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CAN COMMUNITY ENGAGEMENT HELP TOWARDS CLEANER WATER?

‘KNOW YOUR WATER’ WORKSHOP REPORT

Report by:

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HIGHLIGHTS

- Water pollution threatens both environment and human health globally
- ‘Know Your Water’ workshops empower communities through participatory research
- The workshops highlighted collective and individual actions for water sustainability
- Regular meetings strengthen engagement and long-term collaborations
- Citizen science boosts awareness and commitment to protecting water resources

ABSTRACT

Water pollution poses a significant threat to global ecosystems and public health, driven by economic growth, population expansion, and human activities. The 'Know Your Water' workshop, organised by the Sustainability Working Group at the MRC Centre for Environment and Health, Imperial College London, and supported by multiple partners, aimed to address these challenges. Held over two days in 2024, the workshop brought together researchers, students, and the public to foster collaboration and raise awareness about water pollution.

Participants engaged in discussions on contaminants of emerging concern (CECs), including pharmaceuticals, pesticides, and microplastics, which are increasingly detected in global water sources. Conventional water treatment plants often fail to remove these pollutants, highlighting the urgency for advanced analytical methods and sustainable management practices.

The workshop demonstrated the potential of participatory research and citizen science in addressing water quality issues. It equipped participants with tools to engage in water sustainability initiatives, emphasising collective and individual responsibilities. Key outcomes included increased interest in citizen science projects, recognition of the need for sustained collaboration, and the importance of addressing water pollution as part of daily practices.

Despite improvements in water management frameworks like the European Water Framework Directive, England's rivers remain chemically contaminated. By integrating community-driven efforts and advanced research, workshops like 'Know Your Water' highlight the importance of collaborative actions for achieving sustainable water management and protecting future generations.

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About this report

This report summarises the participant's and facilitators' views from the workshop titled 'Know your water'. The workshop was organised by the [Sustainability Working Group](#) in [The Researchers' Society](#) at the [MRC Centre for Environment and Health \(MRC-CEH\)](#), the [Environmental Exposure and Health \(EEH\) HPRU](#) and [Chemical and Radiation Threats and Hazards \(CRTTH\) HPRU](#) at Imperial College London, as part of the [Transition to Zero Pollution Initiative](#). Hosted in partnership with Imperial's Community Engagement Team, the workshop was held over two separate days: on 23 February 2024 for staff and student members of Imperial College London as part of the Sustainability Fortnight, and on the 04 September 2024, where it was opened up to the public with support from the [Public & Community Involvement, Engagement & Participation \(PCEIP\)](#) Seed fund 2024 and the RSC Outreach Fund (Grant: 225564581).

Water pollution

Water demands are being altered by economic and population growth, and due to human activities, its quality is also being impacted (Jones et al., 2023). Water pollution is one of the major causes of ecological degradation on our planet, and it is directly linked to public health (Deletic and Wang, 2019; Rapp-Wright et al., 2023b). It has been estimated that by 2100, up to 5.5 billion people could be exposed to polluted water across the world (Tozer, 2023). Contaminants such as chemicals, nutrients and pathogens are continuously being released into the environment and contaminating water bodies (Deletic and Wang, 2019; Rapp-Wright et al., 2023a).

There are approximately 219 million substances listed in the Chemical Abstract Service (CAS) Registry (Wang et al., 2020), and chemical production is expected to increase over time (Persson et al., 2022). Contaminants of emerging concern (CECs) are a diverse group of chemicals increasingly detected in water sources worldwide due to urbanisation, industrialisation, and agricultural intensification (Morin-Crini et al., 2022). These include pharmaceuticals, personal care products, pesticides, industrial

