Participatory-Citizen Science: Opportunities for GEF IW Projects

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ADVENTURE SCIENTISTS

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Introduction

In January 2024, the GEF STAP released a Briefing Note supporting the promotion of Citizen Science (CS) in GEF projects. They noted "citizen science can contribute to delivering global environmental benefits (GEBs), and raise community awareness, improve scientific literacy, promote social learning and behavior change, engender empowerment, and increase the transparency and accountability of environmental decision-making".[1] The Briefing Note outlined 10 principles for PCS used by the European Citizen Science Association,[2] and outlined existing use of CS across the GEF focal areas. The Briefing Notes recommends that the GEF should:

i. Adopt a more consistent definition of citizen science to provide a better shared understanding in the GEF partnership.
ii. Develop criteria to guide the use of citizen science, as the basis for a more systematic review of how citizen science has contributed to project outcomes, what are the barriers to more widespread adoption, and what measures could harness greater citizen participation.
iii. Include "citizen science" as part of the taxonomy of terms in the new strategy for Knowledge Management and Learning.
iv. Ensure sound training and feedback to improve citizen engagement, ownership, and data quality.
v. Develop and implement sound data quality assurance and quality control protocols along with clear rules for data ownership.
vi. Encourage partnerships between citizen science initiatives, Indigenous Peoples, local communities, research institutions, and government agencies to enable knowledge-sharing, including with the GEF Civil Society Organization (CSO) network.

This move towards encouraging communities and the general public to engage in knowledge development is supported by GEF 8 (Annex 1) as well as by international mechanisms, including the Kunming-Montreal Global Biodiversity Framework which in December 2022 invited parties and organisations to "support community-based monitoring and information systems and citizen science" to help fill temporal and spatial gaps in the monitoring framework.[3] This position

[1] STAP (2024) Citizen Science: A STAP Background Note. January, GEF. Available from https://www.thegef.org/sites/default/files/documents/2024-01/EN_GEF.STAP_.C.66.Inf_.06_Citizen_Science.pdf

[2] Note these are based on : Robinson, Lucy Danielle, Jade Lauren Cawthray, Sarah Elizabeth West, Aletta Bonn, and Janice Ansine. 2018. 'Ten Principles of Citizen Science'. Pp. 27–40 in Citizen Science, Innovation in Open Science, Society and Policy, edited by A. Bonn, S. Hecker, M. Haklay, A. Bowser, Z. Makuch, and J. Vogel. UCL Press

[3] CBD-COP (2022) Decision Adopted by the Conference of Parties to the Convention of Biological Diversity 15/5 : Monitoring framework for the Kunming-Montreal Global Biodiversity Framework. CBD/COP/DEC/15/5. Available at: https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-05-en.pdf

is shared by different agencies. For example, UNEP statistician J. Campbell notes "we have insufficient data for tracking global progress for 68 per cent of the environment-related Sustainable Development Goal indicators. We will never be able to monitor the environmental dimension of the Goals using traditional data sources alone".[4]

This report provides an initial scan of how Participatory-Citizen Science is currently being used by GEF agencies, and provides some guidance towards opportunities to enhance its application under the GEF international waters portfolio (IW). The report is based on a scan of policies and approaches being used by GEF Agencies (Annex 2); a rapid assessment of case studies with applicability to IW (Annex 3); and a clinic run at the 10th GEF Biennial International Waters Conference, 23-26 September 20234 (Annex 4).[5]

Background

In terms of a definition, "a shared characteristic of most of what we might call 'citizen science' is the *participation of community members, 'citizens' or 'citizen scientists', in research that extends beyond the parameters of those who are employed by research institutions*."[6] Consequently, there is a shift to use the term "participatory science".[7] Note, the Citizen Science Association has changed its name (and website) to 'Association for Advancing Participatory Sciences'.[8]

In thinking about Participatory-Citizen Science (PCS) it is important to understand the breadth and scope of how communities and the public are incorporated in projects. This can be wide in terms of scale, technical focus, and involvement of the public (or non-research institution persons). Indeed, the extent or 'degree' of public involvement in supplying data has been shown to be very broad, and attempts have been made to map out the type and style of public involvement in PCS (See Table 1). Examples exist where the public have been involved throughout all stages, such as project design, assisting data collection, analysis and post project monitoring which is generally considered as "collegial or extreme citizen science". However, more often, the public has been trained to use technical instruments for sampling, or have had minor training to use simple phone apps such as "inaturalist". In many cases the public has participated over decades in species identification activities, such as annual bird counts, and more recently in specific species identification using phone apps.

