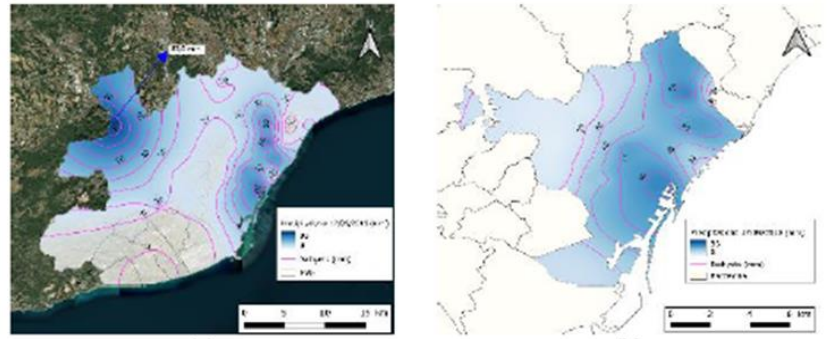


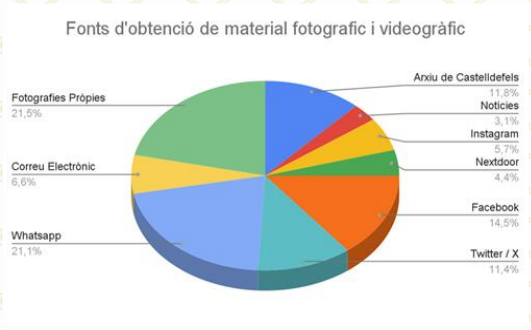
Figure 5. Rainfall registered in MAB stations (a), and rainfall registered in BCASA stations (b) of 17th August 2018.

MeteoTracker summer citizen science campaign:

- Uniformity of the temperature patterns during night tracks vs more variability in the morning ones.
- Dense urban areas concentrate more heat.
- Open areas (built type or green) showed large difference between morning and night.
- Sea breeze influence and influence of Urban Heat Island.

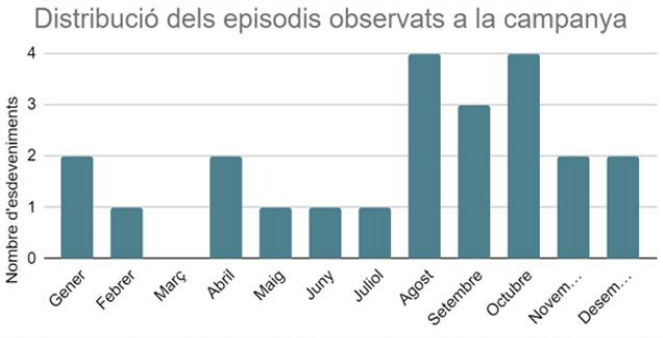
Key activities for raising citizen knowledge and awareness

Dissemination of the campaign



Obtaining sources of data


Flood of 2002 of Castelldefels



Distribution of observations

Flood campaign in Castelldefels: Data collection, analysis and proposals of adaptation measures related to floods and marine storms, led by High School students (**228 images and videos**) to collect data

Climate Action Training Schools (CATS): leaders to promote sustainability and change in habits in schools and between the students, teachers, and other school workers.
3 sessions (one in 2022), 4h each. In collaboration with FJE schools

Key results on climate change understanding and behavioral change promoting actions

- Working with a large schools' network using the Smart Citizen Kits (SCK) enabled the possibility to add **more climate change content in the educational curriculum**.
- Throughout the year I-CHANGE participated in the **training of Sustainability Promoters**, whose mission is to spread behaviours and attitudes in each school aligned with the European Green Deal.
- Families and other workers from the school, have also been influenced through participation in **meetings with green school committees**. Students of one school have comitted to s**top using metallic paper** as packaging, meat consumption has decreased and the **number of students who go to school by public transport is increasing**
- Other citizens part of non luctrative associations and other volunteers have shared their concern on local impacts of climate change and contributed to increase the scientific knowladge in their area trough the participation in BALL activities to

Bologna Living Lab (BOLL)

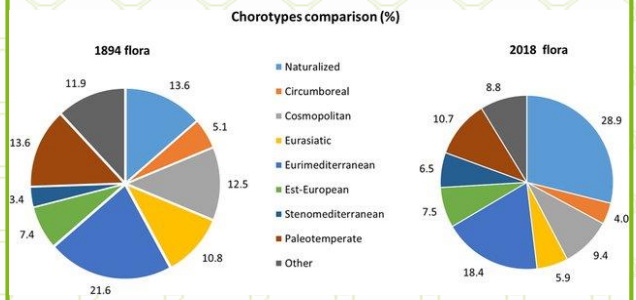
Air Pollution

Sustainable Transport

Energy Consumption

Biodiversity

Image 1



Main stakeholders involved in the I-CHANGE BOLL

The Bologna LL opened a significant discussion and collaboration with key local stakeholders: public authorities, different research centres as well as local associations. An increasing number of stakeholders have been engaged in the four areas of the quadruple-helix approach, as well as a significant number of citizens has been engaged and involved in the project activities: no less than 700 people actively participated in person in an I-CHANGE activity.

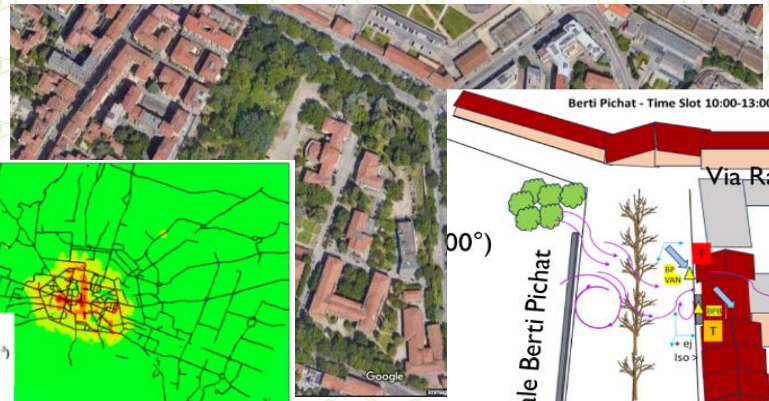
Government	Academic Research	Civil Society	Business
Municipality of Bologna Fondazione Innovazione Urbana ARPAE	University of Bologna (Dept. Of Physics and Astronomy, Dept of Sociology and and Busines Law ENEA Centro Antartide Liceo Scientifico Righi EIT Climate-KIC Politecnico Milano Fondazione Golinelli	Salvaiciclisti- Bologna Legambiente Emilia Romagna Meteo Slowfood Bologna Fridays for Future Bologna for Climate Justice UniversiRà FabLab Valsamoggia Ass. MeteoNetwork OdV	Impronta Etica Arvaia S.p.a.

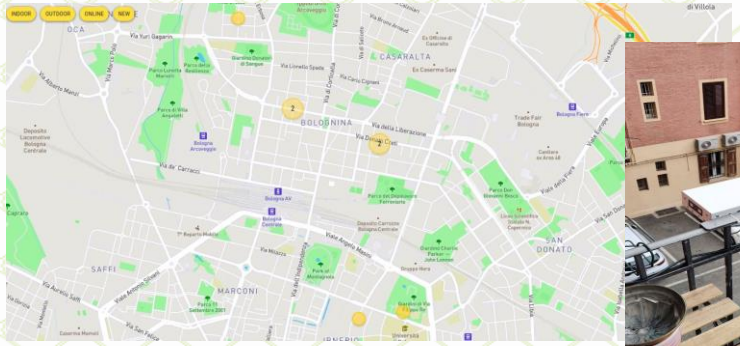
Key activities on data collection and analyses

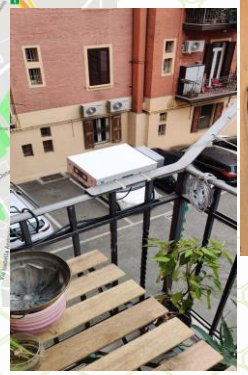
Experimental field Campaigns and numerical study in Bologna (2023-2024)

The aims are to monitor air pollutant and climate-related variables in two pedestrian and limited traffic areas close to main traffic roads to:

- **Evaluate meteorological drivers** for courtyards pollutant accumulation
- **Assess the risks related** to the low air quality exposure and how morphology and vegetation can be beneficial
- **Highlight potential co-benefits of NBS** interventions pollutant and climate stress mitigating factor







Monitoring campaign

Ongoing campaign to collect air quality data in the Bolognina, a Bologna north-centre residential districts. Total of 10 SCKs were installed in 7 private houses.