chemicals, and microplastics (Morin-Crini et al., 2022; Rapp-Wright et al., 2023a, 2023b; Stefanakis and Becker, 2020). Major sources of CECs are domestic and industrial wastewater, agricultural runoff, and landfill leachates (Morin-Crini et al., 2022; Schoenfuss, 2021). Conventional water treatment plants are often inadequate for removing these contaminants, necessitating upgrades such as tertiary treatment systems (Morin-Crini et al., 2022; Rapp-Wright et al., 2023a). The impact of CECs on water quality and aquatic ecosystems is concerning, potentially affecting existing populations and delaying conservation efforts (Schoenfuss, 2021). Advancements in analytical techniques to measure these contaminants and understanding mixture toxicity are crucial for assessing and mitigating the risks posed by CECs to aquatic life and animal and human health (Schoenfuss, 2021; Stefanakis and Becker, 2020).

The European Water Framework Directive (WFD), adopted in 2000 and adopted by the UK after Brexit, is the main law for water protection in Europe and it focuses on aims to achieve good ecological status in all EU water bodies (European Commission). The WFD has led to improved assessment methods and standardised tools across Europe, but implementation has been more complex and time-consuming than anticipated

(Hering et al., 2010). In the UK, combined sewer overflows (CSOs) discharge the excess flow from sewers after heavy rainfall, releasing wastewater from domestic, commercial and industrial activities as well as stormwater runoff (Giakoumis and Voulvoulis, 2023). Overall, the number of serious pollution incidents from sewage and water supply assets has decreased from 2011 to 2022, as observed in Figure 1 (Defra, 2024). However, there was a 54 % increase in the number of sewage spills from 2022 to 2023 (Environment Agency, 2024). Furthermore, the percentage of surface water bodies in England meeting good chemical status is 0 % when ubiquitous, persistent, bioaccumulative, and toxic pollutants are included (Defra, 2023). This means that no river in England is free of chemical contamination (Environmental Audit Committee, 2022).

Why public and community engagement?

Public and community engagement - used interchangeably in this context - is crucial for successfully addressing water

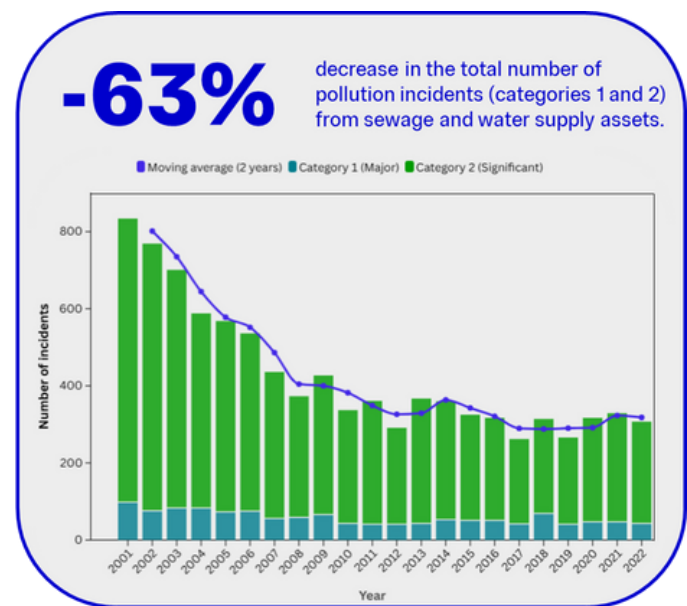


Figure 1. Cumulative number of incidents (categories 1 and 2) from 2011 to 2022, including the 2-year moving average. Figure reproduced from (Defra, 2024).

pollution and promoting sustainable water management. It facilitates effective communication of environmental health risks, particularly in environmental justice communities disproportionately affected by contamination (Neet et al., 2019). These communities often face higher exposure to pollution, making their involvement in decision-making processes essential for equitable and impactful solutions.

Engaging the public is not only fundamental for raising awareness about waterway health but also for enabling individuals and communities to take ownership of the issue. Since both the public and communities contribute to, and benefit from water quality, their participation is fundamental to creating and sustaining improvements (Catchlove

et al., 2007). Successful engagement strategies such as community workshops, local champions and ambassadors, digital platforms, and hands-on training have demonstrated measurable positive impacts on water conservation and community development (Merei, 2024).

