

POLICY BRIEF



ANCONA, ITALY



SOCIO-BEE is a HORIZON-funded project that took place over 2021–2024, by an international consortium of 18 organisations across Europe.



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Ancona was one of three pilot cities in Europe that conducted local citizen science campaigns to measure air quality and pollution.



Citizens were at the heart of SOCIO-BEE, driving climate research and greater community engagement in urban planning.



INTRODUCTION

The [HORIZON 2020 SOCIO-BEE Project](#) (Wearables and droneS fOR City socio-environmental Observations and BEhavioral changE) is a pioneering effort in citizen science, empowering European communities to monitor and enhance air quality for a cleaner, healthier, and more sustainable future. This multidisciplinary initiative engaged diverse demographics across European cities, fostering active citizen participation in environmental stewardship and the fight against climate change.

Between October 2021 to September 2024, citizens in pilot sites in Italy, Spain, and Greece were involved in project activities where they used wearable sensors and other technologies to measure and assess air quality. This process connected them with scientific research and encouraged behavioural change regarding climate neutrality efforts, contributing to improved climate resilience. The data generated in the project will support local policymakers in developing evidence-based air pollution reduction strategies.

*This document shares key insights from the SOCIO-BEE pilot in **Ancona, Italy**, with a focus on the motivations, challenges, and outcomes observed. These findings can serve to inform air quality policies and advance community engagement in climate resilience at both the local, national, and European level.*

SOCIO-BEE & CITIZEN SCIENCE

Citizen science is an approach that involves public participation in scientific research, where individuals can contribute to data collection, analysis, and interpretation, consequently bridging the gap between scientific research and community engagement.

SOCIO-BEE used this approach to engage communities in air quality monitoring and environmental stewardship. By involving citizens in the scientific process, the project expanded data collection to under-monitored areas, raised environmental awareness, and provided valuable data for policymakers to potentially inform urban planning.

SOCIO-BEE involved diverse groups, including school children, older adults, and commuters, emphasising inclusivity and gender equality through tools like the Project's [Social Inclusion and Non-Discrimination Checklist](#). Participants identified local issues, tested hypotheses, and designed experimental campaigns using wearable technologies.

The project used a bee colony metaphor to structure roles within *Hives* (local action groups): *Beekeepers* managed local groups of volunteers, *Queen Bees* led and coordinated the experimental campaigns, *Worker Bees* collected air quality data, *Drone Bees* were non-participants that were indirectly influenced by campaigns and disseminated the project and its results to the wider audience, and *Bears* – such as policymakers – connected the campaigns to local governance and wider social impact.



Through this type of collaboration, which engaged citizens across various levels of involvement, SOCIO-BEE empowered communities to take ownership of air quality issues, fostering a foundation for informed, community-driven solutions to urban pollution.

What is citizen science?

Read more about citizen science and how it was used in the SOCIO-BEE Project in the 'White Paper: Enhancing Air Quality Monitoring Through Citizen Science: Insights and Recommendations from The Socio-Bee Project'.

For more information on how to integrate citizen science into local governance, see Scivil's guide: [Citizen Science and Local Government](#)

AIR POLLUTION

Given the growing concerns about the impact of air pollution on public health and the environment, effective air quality monitoring is essential, especially in urban areas. Accurate and reliable data plays a fundamental role in shaping policies, driving pro-environmental actions, and safeguarding community well-being. High-quality citizen science data is particularly valuable to authorities and decision-makers, as it helps inform evidence-based policies from a citizen-centred perspective, contributing to public health, environmental protection, and overall quality of life based on local indicators.

TECHNOLOGY & INNOVATION

The SOCIO-BEE Project recognised the importance of data accuracy for local governance and developed innovative, wearable-based technologies to monitor air quality. These included the AcadeME web platform (which allowed the management of citizen science campaigns and the visualisation of the data gathered in the campaign), wearable air quality sensors produced by BETTAIR (*see right*), and a mobile app connected to the sensors that enhanced participant interaction by recommending optimal routes and locations for taking measurements and uploading the collected data to a database. Citizens used these three technologies to take part in campaigns to measure pollution levels in precise locations. Additionally, SOCIO-BEE employed drones equipped with the air quality sensors, allowing for additional real-time air quality measurements.



The project's innovative approach and technologies has been show-cased at various international conferences, including the [EuroGEO 2022](#), [21st European Week of Regions and Cities 2023](#), [Ecsite 2023](#), [EU Green Week 2023](#), [SPlittech 2023](#), [WHO European Healthy Cities Annual Business Meeting and Technical Conference 2023](#), and [XVIIth International Congress of Educating Cities 2024](#).

THE SOCIO-BEE CONSORTIUM



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PILOT FINDINGS

Background on Ancona

Ancona, a city and seaport in the Marche region of central Italy, serves as the capital of both the province of Ancona and the region itself. With a population of approximately 100,000 inhabitants, Ancona is the primary economic and demographic hub of the region, spanning an area of about 184 km² and a population density of approximately 809 inhabitants per km². The city has historically evolved around its port, which remains a vital economic centre, located directly adjacent to the city centre. However, this high level of urbanisation has led to increased pollution and a decline in environmental quality, significantly impacting the quality of life for Ancona's residents.



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Ancona faces considerable traffic congestion, exacerbated by the fact that there are only two main entry and exit points to the city. The central area, which includes a pedestrian street, hosts the city's primary social hubs. This prompts concerns about the potential health risks for residents: are these popular gathering places truly healthy environments?