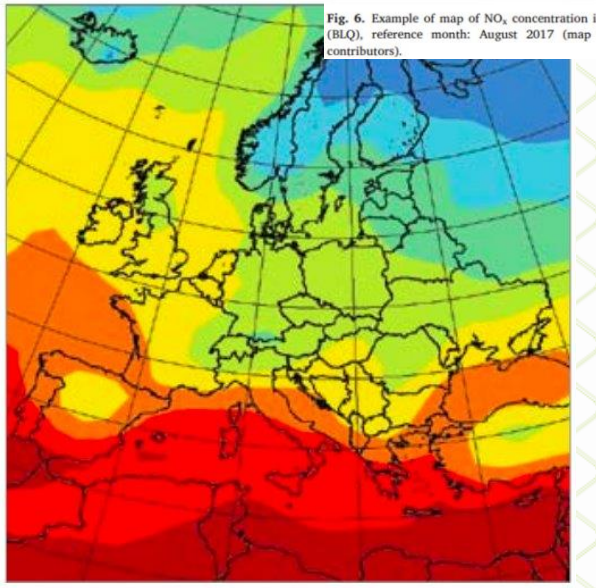


Fig. 6. Example of map of NO_x concentration in BASE cases for urban scale (BLQ), reference month: August 2017 (map source: OpenStreetMap and contributors).

Global Climate Model Resolution.
Simulated summer temperature (1961-1990)

Numerical multiscale analyses on urban heat stress and air quality

Climatic future scenarios, obtained by integrating the impact of behavioural change and NBS on climate change, are utilized to analyse future heat extremes and air quality, to formulate recommendations on adaptation and mitigation measurements by public auth orities and individual citizens.

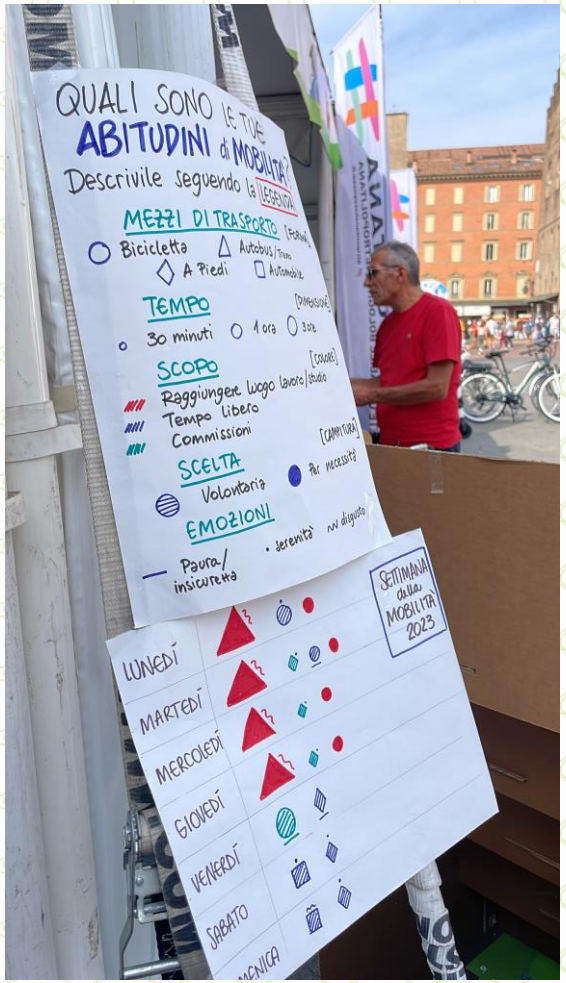
Key activities for raising citizen knowledge and awareness

Citizen Science Activities (2023-2024)

The serious game "Hands on Map" was developed in 2023 and applied to three different target groups (360 participants):

- University students and citizens collected data on sustainable mobility and identify issue on Bologna's mobility issues
- Middle school students reflect on their daily behaviour and identify how they could make different choices on mobility
- Local administrators to deeply understand burdens on city planning towards underrepresented citizens.

Climate Action Training School (2023)



EU Green Week

Public event about air pollution and sustainable mobility at Montagnola park with Bologna Municipality and ARPAE.

Masterclass for STEAM

In partnership with Fondazione Golinelli, masterclass for high school professors on data humanities

EU Mobility Week

In Bologna Piazza Maggiore, open event on sustainable mobility, in partnership with the Municipality of Bologna and local cycling association "Salvaiciclisti"

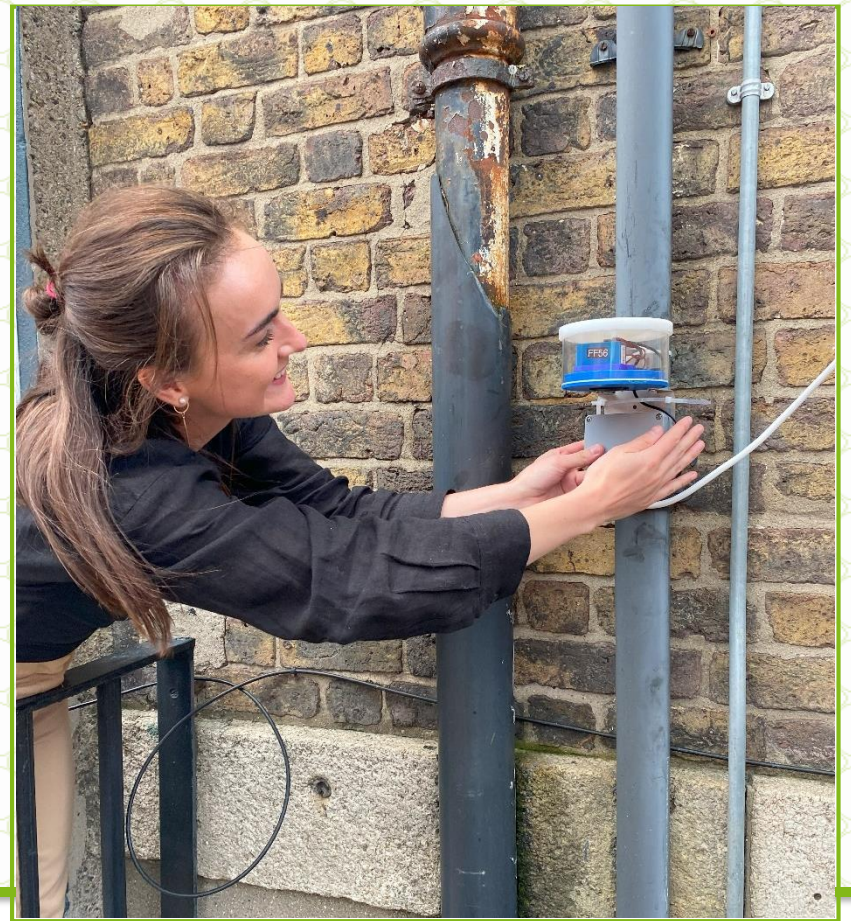
Key results on climate change understanding and behavioral change promoting actions

- Activities contributed to interacting with different stakeholders, mainly focusing on air quality and urban mobility, thus paving the way to modify the mobility choices to lower carbon and environmental footprint in the city of Bologna.
- SCK have been used to engage citizens in science activities and monitoring the spatial variability in the concentrations of air pollutants, including the discussion on the role of urban NBS as mitigating solution.
- Meteotrackers have been used to raise awareness on the **link between urban morphology, presence of vegetation and temperature distribution**, in view of sustaining choice of proactive and pro-environmental lifestyles
- Hands on Map serious game and awareness tools for sustainable mobility increased **people's awareness of their mobility choices, promoting lifestyle changes**. Qualitative tools like focus groups and workshops, along with interviews and questionnaires, showed a significant rise in awareness and adoption of sustainable mobility practices, especially among young participants and middle school students.