Participatory research and citizen science further strengthen public and community engagement by actively involving individuals in data collection, analysis, and problem-solving.

These approaches enable communities to become co-creators of knowledge rather than passive recipients, cultivating a deeper understanding of local water issues and their broader implications (Dominguez-Rendón et al., 2024; Schölvink et al., 2022). For example, citizen science initiatives enable residents to monitor water quality, identify pollution sources, and contribute to scientific studies (Dominguez-Rendón et al., 2024; Schölvink et al., 2022). This democratises access to scientific research and ensures that solutions are informed by local context and lived experiences.

While public concern may spike during water-related crises, triggering short-term engagement, sustained engagement relies on cultivating a sense of collective identity, community belonging, and perceived efficacy (Case and Zeglen,

2018). Long-term involvement is essential for addressing systemic challenges posed by water pollution. The "pyramid of engagement" model provides a valuable framework for understanding public and community involvement as a multilevel, developmental process, helping to build and maintain active participation over time (Case and Zeglen, 2018).

Public and community engagement must also focus on raising awareness about the diverse types of water pollution and how contaminants are introduced into the environment. Key pollutants such as chemicals, nutrients, and pathogens – along with emerging threats like microplastics and pharmaceutical residues – are often poorly understood by the public despite their significant risks to ecosystems and human health (Morin-Crini et al., 2022). Effective engagement raises awareness of these issues while enabling individuals to implement practical strategies for reducing pollution both personally and collectively.

The 'Know Your Water' workshop illustrates how community and public engagement can effectively connect participants with environmental issues. By creating an interactive platform that promotes discussions on water sustainability and pollution, the workshop encouraged collaboration, deepened understanding, and meaningful

engagement. This approach demonstrates the value of engagement in bridging the gap between scientific knowledge, public awareness, and community action.

About the workshops

The workshops brought together 20 staff and students from Imperial College London and 30 community participants from London and its surroundings, ranging from 20 to 60 years old. Participants were divided into small groups (~5 people per group) to facilitate discussions. Before every activity, participants were provided with background information to ensure each had the same starting knowledge and thus facilitating improved discussions. Facilitators went around the groups stimulating conversations, answering queries regarding the activities, and taking notes. Lastly, group activity results were presented to everyone promoting further talks among all participants and facilitators in a relaxed setup (Figure 2). Furthermore, an artist gathered visual notes across the public engagement workshop, and created a summary visualisation that was sent to participants. The visualisation has been used as the cover of this report.

Each workshop was designed around three sessions:



Understanding the Chemistry of Water

A foundation of the key aspects of water sustainability was introduced with two activities: “Testing your water” and “Identifying Chemical Pollution Sources”. In these interactive activities, participants had the opportunity to test water samples of their own and better understand the sources and types of pollution, focusing on chemical pollution by using real data collected by the [Emerging Chemical Contaminants team](#) in the Environmental Research Group (Egli et al., 2023; Rapp-Wright et al., 2023a).



Community Engagement and Water Sustainability

Participants were guided on how participatory research, community engagement and citizen science projects are performed. National and international citizen science projects involving different pollutants in water (i.e., plastics, microbials, and chemicals) were also highlighted. This led to an activity where participants were asked to choose a problem related to water sustainability that they wanted to solve by using citizen science, facilitating discussions on how citizen science can be improved and how

researchers can learn from activities undertaken by the public.

3.

Policy and Governance

This session showcased how the research learnt is translated into policy, and what legislations are run internationally and nationally to assess the water environment. How it starts from water awareness to influence governance, and where responsibilities fall (e.g., water companies, farmers, and regulators). This

session ended on how the public can help and contribute towards water sustainability every day.