In terms of air quality, Ancona's levels are generally consistent with regional and national averages. However, the city does experience a high volume of road traffic which contributes to unexpected air pollution as compared to its small population.



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SOCIO-BEE in Ancona

The Ancona pilot, led by the Municipality of Ancona and Università Politecnica delle Marche (UNIVPM), focused on engaging the community in collecting and mapping air pollution data using wearable sensors developed by the project. The pilot aimed to identify pollution hotspots, particularly those affecting vulnerable populations such as those over the age of 65. The collected data informed strategies to reduce exposure to pollutants, promote outdoor activities in safe environments, and improve public health.

The primary target group in Ancona was people over 65, a demographic that represents 26% of the city's population. To reach this group, various senior citizen associations in the city were directly contacted through local social services. The aim was to use the outcome of the project to encourage this age group to be active outdoors in a non-polluted and non-crowded environment, promoting a healthy lifestyle and to help the municipality develop and provide social assistance and define proper mobility policies. The pilot focused on engaging the community in actively collecting and mapping air pollution data using wearable air sensors. This initiative aimed to identify pollution hotspots, particularly those affecting vulnerable populations such as

A memorable moment occurred during a discussion among participants, where a retired chemist explained the importance of detecting O₃ and its correlation with NO₂ levels. A retired doctor joined the conversation, explaining the various effects these pollutants have on the body. It was a spontaneous, enriching exchange of scientific knowledge that highlighted the depth of expertise within the group.

older adults. The data collected will inform the development of targeted strategies to reduce exposure to polluted neighbourhoods, promote outdoor activities (such as walking or jogging routes) in safe environments, and improve overall public health.

The campaign focused on key public gathering areas, such as Viale della Vittoria (the main avenue in the city) and the port. Participants were equipped with wearable sensors and collected data over one to two weeks, with a total of 339 measurements recorded.

Participants had strong interest in the topic and actively engaged in the project despite certain challenges (i.e., difficulties with the technologies, as well as dropouts due to family issues and personal reasons such as health, which reduced the expected number of participants).

Findings & insights in Ancona

Overall, the collected measurements confirmed expected trends: the main meeting points in the city, which also experience the highest daytime traffic, showed elevated levels of air pollution. This correlation is particularly evident in the city centre, where a high concentration of offices and commercial premises leads to significant incoming and outgoing traffic. This was especially noticeable during typical office hours. Although the overall pollution levels did not deviate significantly from the city's average, certain activities, such as walking in these high-traffic areas, were identified as being potentially harmful due to the exposure to pollutants (in comparison to international standards).

One of the most valuable outcomes was the high level of spontaneous involvement and desire to be involved from the participants. The depth of community interest exceeded expectations, underscoring the importance that citizen science can have in fostering participation in environmental stewardship.

The confirmation of the heavy pollution of popular gathering spots can be crucial for policymakers. This type of information can offer a solid foundation for developing needed targeted actions and regulations. Potential initiatives could include modifying traffic patterns, permanently pedestrianising certain areas, or implementing other such measures to improve air quality and public health. In this way, the findings from Ancona could serve as a model for other municipalities, encouraging broader adoption of citizen science-driven environmental initiatives and best practices on encouraging climate neutrality.



PILOT RECOMMENDATIONS

To maximise the impact and sustainability of the SOCIO-BEE Project, we propose several recommendations for national and local policymakers.

- 1 Integrate Citizen Science into Environmental Policy Frameworks**

Citizen-generated data can complement traditional air quality monitoring systems, providing hyper-localised, real-time insights that can highlight pollution hotspots and emerging trends that might otherwise be missed, as well as give a voice to vulnerable groups. Including citizen science in policy frameworks would ensure that air quality policies are more responsive, grounded in community realities, and capable of addressing localised pollution issues effectively.
- 2 Expand Public Funding for Citizen Science Projects**

Sustainable funding is essential to the continuity and scalability of citizen science initiatives. Increased funding would not only enhance the capacity of these projects but also enable the widespread engagement of communities, leading to a richer dataset and more informed air quality policies that reflect the realities of citizens.
- 3 Enhance Public Education and Awareness Campaigns**

Public awareness is a powerful driver of participation in citizen science projects and can lead to behavioural changes that help reduce pollution. By educating citizens on the impact of air quality on health and how they can contribute to mitigation and monitoring efforts, these campaigns empower communities to take proactive steps in improving air quality, thereby enhancing public health outcomes and fostering a culture of environmental stewardship.
- 4 Improve Urban Air Quality Monitoring Infrastructure**

Enhanced monitoring infrastructure that integrates citizen-generated data would provide a more detailed and localised understanding of air pollution patterns, enabling quicker and more targeted interventions. This approach would ensure that policymakers have access to comprehensive, real-time data, leading to more effective strategies for mitigating air pollution and protecting public health in different urban areas.

CONCLUSION

The SOCIO-BEE pilot in Ancona demonstrates the effectiveness of citizen science in enhancing air quality monitoring and community engagement. The findings highlight the importance of collaborative efforts in achieving sustainable urban development. Policymakers are urged to use these insights to enact evidence-based policies that prioritise air quality, empower communities, and foster long-term environmental stewardship. By integrating citizen science into policymaking, Ancona and other cities involved in the SOCIO-BEE Project can lead the way in creating healthier, more sustainable urban environments in Europe.



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