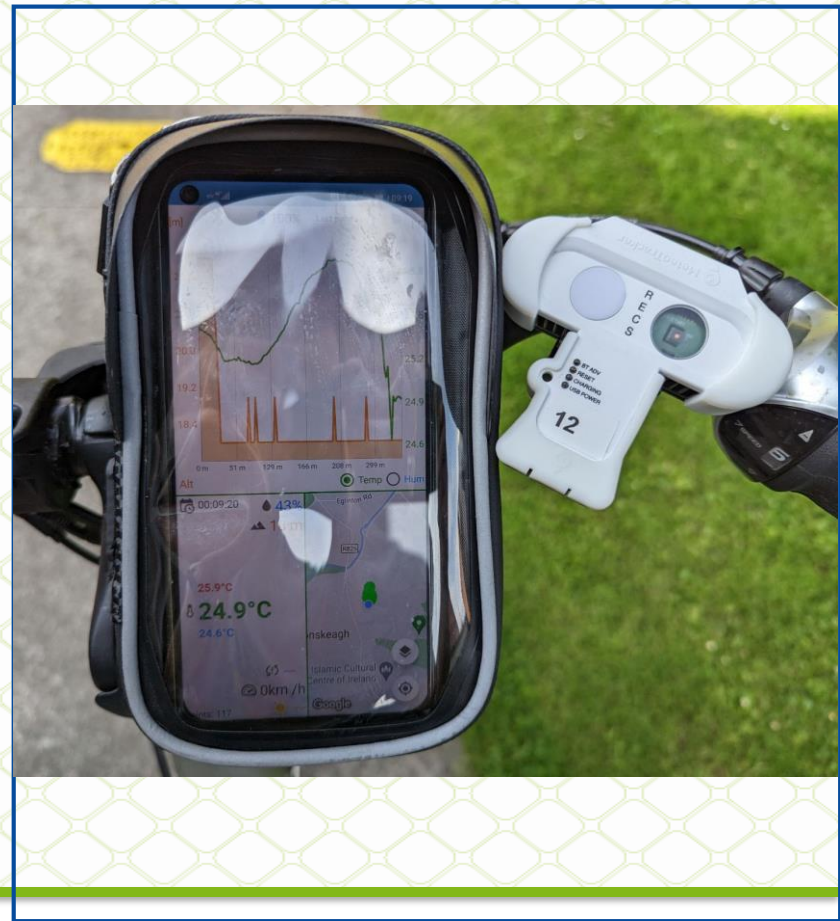
Dublin Living Lab (DULL)

Sustainable Transport

Air pollution



Heat



Main stakeholders involved in the I-CHANGE DULL

This LL has engaged a wide range of stakeholders during the project. Through our engagement with the National Transport Authority we secured **additional funding** to purchase the bikes that have been used in Phase 1 of the **Dublin Bike Library** and in the **expansion of the Bike Library** during RP2.

Government	Academic Research	Civil Society	Business
Dublin City Council Environmental Protection Agency (EPA) Climate Action Regional Office (CARO) Dun Laoghaire Rathdown Council Dublin South Council Fingal Council National Transport Authority	University College Dublin Trinity College Dublin Dublin City University University College Cork Massachusetts College of Pharmacy and Health Sciences	A Playful City ECO-UNESCO Dublin Cycling Campaign An Taisce GLOBE The Gaelic Athletic Association Academy of the Near Future	Good Travel Software Bleeperbikes Dublin Bus Dogpatch Labs Kinia STEM Educational

Key activities on data collection and analyses

Data collection and analysis in schools (2023-2024)

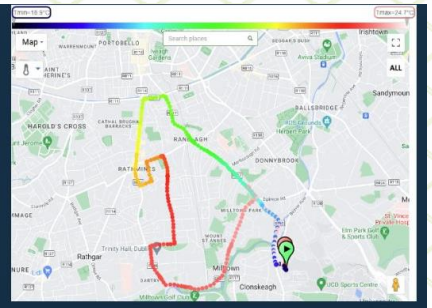
During the **1st** workshops in schools we installed a SCK air pollution monitor and a Telraam traffic counter.
During the **2nd** workshops in schools the students analysed the data collected. With guidance from the I-CHANGE team they focused on:

- **Identifying peaks** in traffic, particulate matter and noise
- **Exploring patterns** in traffic and the pollutants including temporal patterns and potential correlations
- **Assess exceedances** of the particulate matter concentrations relative to the Irish air quality regulations and WHO guidelines

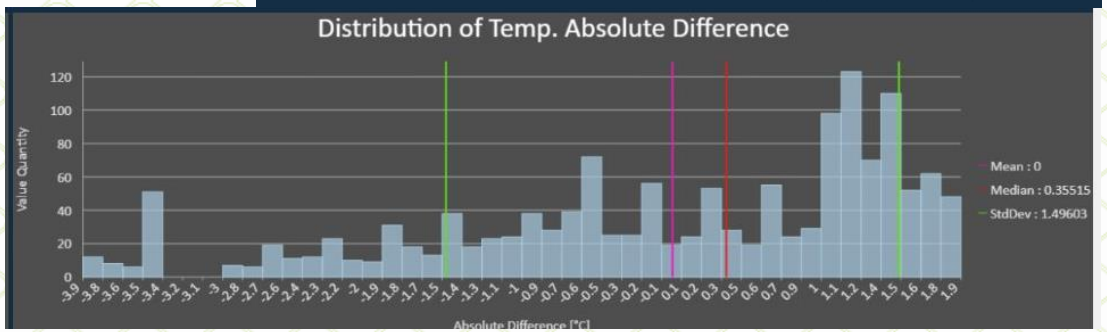
ArcGIS StoryMaps

Notable temperature fluctuations occurred at 4 points throughout. From the starting point to the finish, temperature was changing, even if it was at a difference of .1 for lengths.

1. Entering Clonskeagh Rd. from UCD Richview
2. Passing Milltown Park on Sandford Rd.
3. Turning off the Grand Canal R111
4. Entering Central Rathmines



Temperature Map (Src. - Meteotracker)



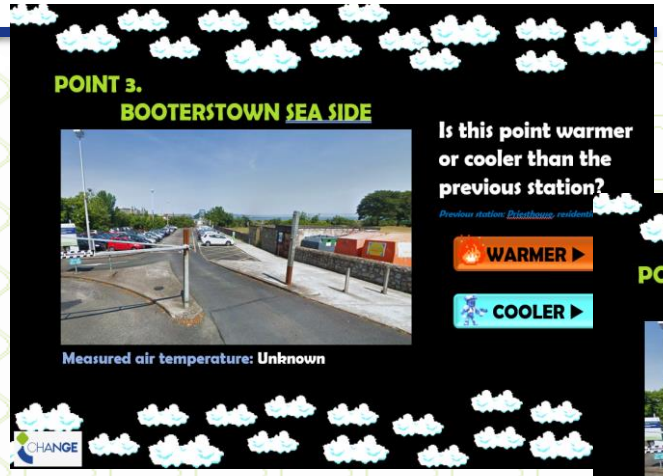
Data collection and analysis by students (May 2023)

Postgraduate students taking the Advanced GIS module used the **Meteotracker sensors** to collect temperature data along a prescribed route. They used a range of techniques that they had learned during the module to analyse their data, including heat maps, correlation with land cover, interpolation. Each student presented their data and analysis in a ArcGIS StoryMap.

Key activities for raising citizen knowledge and awareness

CATS in primary schools (2023-2024)

We organised workshops in primary schools on the topic of **cars idling and air pollution**. Schoolchildren were introduced to the health impact of air pollution and watched a demonstration of idling with an air pump and a balloon. In one school we also used the **train the trainer** approach: the workshop was attended by 1-2 children from each class (1. to 6. class), who then reported back to the rest of their class.



MeteoTracker Game (April 2024)

We developed a **computer game** for children using data collected by the Meteotracker. The children are shown photographs of different locations in Dublin and have to guess, if the new **location is hotter or colder** than the previous one based on the visible environment. After their guess they get a short information text about the effect of the built environment on local temperature. We developed this game for the UCD Festival in June, which was unfortunately cancelled.

Key results on climate change understanding and behavioural change promoting actions

- Students in secondary schools developed **action projects** to raise awareness of traffic and active travel related issues in their local area.

- The **Dublin Bike libraries** were expanded to GAA clubs and the UCD library, providing cargo, folding and electric bikes to families and UCD staff free of charge.

- Between April '23 and May '24 the bikes travelled >80,000km, replacing a significant amount of car journeys.