A summary of the main discussion as well as recommendations are included in this report. Furthermore, at the end of the workshop, feedback was collected in an online interactive form; results are discussed throughout the report. Resources such as research articles where data for the activities were taken from, were also provided to participants at the end of the workshop.

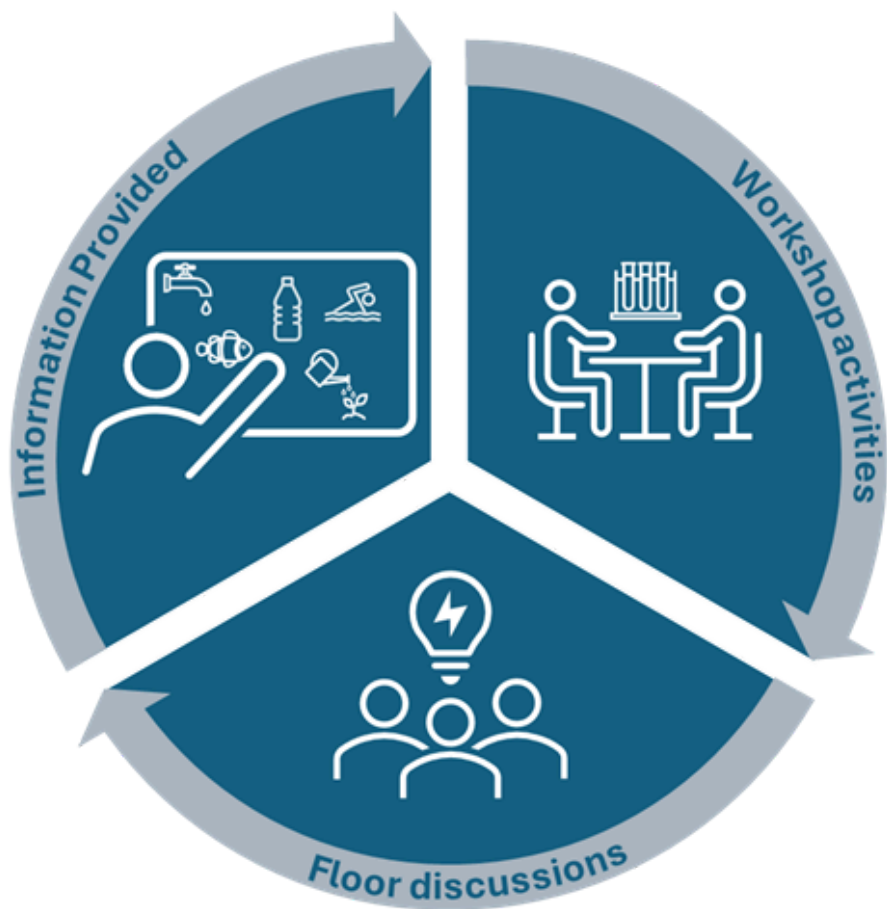


Figure 2. Summary of the 'Know your water' workshop.

Summary of participants' discussion

Water pollution and sustainability

The workshop promoted deep discussions about the interconnectedness between human activity, water quality, and environmental health. Many attendees perform water sports including outdoor swimming, kayaking, and paddle surfing, giving this as the reason they were keen on attending the workshop (Figure 3). Throughout the sessions, participants not only voiced their concerns about exposure to polluted water during recreational activities but also gained a broader understanding of the scope of water contamination and how their daily habits contribute to it. The initial discussions about personal safety while swimming or kayaking expanded into a more comprehensive exploration of water pollution sources, from storm overflows and sewage discharges to chemical pollutants found in household products such as shampoos, detergents, and cleaning products. Many were surprised to learn how everyday items release

Why did you come to this workshop?

“To improve knowledge about the river Thames, a water course we kayak on!”

Participant

harmful chemicals that, although often invisible, pose serious risks to aquatic ecosystems and ultimately to human health.