As Haklay (2018) notes that the different levels of engagement and participation for the public in PCS should not be seen as better or worse, but indeed dependent upon the needs of the "project" and public in question. He does note, that there are valid concerns regarding "control

[4] https://www.unep.org/news-and-stories/story/untapped-potential-citizen-science-track-progress-sustainable-development
[5] The clinic was entitled
[6] Tolbert, S., Olson, C., Haq, R. U., Evans, L., dos Santos, A. P. O., Franco, A. A., ... & Jopling, M. (2024). 'Citizen scientists' on citizen science. Postdigital Science and Education, 1-23.
[7] Jandrić, P., Tolbert, S., Hayes, S., & Jopling, M. (2023b). Postdigital Citizen Science: Mapping the Field. Postdigital Science and Education. https:// doi. org/ 10. 1007/ s42438- 023- 00443-3
[8] See https://participatorysciences.org/

and power, and citizen science can open up situations in which the effort of participants is exploited, or in which projects are conceived without allowing participants to develop deeper engagement even if they wish to do so". He further suggests that utilizing principles outlined by Robinson would help in mitigating these concerns.[9]

Continuum based on Shirk *et al.* (2012)[10]	**Continuum based on Haklay (2018)**[11]
Contractual projects, where communities ask professional researchers to conduct a specific scientific investigation and report on the results;	
Contributory projects, which are generally designed by scientists and for which members of the public primarily contribute data;	*Crowd Sourcing* – • Citizens as sensors • Volunteered computing or 'free' data
Collaborative projects, which are generally designed by scientists and for which members of the public contribute data but also help to refine project design, analyze data, and/or disseminate findings;	*Distributive Intelligence* • Citizens as basic interpreters • Volunteered Thinking
Co-Created projects, which are designed by scientists and members of the public working together and for which at least some of the public participants are actively involved in most or all aspects of the research process	*Participatory Science* • Participation in problem definition and data collection.
Collegial contributions, where non-credentialed individuals conduct research independently with varying degrees of expected recognition by institutionalized science and/or professionals	*Extreme Citizen Science* • Collaborative Science – problem definition, data collection and analysis.

[9] See note 2 above.
[10] Shirk, J. L., Ballard, H. L., Wilderman, C. C., Phillips, T., Wiggins, A., Jordan, R., ... & Bonney, R. (2012). Public participation in scientific research: a framework for deliberate design. Ecology and society, 17(2)
[11] Haklay, Muki. (2018). 'Participatory Citizen Science'. in Citizen Science, Innovation in Open Science, Society and Policy, (eds. M. Haklay, S. Hecker, A. Bowser, Z. Makuch, J. Vogel, and A. Bonn) UCL Press Pp. 52–62

Table 1: Extent of PCS in research projects

Overwhelmingly PCS Is considered to serve the interests And research needs of institutions and agencies, and as such has been promoted in a way that the public, local communities, and indigenous peoples provide support to existing projects or interests. It is important to note that Shirk *et al.* (2012) identifies situations where local communities or groups would have interests of their own which require scientific methodology, and us may actually contract scientists to fulfil their data needs. This they classified as ”contractual projects”.