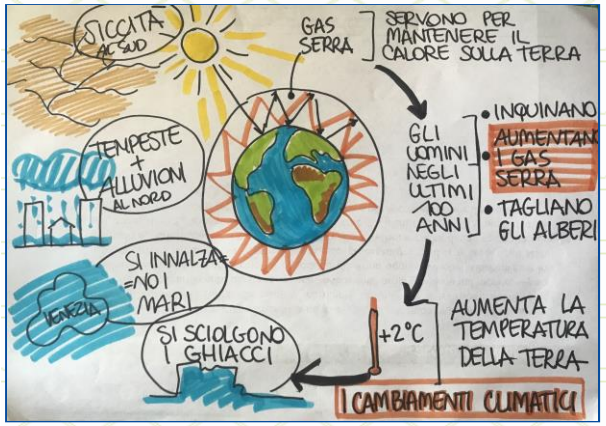
Genova Living Lab (GELL)

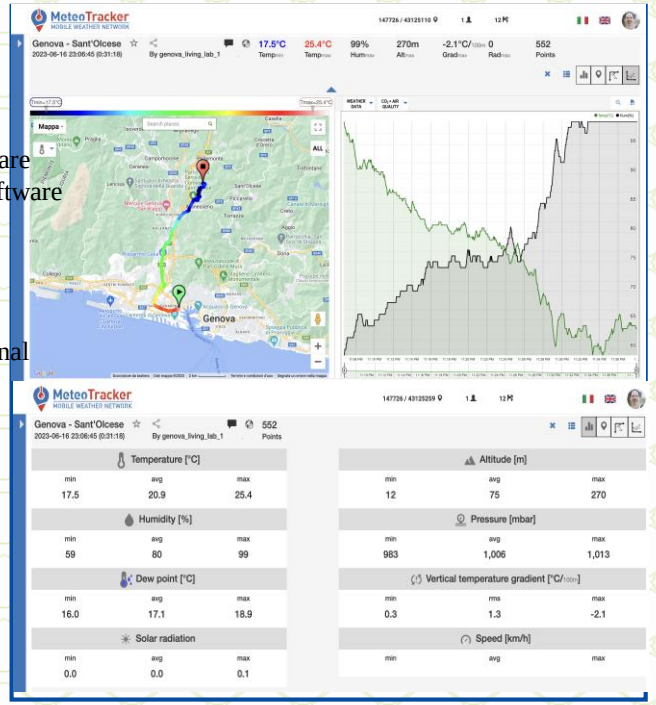
Water Cycle

Extreme Events

Heat

Air pollution





Main stakeholders involved in the I-CHANGE GELL

A growing number of stakeholders has been engaged in line with the quadruple helix approach discussed in WP2, namely a total of 30 entities.

Government	Academic Research	Civil Society	Business
- Union for Mediterranean - Regione Liguria - Liguria Region Environmental Protection Agency - Natural History Museum - Genova Municipality - Chiavari Municipality - Guardia costiera ausiliaria - Arenzano Municipality - Mele Municipality	- University of Genoa - UniValbormida - UniTre Arenzano-Cogoleto - University of Wyoming	- Schools Serra Riccò and Sant'Olcese - Schools Genova Pegli - Schools Genova Voltri and Mele - Schools Sassello and Stella - Schools Campomorone and Ceranesi - Schools Genoa Rivarolo and Genoa Begato - Schools Arenzano - Naval Lega of Sestri Ponente - Naval Lega of Chiavari - Turchino Outdoor – cyclists - Unione Italiana Fotoamatori - Italian Alpine Club - Osservatorio Raffaelli	- Iotopon SRL - Tigullio Maritime Service - Liguria Via Mare - Genoa Municipality Public Transportation

https://doi.org/10.3390/s24144598

sensors

MDPI

Article

Validation of Citizen Science Meteorological Data: Can They Be Considered a Valid Help in Weather Understanding and Community Engagement?

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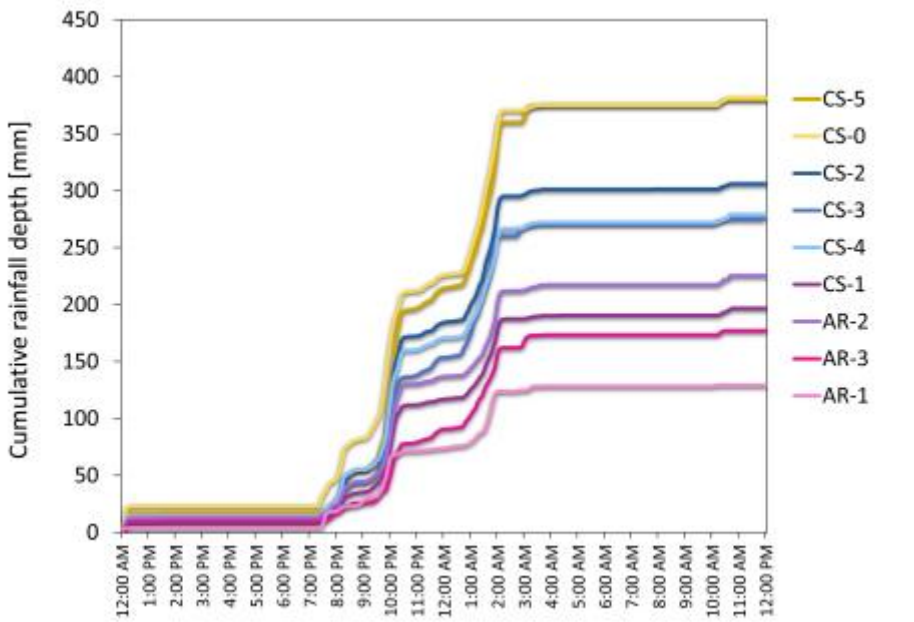
Abstract: Citizen science has emerged as a potent approach for environmental monitoring, leveraging the collective efforts of volunteers to gather data at unprecedented scales. Within the framework of the I-CHANGE project, MeteoTracker, a citizen science initiative, was employed to collect meteorological measurements. Through MeteoTracker, volunteers contributed to a comprehensive dataset, enabling insights into local weather patterns and trends. This paper presents the analysis and the results of the validation of such observations against the official Italian civil protection in situ weather network, demonstrating the effectiveness of citizen science in generating valuable environmental data. The work discusses the methodology employed, including data collection and statistical analysis techniques, i.e., time-series analysis, spatial and temporal interpolation, and correlation analysis. The overall analysis highlights the high quality and reliability of citizen-generated data as well as the strengths of the MeteoTracker platform. Furthermore, our findings underscore the potential of citizen science to augment traditional monitoring efforts, inform decision-making processes in environmental research and management, and improve the social awareness about environmental and climate issues.

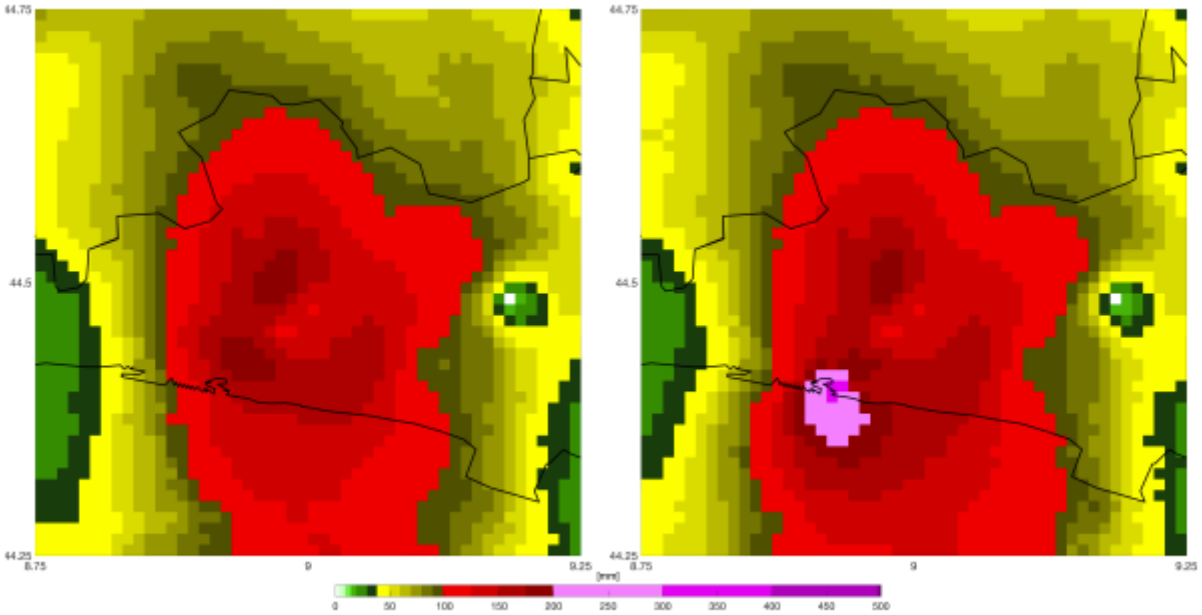
Keywords: citizen science; MeteoTracker; meteorology; I-CHANGE