One of the major takeaways for participants was the discovery that water pollution is not always visible and that even trace amounts of certain chemicals can disrupt aquatic life, impacting biodiversity and the overall health of rivers and oceans. Discussions about non-visible pollutants, such as microplastics and pharmaceuticals, highlighted the challenges of addressing pollution that cannot be easily detected but can accumulate in the environment over time. This raised awareness about the importance of water monitoring technologies and the role that informed citizens can play in ensuring the water

“Human-powered sports have in some cases decades of experience with water quality.”

In this case for the river Thames where the participant goes kayaking regularly.

Participant

they use and enjoy remains safe. Some participants shared examples of small practices they often do before engaging in water activities to avoid contamination, such as checking real-time data online for sewage discharges from storm overflows (e.g., www.sewagemap.co.uk).

In the feedback, participants highlighted what they learned in the workshop, emphasising how much they hadn't known about water quality before attending. Furthermore, the workshop emphasised the complex pathways through which contaminants enter the water system. Participants looked into the role of wastewater treatment plants (WWTPs) and how industrial, agricultural, and domestic discharges contribute to water pollution. The discussion on WWTPs provided an understanding of their function, including the limitations of current technology in removing certain CECs (e.g., pesticides, hormones, and

personal care products). However, participants were reassured to learn that in some regions, such as London, most chemicals are typically found at low levels of concentrations and overall do not pose immediate risks (Egli et al., 2023). However, they also reflected on how this situation might differ in regions lacking sufficient wastewater infrastructure. These insights initiated meaningful conversations on global disparities in water access and sanitation, and how communities with poor water management practices face more severe health risks.

Lastly, participants were asked to estimate the average daily water consumption per person and were surprised by the discrepancy between perceived and actual water usage. The majority of them underestimated their daily consumption stating less than 30 litres/day as the average, however, in



Figure 3. Word cloud showing participants' motivations for joining the workshop. Word size reflects frequency, with larger words mentioned more often.

an average person in England and Wales was estimated to use 140 litres/day (Statista, 2024). This revelation was eye-opening, starting conversations about the hidden water footprint of everyday activities. Furthermore, taking food into account, 2,400 litres/day are needed to feed one person in the UK (LWEC, 2016), which made participants recognise the indirect impact of their dietary choices on water sustainability. This broadened their understanding of how water is not only vital for personal hygiene and hydration but is also embedded in agriculture and food production systems, requiring collective action to minimise waste and preserve this essential resource.

The science behind

One of the key results of the workshop was the understanding of how the scientific process works in water quality assessment. In particular interest was high for chemical detection, from collecting water samples to identifying what chemicals are in the samples as well as quantifying their concentrations in order to see if they pose a risk to the environment by performing risk

assessments. Participants learnt about the most common techniques used in the laboratory for water analysis as well as the challenges associated with analysis of a broad number of chemical compounds. Currently, there are >200 million substances listed in the Chemical Abstract Service (CAS) Registry, and the global chemical production pipeline increases over time (Persson et al., 2022; Wang et al., 2020). Furthermore, many were aware that specialised equipment is required for chemical analysis but did not know the large costs associated with it, and hence understanding the limitations that many laboratories will face when analysing this type of samples.

Regarding the analytical process, none of the participants were aware of how tedious and time-consuming the process can be, including the collection and storage of samples prior to analysis. Also, how data processing and analysis have a high level of complexity as scientists need to ensure results are accurate before reporting them. In addition, long-term monitoring of water quality is crucial for assessing and addressing contamination risks. But water quality is not an easy area to work in as studies have shown that

“Working together we are more likely to solve pressing environmental issues.”

Participant

quality can vary over time due to factors such as urbanisation, land use changes, and rainfall patterns. Participants learnt the challenges of how to study the 'unknown' of what chemicals to find and where, as compositions will be different in urban and rural environments, as well as seasonally. At the end, participants agreed that knowledge of the challenges associated with not only the laboratory analysis but also collecting data and interpreting results would help people understand why it is not an easy task and is a slow process when talking about water quality. It was highlighted that not only engaging the community is necessary but training them and improving their knowledge will be more effective.