The breadth and range of using participatory-citizen science is wide and continually expanding as new technologies, particularly ICT, become available. Some book-ends include:

- **Adventure Scientists** is dedicated to bringing together public and scientists to design programs where the public and local community members can help to fill data gaps. Their work in the water sector includes : collecting water samples and utilizing in-situ sensors across large numbers of rivers; conducting rapid assessments of Harmful Algal Blooms (HABs); measuring concentrations of pollutants such as microplastics across waterways; Invasive species monitoring; biodiversity monitoring; validating snowpack data; collecting glacial samples; amongst others. Their work includes global initiatives, such as the Global Microplastics Initiative that utilizes a network of trained volunteers to collect water samples across the world’s oceans, rivers, lakes, and streams. This initiative involved 1,058 volunteer- led expeditions collected 2,677 water samples over four years and spanning each continent and every ocean. It has resulted in one of the most diverse and the largest known dataset documenting microplastic pollution on a global scale.[12]
- **UNESCO** launched eDNA Expeditions pilot study which is a citizen science initiative that empowers local communities to sample their Marine World Heritage sites with cutting edge eDNA methods. Between September 2022 and April 2023 communities participated in collecting environmental DNA samples across 25 Marine World Heritage sites around the world. For example, in April 2023, children from three high schools from the rural village of Mtubatuba, Mbazwana and Kosi Bay in South Africa participated in collecting water samples from iSimangaliso Wetland Park World Heritage area. The students were shown how to sample, filter and “preserve” the samples to ship to a specialized lab for analysis, alongside other eDNA samples from around the world.[13] The students become part of a global snapshot of marine biodiversity which has been placed in UNESCO’s Open Biodiversity Information System that has collected marine data from hundreds of data bases around the world.[14] eDNA conducted by Nature Metrics have employed the public in numerous studies including in the Orange and Senqu rivers, with ORASECOM as well as in the Limpopo river and coastal Mozambique illustrating that communities and local partners can be effectively engaged without compromising data quality. In Mozambique, they successfully used eDNA sampling to support conservation,

[12] https://www.adventurescientists.org/microplastics.html
[13] https://www.unesco.org/en/articles/school-children-rural-areas-south-africa-join-edna-sampling-isimangaliso-wetland-park?hub=66910
[14] https://www.obis.org/

fisheries monitoring, and ecological impact assessment. Training was delivered through video and using 50 samples detected over 303 fish species and noted that there was no deterioration in the sample quality even after 3 months of storage.[15] This opens up possibilities for an increasing use eDNA in isolated and difficult to reach areas.

- Building on their experience with birds, Cornell University Lab of Ornithology has teamed with the Wildlife Conservation Society and the Gordon and Betty Moore Foundation to develop Ictio,[16] which is a *database* and a *mobile phone app* created to register observations of caught fish in the Amazon basin. It was developed as part of the Citizen Science for the Amazon project, which aims to connect citizens in the collection and sharing of information on the most important Amazonian fish species. Its wider objective is for that information to contribute in understanding Amazonian fish migration. The database, already with thousands of entries, hopes to track migratory fish for improved decision-making and policy making around fish species.
- In a more localized setting, Wildroots operating in India, has focused on inspiring and encouraging students and the public to become involved in local conservation primarily through bird watching and avian surveys. They also provide media awareness training and documentary film making workshops for those who want to go on and promote conservation through multi media.[17] While focusing on birds, the NGO promotes nature conservation in general and builds awareness and empowerment through connection with other like minded NGOs and institutions through IUCN-CEC Commission on Education and Communication.[18]

Discussion

The STAP report noted that "Citizen-supported water quality monitoring can be applied in GEF projects under the International Waters portfolio as well as the Clean and Healthy Ocean Integrated Program to reduce land-based sources of pollution." [19] This initial scan clearly illustrates that there is a broad range of activities which the public and non-professional scientific community can participate in which would advance knowledge and understanding of natural systems and build partnerships to help solve the challenges of the coming decades. While few agencies have a clear policy or mandate to engage in citizen-participatory science, they all have avenues for incorporating inclusive approaches to knowledge management. It is an area that is clearly growing and has expansive possibilities. Moreover, policies such as the European Commission's Open Science promotes public engagement in research and innovation, bolsters citizen science and enhances public trust in science,[20] linking PCS with transparency in data gathering and enriching legitimacy in decision-making.

