

POLICY BRIEF



ZARAGOZA, SPAIN



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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Zaragoza 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 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 **Zaragoza, Spain**, 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 Zaragoza

Zaragoza, in northeastern Spain, is the fourth largest city in the country, with a growing population of over 700,000 inhabitants. In 2022, the European Commission selected Zaragoza as one of its ‘100 Climate-Neutral and Smart Cities by 2030’ – cities that function as experimentation and innovation hubs in Europe to put all European cities in a position to achieve climate neutrality by 2050.

As part of its commitment to achieving zero emissions by 2030, Zaragoza is focused on understanding and enhancing its air quality. Air quality serves as a crucial indicator of the city's progress toward climate neutrality. Compared to larger Spanish cities like Madrid and Barcelona, Zaragoza enjoys relatively good air quality. Its location in the Ebro Valley supports good air quality and the city's dense, Mediterranean urban structure and balanced mobility options reinforces the air quality profile of Zaragoza.



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Notably, the city has consistently met air quality standards, with no recorded exceedances in pollutant levels as of 2022. However, its development as a major logistics hub for Southern Europe has led to increased road traffic. Traffic remains the primary source of pollution, prompting Zaragoza to implement various green and smart mobility measures over the past 15 years. These include the introduction of a tramway, a 30 km/h speed limit on single-lane streets, expanded bike lanes, and the pedestrianisation of key districts. Collectively, these policies have significantly reduced traffic-related pollution.

Despite these efforts, Zaragoza faces challenges due to the urban ‘heat island’ effect, exacerbated by hotter, longer summers. These factors, coupled with increased logistic activities, pose public health concerns, highlighting the need for continuous air quality monitoring.

SOCIO-BEE in Zaragoza

This pilot, led by Zaragoza City Hall, the IBERCIVIS Foundation, and the Zaragoza City of Knowledge



Foundation (ZCKF), engaged the local community to collect, analyse, and visualise air quality data to inform local environmental strategies and foster a culture of environmental stewardship among residents. Zaragoza's prior experience with citizen science projects, such as the Vigilantes del Cierzo (2017) and Vigilantes Del Aire (2019 and 2020) projects, provided a strong foundation for SOCIO-BEE. This existing interest, combined with the commitment and resources of the local authorities, demonstrated the city's dedication to preserving and improving air quality over time.

Key Pilot Activities

The pilot focused on engaging young people aged 11-16 in schools, achieving a total of 221 participants across the pilot. This demographic was selected due to their potential to drive long-term behavioural change and their existing involvement in environmental topics through school curricula. The project was anchored at the Etopia Centre for Arts & Technology (ETOPIA), a hub that facilitated participant recruitment and engagement.



Recruitment efforts included a series of campaigns and events aimed at fostering interest in environmental science. Despite the challenge of coordinating activities alongside the academic calendar, the project successfully maintained high levels of student involvement.

Staff from Zaragoza City Hall, IBERCIVIS, and ZCKF went to a number of schools/institutes to carry out the training, teaching participants to use air quality monitoring devices, interpret pollution data, and visualise their findings. This hands-on experience not only provided them with technical skills but also encouraged critical thinking about their environmental impact. SOCIO-BEE wearable devices were distributed among participants, who used them to collect air quality data across

Zaragoza. The data collection phase was central to the project, allowing students to engage with the scientific process. Afterwards, students analysed and visualised the results, linking their findings to broader urban planning issues. This analysis phase was crucial for empowering students to propose city-wide improvements based on their observations, fostering a sense of responsibility and agency. The project leveraged existing connections with local schools, many of which had prior experience with citizen science initiatives. This facilitated access to motivated participants and enabled the campaign organisers to include specific target groups, such as students with special needs. However, delays in technology deployment coinciding with the end of the school year limited participation from some schools.

Thirteen classroom-based citizen science campaigns were conducted across four schools – La Salle School, Juan de Lanuza School, IES Pablo Gargallo, and IES Pedro de Luna – between May and June 2024. These campaigns engaged students in the full scientific cycle: formulating hypotheses, collecting and analysing data, and communicating their findings. Despite some technological challenges, such as server issues requiring the repetition of campaigns, the pilot successfully completed the scientific process, maintaining strong student engagement throughout.

Stakeholder collaboration

The Zaragoza pilot was strengthened by partnerships with local decision-makers, educational institutions, and NGOs, ensuring that the project's findings and community involvement would influence and play a part in future urban planning. The Municipality of





Zaragoza’s education department played a key role, participating in data collection and promoting the project's activities. This collaboration highlighted the potential for ongoing partnerships to further enhance Zaragoza’s environmental policies. Additionally, the project aimed to extend its influence by participating in national forums, such as the CONAMA congress, Spain’s leading environmental policy event, and the [17th International Congress of Educating Cities](#) (May 21-24, 2024) in Brazil. By showcasing SOCIO-BEE internationally, Zaragoza contributed to the broader debate on air quality, reinforcing its commitment to environmental sustainability and citizen science.

Findings & insights in Zaragoza

The Zaragoza pilot provided crucial insights into air quality and the role of citizen science in community engagement. Although Zaragoza generally enjoys better air quality than larger Spanish cities, its growing logistics sector presents new challenges, highlighting the need for ongoing monitoring and targeted interventions.

The pilot effectively raised environmental awareness, particularly among young participants, who displayed strong commitment. Through active involvement in formulating hypotheses, collecting data, and analysing results, participants gained a deeper understanding of air pollution, the importance of personal actions, and the scientific processes behind these efforts. The swift adaptation of younger participants to project technology underscored the potential for long-term replication. Additionally, schools expressed interest in continuing air quality monitoring post-project, indicating sustained community engagement.

The project also demonstrated the value of citizen-generated data, fostering a sense of ownership and responsibility in addressing environmental issues. These findings suggest that SOCIO-BEE not only provided essential air quality data but also empowered the local community, particularly the youth, to take an active role in environmental stewardship.



PILOT RECOMMENDATIONS

To maximise the impact and sustainability of the SOCIO-BEE Project based on the pilot in Zaragoza, we propose several policy recommendations for national and local policymakers.

- 1 Enhance Continuous Air Quality Monitoring**
Strengthening and expanding continuous air quality monitoring systems is crucial in growing urban environments. Policymakers should ensure that data from citizen science initiatives, such as SOCIO-BEE, is integrated into these systems to provide a comprehensive understanding of local air quality trends and emerging pollution sources.
- 2 Incorporate Citizen Science into Educational Curricula**
The high level of engagement of young participants in the SOCIO-BEE project highlights the value of incorporating citizen science into school curricula. Educational authorities should formalise environmental science projects in schools, ensuring sustained youth involvement and fostering long-term environmental stewardship.
- 3 Develop Community-Led Air Quality Policies**
To maximise the impact of citizen-generated data, local governments should involve communities in the policymaking process. Establishing participatory processes where citizens can present findings and propose solutions to different levels of local, regional, and national policymaking will ensure that air quality policies reflect their particular needs and insights.
- 4 Invest in Technological Infrastructure**
To support the scalability of citizen science initiatives, municipalities should invest in the necessary technological infrastructure, including wearable sensors and data analysis tools. Funding should be allocated to maintain and upgrade these technologies, ensuring their accessibility to a broad audience.
- 5 Promote Collaboration with Stakeholders**
Strengthening partnerships with local NGOs, educational institutions, and municipal bodies is essential for the long-term success of citizen science projects. Policymakers should facilitate these collaborations by creating dedicated support structures within local government to coordinate and sustain these initiatives.

CONCLUSION

The SOCIO-BEE pilot in Zaragoza 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, Zaragoza 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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