Citation: Loglisci, N.; Milelli, M.; Iurato, J.; Galia, T.; Galizia, A.; Parodi, A. Validation of Citizen Science Meteorological Data: Can They Be

1. Introduction

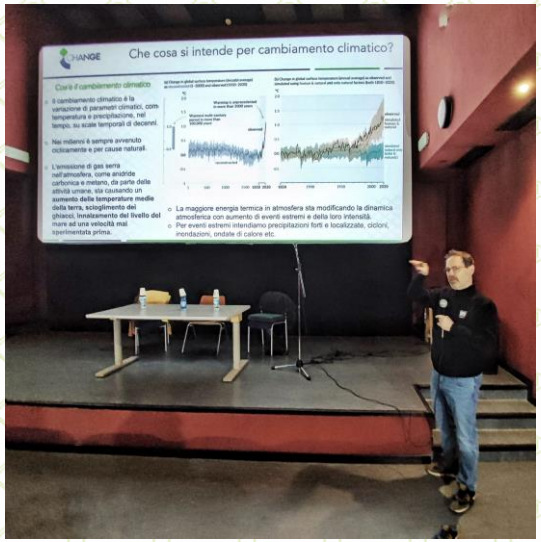
Key activities for raising citizen knowledge and awareness





Key activities for raising citizen knowledge and awareness

- More than 600 students involved (I-CHANGE training program, laboratories etc.)
- About 1100 photos produced (UIF)
- 3 CATS, followed by about 70 teachers
- 10 oral presentations and 12 posters (EGU2024)
- 7 papers accepted/submitted

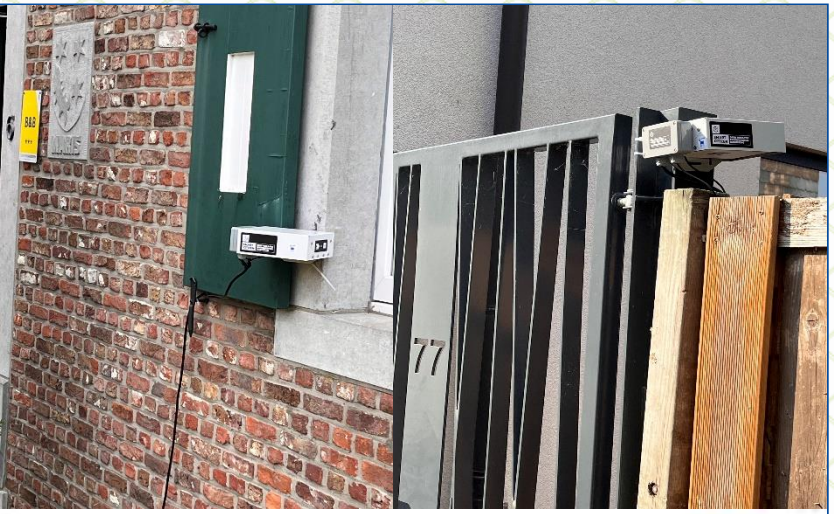


Key results on climate change understanding and behavioral change promoting actions

- Playing with data collected by Meteotrackers and SCK has raised attention by citizens on the **link between atmospheric variables and climate change** related phenomena
- Training of primary and secondary school teachers has spread concepts of climate change and behavioural change, while the large number of schools engaged paved the way of **changing the behaviours of parents via the children**.
- The engagement of photo amateurs allowed using photography to raise awareness of citizens about climate change phenomena.
- > 1200 questionnaires pre- and post-project activities collected showing a **sustainable rise in awareness** and a general behavioural change in favour of more sustainable lifestyles.
- Furthermore, **two schools became plastic free** during their activities in the classes.

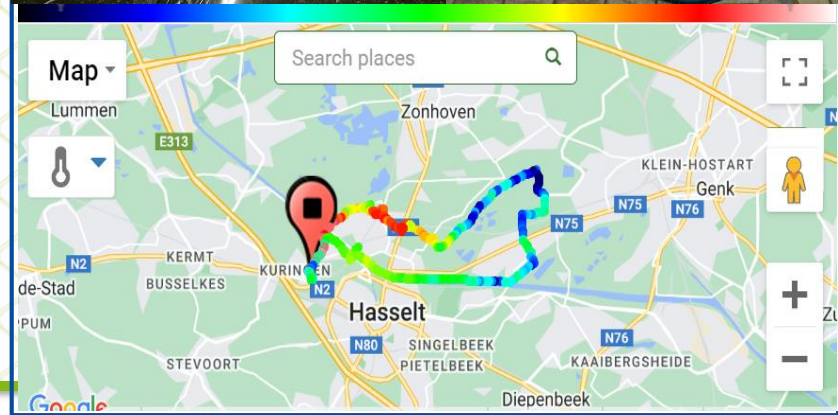
Hasselt Living Lab (HALL)

Air Pollution



Sustainable Transport

Heat



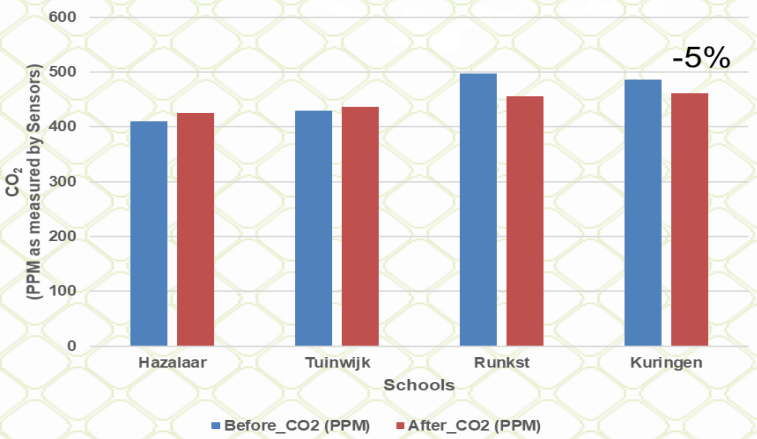
Main stakeholders involved in the I-CHANGE HALL

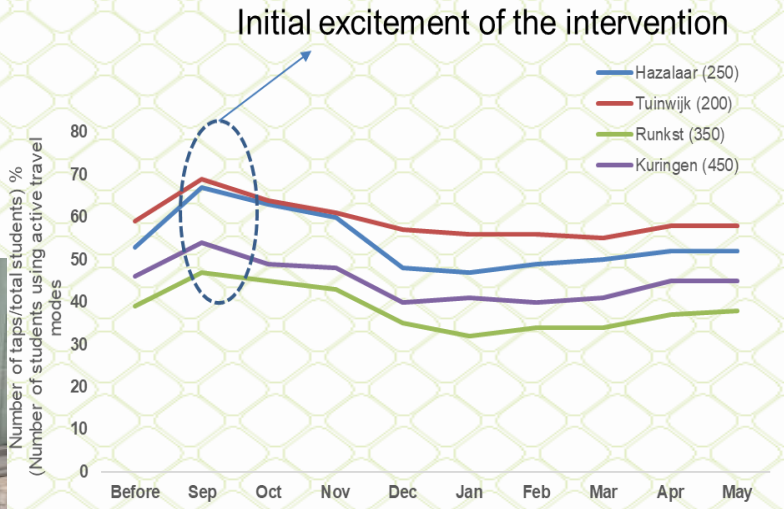
Several stakeholders are on-board and supporting actively to promote the agenda of Hasselt living lab.