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[15] https://www.naturemetrics.com/case-study/mozamseq-case-study#
[16] https://ictio.org/
[17] https://wildrootsindia.in/main/ourworks.php
[18] https://iucn.org/our-union/commissions/iucn-commission-education-and-communication-2021-2025
[19] STAP (2024) Citizen Science: A STAP Background Note. January, GEF. Available from https://www.thegef.org/sites/default/files/documents/2024-01/EN_GEF.STAP_.C.66.Inf_.06_Citizen_Science.pdf
[20] https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/open-science_en

Literature over the past few decades has noted the benefits of applying PCS into programs, and while much of the literature focusses on the experiences of Europe and North America, participants at the 10th IW Conference highlighted the following benefits:[21]

- Sustaining and enhancing community engagement
- Improving education, awareness and livelihood opportunities for community members (particularly those that participate in the collection and analysis of data)
- Improves community pride and ownership over nature – including community law enforcement
- Increasing the geographical area that can be covered by projects
- Producing faster time-sensitive data over a large area
- Cost savings to obtain quality data
- Improved data quality with new technologies such as eDNA, use of Artificial Intelligence, wireless technologies – including phone apps, etc.

Despite clear benefits to incorporating PCS in projects there are also challenges which need to be surmounted. THE STAP briefing Note highlighted low levels of citizen participation; lack of diversity among participants; lack of clarity on data ownership; poor data, quality; and, institutional and financial barriers. Scholars have emphasized **data quality and data management**, including comparability and interoperability are considered difficult to control in PCS programs, however, others suggest that PCS can be prove highly accurate depending on the nature of the data being gathered, and technology is increasingly helpful in this regard.[22] Moreover, data quality issues can be addressed with protocols, data management and training as discussed in Schade and Tsinaraki (2016) and shown by on the ground experience, for example Adventure Scientists work in maintaining data quality. The challenge of data quality can be mitigated through understanding the technologies available, the community and public which will be participating in its collection and analysis, and developing an appropriate monitoring program which focusses on the public's strengths.

A further challenge regarding PCS data is the **acceptance of data for actual decision-making**, even in situations where quality control has been addressed. For instance, "although citizen science is positioned as a key tool to foster open science at the European level, mechanisms are still lacking for citizens to impact evidence based processes for policy making."[23] PCS is often not clearly linked with public engagement mechanisms, nor does the data produced maintain sufficient weight at all policy stages. This was also noted by participants at the clinic, which highlighted the difficulties and challenges in "bringing a traditional knowledge to an equivalent level of acceptance for decision-making as scientific knowledge".[24] Some discussion occurred around the importance of employing scientific method to traditional knowledge.

[21] See Annex 4 for additional details
[22] Nascimento, S., Iglesias, J. M. R., Owen, R., Schade, S., & Shanley, L. (2018). Citizen science for policy formulation and implementation. In S. Hecker, M. Haklay, A. Bowser, Z. Makuch, J. Vogel, & A. Bonn (Eds.), Citizen Science (pp. 219–240). UCL Press. https://www.jstor.org/stable/j.ctv550cf2.23
[23] *Ibid*
[24] See Annex 4

As previously noted, inequality and power imbalances in working with local communities and Indigenous Peoples need to be taken into considered. On this point, participants at the PCS clinic noted that there is a general lack of understanding on how to engage communities in a more systematic way to ensure 'equity' in conducting PCS. Participants further suggested that PCS needs to be developed in such a way that it is not simply left on a level of being 'cheap data collection', but rather promoted as way to enhance community development and ownership over their waters, fish and forests. It was noted also, that often it is national level agencies or government partners which have a limited understanding of the role of communities and Indigenous Peoples in PCS and undervalue their contribution.

Additionally, the clinic highlighted that there are challenges around legal issues concerning use and access to data, funding for PCS, particularly post project to monitor project results, and expectations around the value of PCS.