Public engagement and awareness-raising

The workshop introduced participants to participatory research, particularly citizen science, where members of the public actively contribute to scientific research (Vohland et al., 2021). This approach enables communities to take ownership of water quality challenges and to co-create knowledge and solutions alongside researchers. Participants all agreed there is a need for this type of research which

would be positive and beneficial to the overall goal of improving water quality, as they bring together diverse perspectives and create a sense of shared responsibility. Before this workshop, 89 % of participants had not contributed to a citizen science project. However, after attending, all participants expressed they would now be happy to contribute to these types of projects, with 78% attributing this change to their workshop attendance.



Participants also shared how they would like to engage in these projects, with 32 % expressing interest in data collection, followed by data interpretation (23 %), problem definition (14 %), identifying research questions (14 %), and dissemination (14 %). The diversity in these preferences highlights the broad potential for public involvement across different stages of scientific research. Most participants (78 %) said they would be willing to travel locally (56 %) or

regionally (22 %) to participate. However, they highlighted the importance of having a centralised resource where they can find information about ongoing projects, making participation more accessible and streamlined.

The workshop also showcased successful examples of citizen science and transparent communication, such as how Thames Water publishes combined-sewer overflow discharges data and how the Port of London Authority has an environmental officer that can convene them. Such examples illustrate the value of collaboration between the public, scientists, and policymakers in addressing water quality challenges.

Participants agreed that water quality is a long-term issue, but that action is needed immediately. Through the workshop, they explored actionable steps for both individuals and communities to mitigate water pollution and contribute to sustainability efforts.



Facilitators discuss the workshop's activities and objectives with participants.

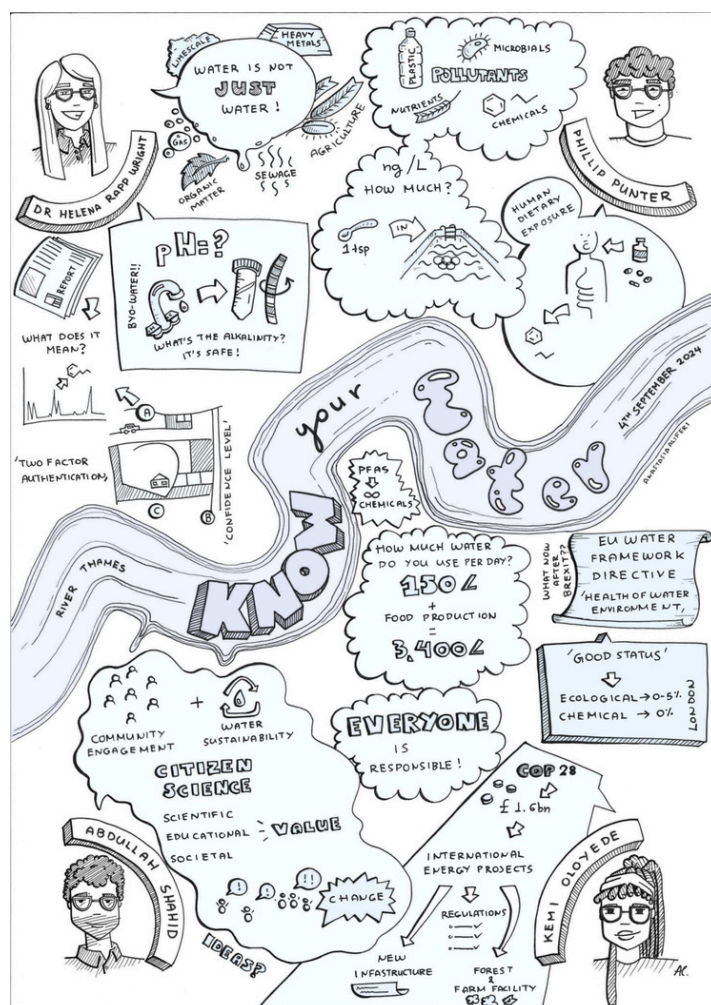


Dr Helena Rapp-Wright explains how pollutants impact water quality to workshop participants.