Government	Academic Research	Civil Society	Business
Municipality Hasselt Flemish Environmental Agency Municipality Heusden-Zolder Municipality Beringen	Hasselt University UCLL HogeSchool	HAST Katholiek Onderwijs Hasselt (Secondary School) Basis Schools Hasselt (4 primary schools) De Fietsersbond Avansa Limburg Doppahuis Hasselt	High-Five Project Cegeka nv

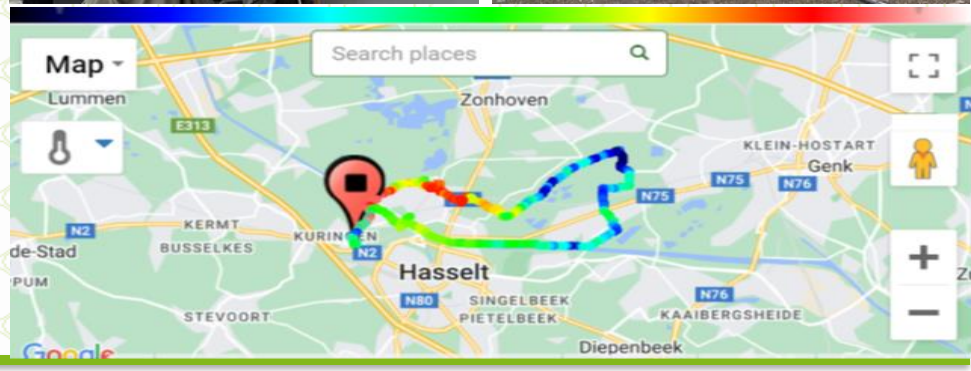
Key activities on data collection and analyses

- Collaboration with High-Five Project:
  - 4 Schools participated, high-five poles and CSK were installed around 4 schools to increase active modes and investigate impacts in relation to change in air pollution around schools.

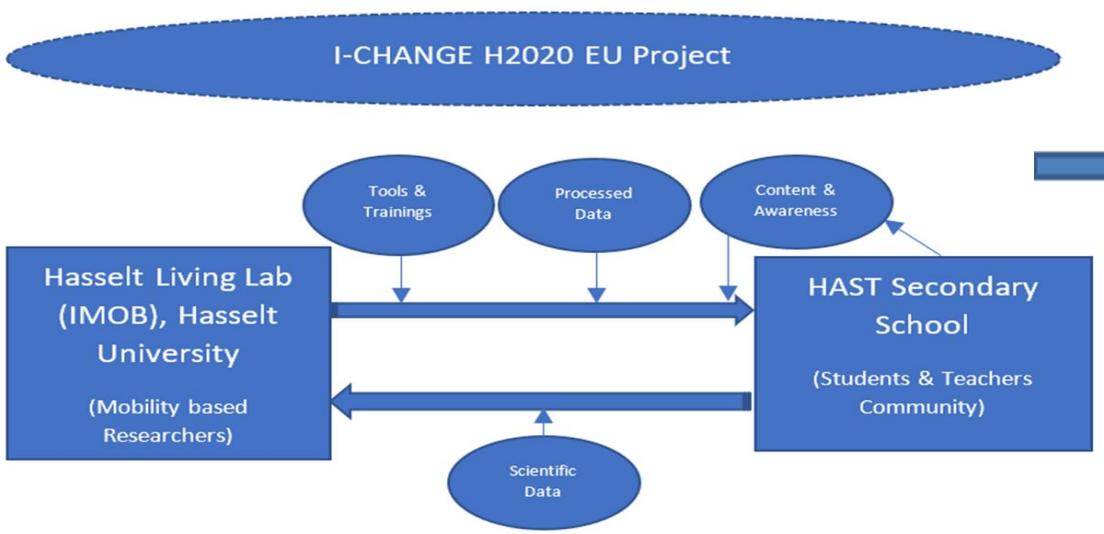




- **Air quality indicators mapping around bicycle tracks in Hasselt city also with comparison of meteotracker measurements**:
  - Dynamic mapping of wether and air quality parameters for bicycle network in Hasselt
  - Quantification of exposure and identifying points where improvements required



Key activities for raising citizen knowledge and awareness

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Enhancing Learning About Climate Change Issues Among Secondary School Students with Citizen Science Tools

Publisher: IEEE Cite This PDF

Muhammad Adnan ; Luk Knapen ; Wim Ectors ; Lien Aerts All Authors

- Going beyond data collection
- Facilitate science educators
- Awareness along with learning using co-created educational content
- Five workshops with engagement of over 300 students /teachers

- **Focus group experiments with citizens and university students for testing a selected carbon footprint calculators**
  - A manuscript along with some results of D1.5 and findings of these activities is submitted to Sustainability

sustainability MDPI

Type of the Paper (Review)

Personalized Carbon Footprint and Lifestyles Calculators: Can they Influence Climate-Friendly Behavioral Change among Consumers?

submitted

Muhammad Adnan[1,*], Fatma Outay[2], Ashar Ahmed[3] and Afzal Ahmed[4]

Key results on climate change understanding and behavioral change promoting actions

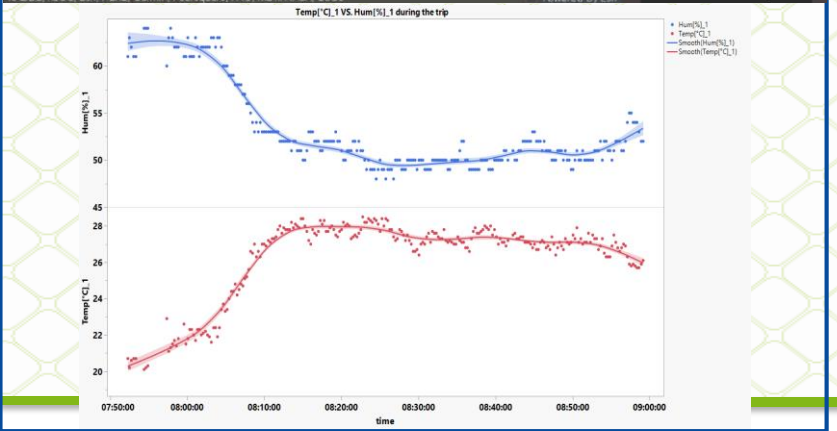
- Carefully planned citizen science activities in relation to sustainable mobility and air quality with the support of tools such SCK and Meteotrackers have resulted in **empowering stakeholders to support in their policy planning**.

- Additionally, the collaboration with the secondary school resulted in significant data, which in turn utilised in **co-creation of various exercises within their curriculum to increase the student's awareness** towards climate hazards.

- Therefore, efforts have been made to let students being citizen scientists analysing their own collected data, understanding it and become an advocators of climate-freindly behavioural change.

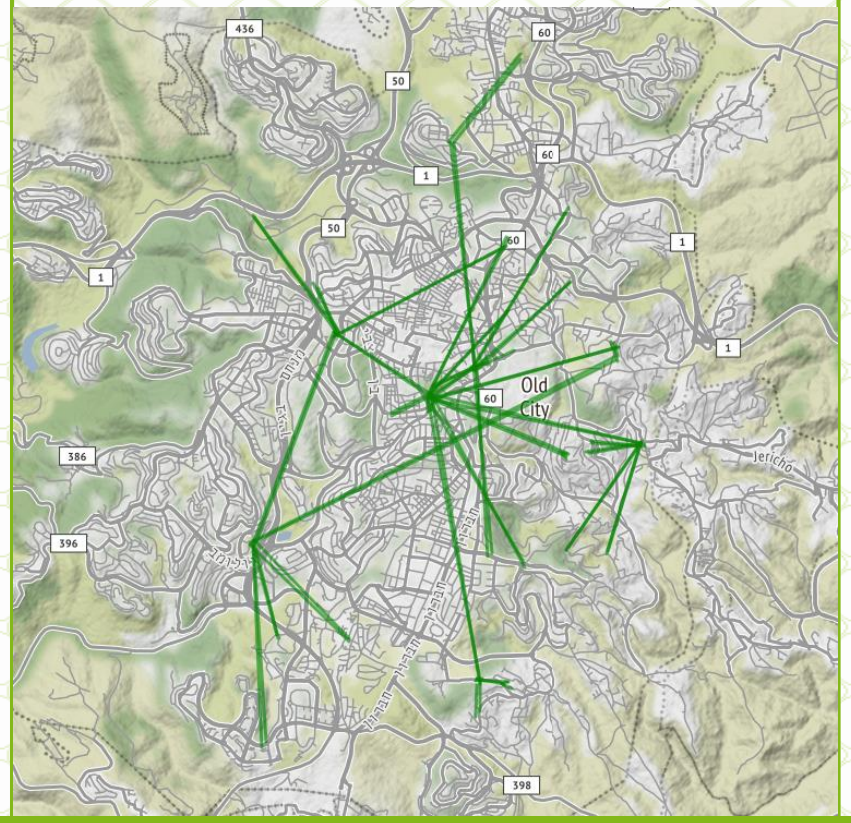
Jerusalem Living Lab (JELL)