Recommendations

Building on the recommendations of the STAP Briefing Note participants at the 10th IW Conference forwarded the following:

1. IWLEARN and the GEF should produce a guidance document, or website, for projects to use to enhance PCS in their projects. There should be a standard set of principles developed for PCS in GEF projects - including how to share benefits with the public, local communities, and Indigenous Peoples.
2. IWLEARN and the GEF could conduct training and capacity building for educators, national partner organizations, and communities to improve the use and profile of PCS. Develop online sessions about successes and failures whereby projects can share their experiences and have their questions answered.
3. Resources could be developed which build on experiences that GEF projects are already doing successfully. In this regard, possible twinning or webinars linking projects which are going PCS and those with are considering it. It should also include the public, local communities, and Indigenous Peoples.
4. IWLEARN could create a database of case studies where there are examples of where PCS is considered on the level playing field as scientific data, or to showcase different approaches in different settings. Also, case studies that show how difficult decisions were done regarding PCS implementation.
5. IWLEARN should examine how to build on the success of existing PCS programs, such as Seagrass Watch, Mangrove Watch, amongst many others, into IW projects to not re-invent the wheel.

Specific topics of interest include:

- Principles and mechanisms for engagement
- Technologies which lend themselves to PCS

- Understanding benefit sharing and data sharing when it relates to local communities is important
- Legal aspects of incorporating PCS, or engaging the public in data collection
- Enhancing traditional knowledge and use in PCS.

IWLEARN, or the GEF as whole, could follow the example of the Federal Community of Practice on Crowdsourcing and Citizen Science (CCS) which has helped to improved credibility and adoption of PCS within the in the US government.[25] They have developed a "tool kit" with resources, case studies, a planning guideline, and legal considerations.

Conclusions

The integration of Participatory Citizen Science (PCS) into Global Environment Facility (GEF) International Waters (IW) projects presents a strategic opportunity to enhance data collection, community engagement, and overall project outcomes. To realize this potential, a comprehensive approach is essential—one that blends technical guidance, capacity building, collaborative platforms, and sustainable funding strategies.

Key recommendations for enhancing citizen science within the GEF IW framework focus on the development of specialized toolkits and online resources to guide project teams in effectively implementing PCS. This includes upholding benefit-sharing principles with local communities and Indigenous Peoples. Capacity-building initiatives are vital to equip stakeholders with the skills necessary for successful PCS implementation, fostering knowledge exchange and collaboration among diverse teams.

A centralized platform for PCS resources will further promote collaboration by facilitating the sharing of best practices and case studies. Strengthening regional cooperation through PCS is also crucial, especially for transboundary water management. Shared goals and data can inform joint management efforts, making cooperation more effective. Hosting region-specific workshops and webinars will support local teams in addressing the unique challenges they face, enhancing the understanding and implementation of PCS in varying contexts.

Sustaining PCS initiatives requires long-term funding, and guidance from IWLEARN and GEF on innovative funding mechanisms is crucial to ensuring viability. Leveraging and expanding existing PCS programs will maximize efficiency and impact, drawing on proven frameworks while avoiding duplication of efforts.

The Independent Evaluation Office (IEO) of the GEF can significantly enhance project evaluation by integrating PCS-generated data. This real-time, localized information will help assess project effectiveness, particularly in environmental monitoring and community engagement, and inform future project designs.

Similarly, the Science and Technical Advisory Panel (STAP) provides essential scientific guidance, ensuring that PCS methodologies meet rigorous standards. STAP emphasizes the

[25] https://www.citizenscience.gov/about/community-of-practice/#

complementarity of PCS with traditional scientific methods, advocating for standardized methodologies to ensure data reliability across diverse contexts.

Grassroots organizations, Indigenous Peoples, and local communities bring invaluable traditional knowledge and firsthand experience to PCS, enriching data collection with insights that often complement conventional scientific methods. Their deep connections to local ecosystems provide unique perspectives on biodiversity, land use, and water management. Including them ensures that PCS initiatives are inclusive, empowering, and culturally relevant. This involvement not only improves scientific outcomes but also promotes community stewardship of natural resources, contributing to the long-term sustainability and equity of GEF projects.