Participants discussed practical ways to reduce their personal water usage, such as installing water-saving devices in their homes and being more mindful of water-intensive activities. Larger-scale solutions were also explored, like supporting green infrastructure projects that help reduce stormwater runoff and advocating for sustainable wastewater management practices.

The workshop concluded with a call to action, emphasising that water quality is not just an environmental issue but a social and ethical one as well. Participants

acknowledged the need for long-term, collaborative solutions to ensure safe and clean water for future generations. They agreed that while current efforts are a step in the right direction, there is still much work to be done, and everyone - from policy makers and corporations to individuals - must take an active role in safeguarding water resources. Addressing such concerns requires community involvement, education, and collaboration where transparent communication between all sectors is key to progress with strategies to improve water quality.



An illustration by Dr Anastasia Aliferi, artistically capturing the essence and content of the workshop.

Conclusions

Water pollution is a global threat to both the environment and human health, making it central to sustainable development. It is a key focus of the United Nations' Sustainable Development Goals, particularly Goal 6: ensuring the availability and sustainable management of water and sanitation for all (UN, 2023). Public and community engagement, including participatory research and citizen science, are critical in addressing water pollution. These approaches enable communities to contribute to the development of innovative solutions and hold stakeholders accountable for water quality.

The 'Know Your Water' workshop shows how community workshops can serve as effective platforms for raising public knowledge about water pollution while building collaborative networks. It introduced participants to participatory research and citizen science, equipping them with the tools and motivation to engage in projects aimed at improving water quality. This aligns with the key workshop outcome: the recognition that action must be taken at all levels, and that water quality and sustainability should become daily topics and standard practices for everyone.

Participants emphasised that events like these require time for meaningful discussions and to develop ideas, and that a day workshop is not enough, suggesting that regular meetings and events could strengthen public engagement and cultivate long-term collaborations. A key outcome was the increased interest in citizen science projects, with all participants indicating they would participate and 78 % attributing this change to their experience of the workshop.

The workshop also succeeded in instilling a sense of urgency and empowerment among participants. By highlighting both individual and collective actions, it left participants more informed, engaged, and committed to contributing to a sustainable water future. Many recognised that while government policies and industrial practices are critical, individual actions - such as reducing water usage, supporting green infrastructure, and participating in citizen science initiatives – also play a significant role.

Water is an essential natural resource for life, and protecting it is a collective responsibility. The 'Know Your Water' workshop demonstrated how participatory research, citizen science, and public and community engagement can catalyse action and cultivate collaboration to address water pollution. Sustained, community-driven efforts are key to ensuring clean and safe water for future generations.

Recommendations

While the workshop successfully engaged participants and raised awareness about water pollution, several actionable steps are recommended to improve future initiatives:

1

ESTABLISH MECHANISMS FOR SUSTAINED ENGAGEMENT AND COLLABORATION:

Create and implement mechanisms for regular follow-ups and long-term collaborations with participants, such as community-led water monitoring/reporting programmes and citizen reporting platforms. This continuity will support deeper discussions, sustained engagement over time, and build a robust collaborative network committed to promoting water sustainability.

2

DEVELOP TARGETED STRATEGIES FOR INCLUSIVE ENGAGEMENT:

Design targeted outreach efforts to ensure the participation of underrepresented and underserved communities. Tailoring future workshops to address the needs of marginalised groups will help create a more equitable and inclusive approach to addressing water quality issues.

3

DIVERSIFY ENGAGEMENT METHODS:

Diversify outreach strategies by incorporating digital campaigns, storytelling, gamification, and school education programmes. These tools can engage wider and more diverse audiences, ensuring the message of water sustainability reaches beyond the workshop participants.

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