Extreme Events



Water Cycle

Cellular links over the center of Jerusalem



Heat

Main stakeholders involved in the I-CHANGE JELL

An increasing number of stakeholders have embraced the quadruple helix approach, involving a total of 18 different entities

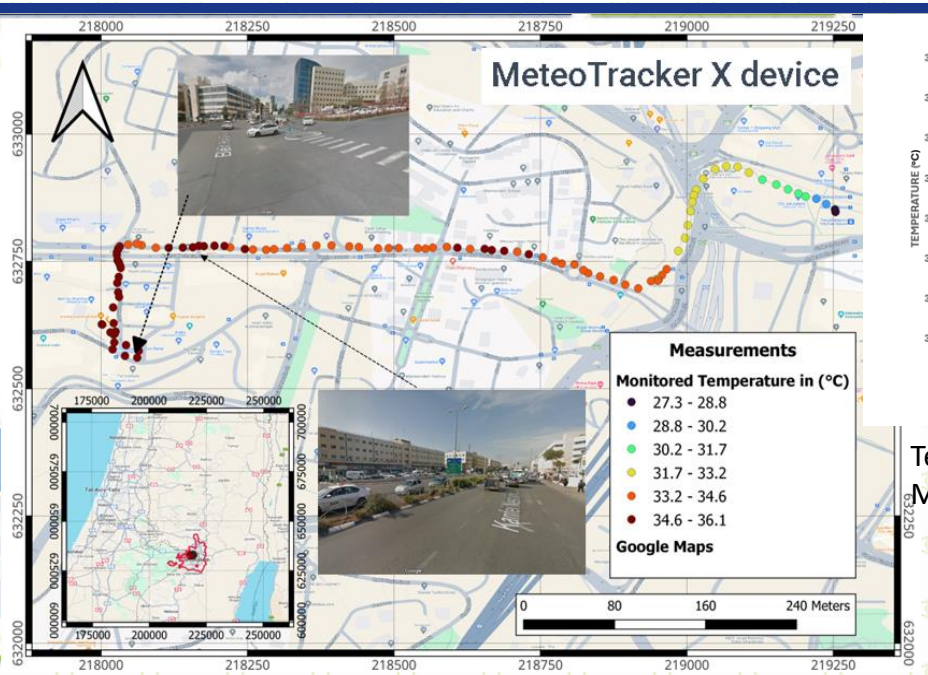
Government	Academic Research	Civil Society	Business
Israeli Meteorological Service (IMS) - Ministry of Transport; Ministry of Environmental Protection; Water Authority - Ministry of Energy and Infrastructure; Jerusalem Municipality;	Tel-Aviv University – I-CHANGE group; Hebrew University Center for Sustainability; Students;	The Jerusalem Bloomfield Science Museum; 5 Junior high Schools; Botanical garden's retired citizens; Jerusalem young adults center; Jerusalem Bicycle riders' group;	SMBIT – EKRON; Public transport in Jerusalem;

Key activities for raising citizen knowledge and awareness

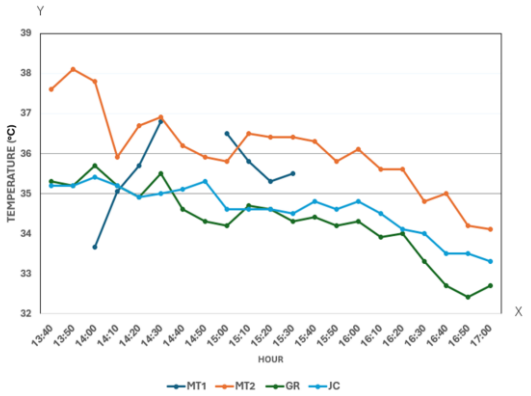
ממוצעי הטמפרטורות בחודש יולי

Date	Hour (Local Time)	מטאוטראייקר Air Temperature Givat Shaul (°C)	השירות המטאורולוגי הישראלי Air Temperature Givat Ram (°C)
09-Jul-23	19:00-20:00	25.6	24.5
10-Jul-23	18:00-19:00	26	24.5
13-Jul-23	18:00-19:00	30.8	32.3
17-Jul-23	18:00-19:00	31	32.6
18-Jul-23	18:00-19:00	28	29.8
19-Jul-23	08:00-09:00	28.1	28.3
20-Jul-23	11:00-12:00	30.3	31.6
23-Jul-23	10:30:11:30	32.5	33.5
25-Jul-23	15:00-16:00	33.5	33.8
26-Jul-23	09:00-10:00	31.1	28.6
27-Jul-23	14:00-16:00	34	34.6

Sensor Parameter	גבעת רם	גבעת שאול	IMS
AVERAGE	35.8	33.8	34.6
MAX	38.1	36	35.8
MIN	34.1	27.5	34.2
Standard deviation	1	2.2	0.9
Standard deviation % of mean	2.7	6.6	2.6



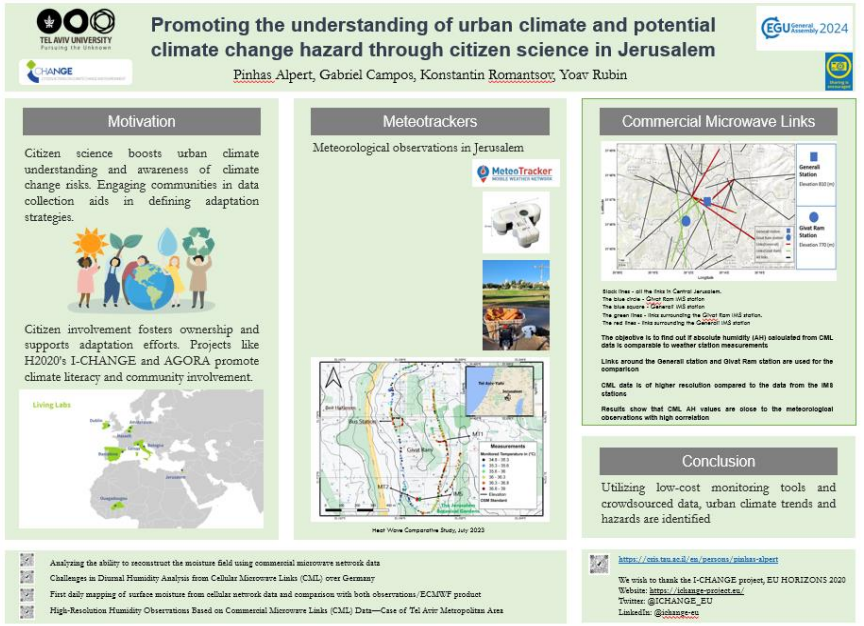
Monthly Comparison Between Two Neighborhoods in Jerusalem: Givat Shaul and Givat Ram (July 2023).



Temperature Comparison: MeteoTrackers vs. Jerusalem Meteorological Stations, July 27, 2023.

1. Awareness along with learning using co-created educational content.
2. Workshops on special days with around 40 participants each.
3. Enroll new volunteers through social media by sharing the project's aim and our activities.

1. High-resolution humidity observations and analysis of the ability to reconstruct the moisture field using commercial microwave network data: Case of the Jerusalem area.
2. Comparison of hotspots in a microscale case over Givat Ram and Givat Shaul in Jerusalem based on MeteoTrackers measurements.
3. Challenges in diurnal humidity analysis from Cellular Microwave Links (CML).
4. First daily mapping of surface moisture from cellular network data and comparison with both observations and ECMWF products.



Poster Presented in Vienna on Activities in Jerusalem.

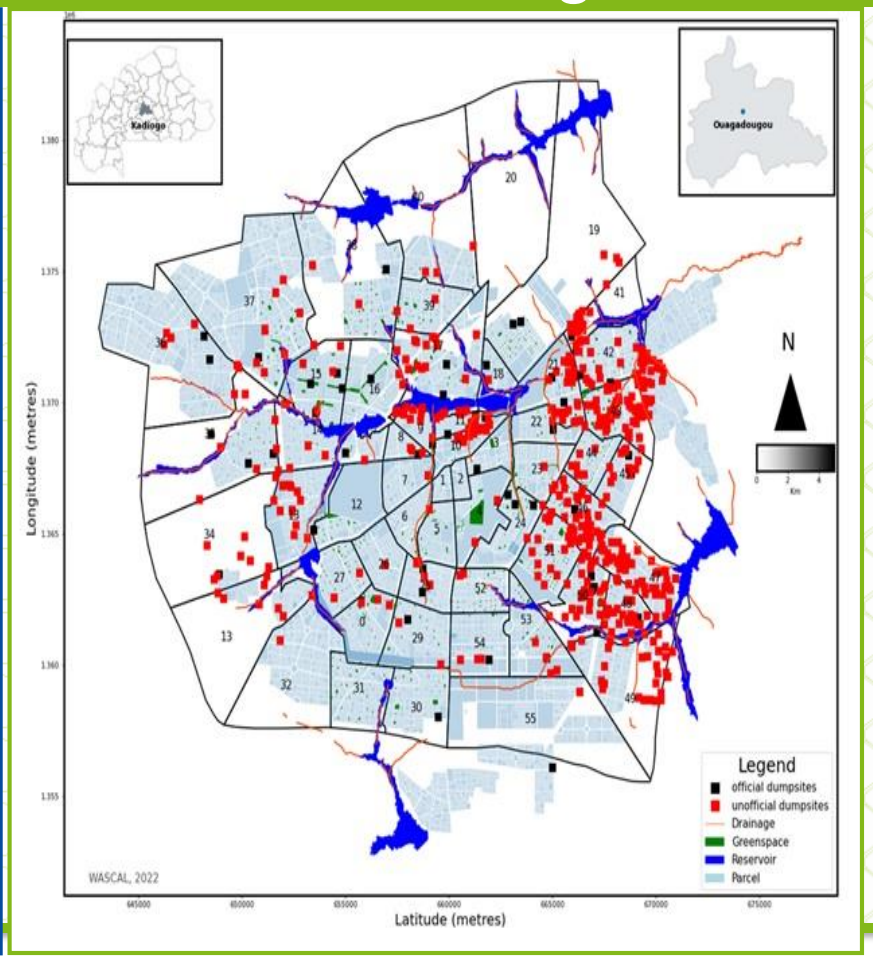
Key results on climate change understanding and behavioral change promoting actions

- Activities have promoted **engagement actions not existing before**, including the Jerusalem Science Lab.
- Students from various schools participated in campaigns focused on the environmental conditions in their neighborhoods. They explored **how different areas, characterized by features such as shade or vegetation, influenced their feelings**.
- Additionally, they engaged with academic work and developed an **interest in contributing data** to enhance our understanding of climate-related issues.

Living Lab West Africa-Ouagadougou (LLWA)

Extreme Events

Waste Managment



Link between Floods and Waste management

Main stakeholders involved in the I-CHANGE LLWA

A growing number of stakeholders have been involved, considering all the groups of the quadruple helix, to reach the number of 32 active stakeholders. In addition to participating in the various workshops as part of the project, members are involved in the collection of real-time urban flood data through the Open Data Kit clients. A further 180 households have been identified as “change champions” to host three colored wastebins to monitor behavioral changes in waste management and its effects on flood risk reduction in flood-prone areas of the city of Ouagadougou.

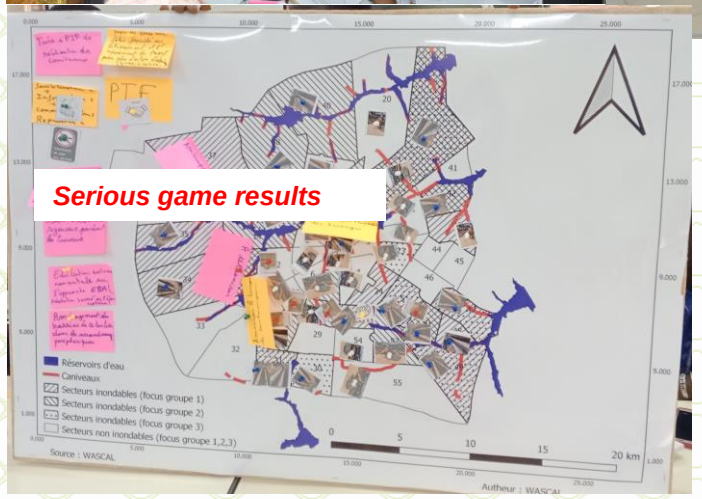
Government	Academic Research	Civil Society	Business
Municipality of Ouagadougou National Council for Emergency Relief and Rehabilitation (CONASUR) General Directorate of Civil Protection (DGPC) National Meteorological Agency (ANAM-BF) General Directorate of Water Resources (DGRE)	Master programme in Climate change & Informatics at University Joseph Ki Zerbo (UOI) Institute of Environmental Engineering and Sustainable Development (IGEDD)	PNB-BF, Burkina Faso's National Biodigester Program C.N.J.S a Civil Society Organization in Ouagadougou Association of Municipalities of Burkina Faso (AMBF)	Waste Transporters (EBTE and SONAF) Waste collectors and sorters (APET and PWB) Associations of Market Gardeners and tree nursery Green Brigade

Key activities for raising citizen knowledge and awareness

- Climate Action Training School: **Learning Flood Risks Management in an Urban Ecosystem through a Serious Game**

Serious game session

PowerPoint presentations and practical exercises on general definition of risk and its components



Serious game results

Citizens feedback

Award for the best ODK clients of the past two rainy seasons

Key results on climate change understanding and behavioral change promoting actions

- Activities contributed to interact with different stakeholders in the field of **waste management and its link with floods** in the city of Ouagadougou.
- **Citizens knew that the main cause of flooding in Ouagadougou is the lack of drainage channels, but they never made the link with their own behaviour, such as uncontrolled land use and inadequate waste disposal**.
- Through the various LL activities, rise in **awareness of the direct impact of their daily actions on their household economy**, their health and their immediate environment. This paves the way for significant changes in behaviour, reducing the risk of flooding and improving hygiene.
- The town council has opted for a **priority investment plan for rainwater drainage**, and an awareness-raising and communication strategy has been put in place. The town hall now uses **public events to share the results of the LL with the local population**.

I-CHANGE LLs network and concluding remarks

I-CHANGE Day – Cooperation among LLS

The I-CHANGE Day is a joint event among the I-CHANGE Living Labs, to foster LL cooperation on measuring campaigns with citizens. Two coordinated activities has been carried out:

- **Smart Citizen science measuring campaign (22.05 - 05.06)**. Collection of data in several Living Labs for a cordinate measure of air pollution in the different cities regions. **Aim**: raise awareness about air pollution issues and promote change of behaviours for the most sustainable ones.

- **Temperature and humidity perception in your neighborhood (05.06).** A group of citizens was guided on a step-wise route through a selected neighbourhood. **Equipped with Meteotrackers, they monitored the variation of temperature and humidity in the various urban areas** (highly urbanised, with green parks, central and peripheral). At each stop, the subjective perceptions of temperature and humidity were collected and compared with measurements. **Aim**: to increase citizens' knowledge of the distribution of temperature and humidity in the city and the role of the green and blue spaces.

- All LLs have co-designed and realized a large number of activities with stakeholders representing the ***four-helix diagram***.

- Key elements in all LLs have been the availability of sensors, tools and knowledge of processes ranging from extreme events to air pollution and urban heat (**hard science and technology)** combined with expertise and know-how from citizen science approaches (**social science)**. Success in the activities towards raising awareness can be attributed to the combinations of methods and practices adopted and by the cross-fertilization of fields of expertise.

- The variety of activities planned by the LLs (as will be described later) have already generated a large **impact** on the number of people engaged and that are currently using the knowledge produced. There is an indication from several Labs of "*some"* behavioural changes of participants to the activities.

CHANGE

CITIZEN ACTIONS ON CLIMATE CHANGE AND ENVIRONMENT

Find out more

https://ichange-project.eu/

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