Civil Society Organizations (CSOs) play a crucial role in advancing PCS by acting as intermediaries between local communities, scientific institutions and governments. They help incorporate local voices and traditional knowledge into data collection processes, advocating for transparency and ensuring that citizen-generated data informs policy decisions. CSOs thereby strengthen the legitimacy and effectiveness of IW management efforts.

Finally, GEF Implementing Agencies provide essential technical support, capacity building, and financial resources. Their involvement ensures that PCS initiatives align with global environmental standards and objectives. They also bridge the gap between grassroots organizations, local communities, and national governments, ensuring that citizen-generated data is incorporated into official assessments and decision-making processes. By scaling up successful models across regions and ecosystems, GEF Implementing Agencies ensure that PCS efforts are sustainable, inclusive, and aligned with both community needs and global goals.

Final Reflections

In summary, enhancing PCS in GEF International Waters projects requires a holistic strategy that integrates technical resources, capacity building, collaborative platforms, sustainable funding, and rigorous evaluation processes. The collaboration between GEF, IWLEARN, IEO, STAP, local communities and Indigenous Peoples, GEF Implementing Agencies and CSOs, will play a key role in achieving this, ensuring that PCS initiatives are impactful, scientifically robust, and aligned with broader conservation goals. By taking these recommendations into account, GEF projects can harness the power of citizen science to improve environmental monitoring, foster community engagement, and achieve lasting outcomes in the management of international waters.

Annex 1 – GEF Policies supporting CS

The GEF-8 Directive does not specifically mention citizen science; however, it strongly supports the role of communities, Indigenous Peoples, and the public in designing and participating in projects. GEF-8 Directive notes:

- "The imperative role of local action and civil society" (p. 210)
    - CSOs bring citizen's voices to national and international debate, initiate and implement local solutions, and elevate local needs in national and global strategies
    - Local actions conceived and executed by CSOs and CBOs are critical to conserving and restoring the environment while enhancing well-being and livelihoods at the community level and beyond
    - Recognize the need for 'top-down' and bottom-up' dimensions
    - Recognize need for local actions to be carried out by civil society actors
- Small Grants Program (p. 211)
    - Provides direct financing and capacity development to CSOs and CBOs, generating important local conservation, development, and livelihoods results
    - Provides demand-driven grant mechanism for local actions and support to local communities and marginalized groups that typically lack technical/institutional capacity to address environmental challenges and access to needed financial resources
    - Knowledge, skills, and partnerships with CSOs will need to be mobilized to muster ideas, innovations, collective will and local action
    - Plans to expand Dialogue Platforms to provide more opportunities for civil society and local actors/communities to influence policy and regulatory schemes and to participate in important planning and technical dialogues and platforms with governments and private sector. This would help locals provide localized/indigenous solutions for development and environmental challenges
    - Emphasize importance on advancing knowledge management and learning, particularly in CSOs and CBOs with limited capacity in remote areas. Approaches include supporting knowledge exchange and training workshops and establishing/nurturing local networks. Will continue to test and ground-truth appropriate community technologies, methods, and approaches, and promote uptake and scale-up by further improvement of existing platforms (i.e. South-South Cooperation Platform) for sharing community innovations

- GEF-8 Integrated Program Objectives (p. 26)
    - Community mobilization and CSO involvement, promoting meaningful stakeholder involvement in all aspects of program implementation from planning stage to implementation to **monitoring;**
- Numerous references to promoting local participation and empowerment across multiple programs;
- GEF promotes protected area co-management between government and local communities;
- Support data and information sharing and participatory approaches to involve all stakeholders; and,
- Specifically under International Waters Focal Area (p. 166):
    - Coastal and marine habitats can be restored through policy, improved management strategies, and more inclusive engagement of local users of the marine resources and deployment of different area-based management tools, including Marine Protected Areas;
    - Sharing knowledge is critical in building capacity to manage marine ecosystems
    - Ensuring transboundary environmental and water security starts by strengthening management capacity at the most local level, which include land degradation management strategies, climate change impacts, adaptation and generally increasing land-based activities; and,
    - Aim to build capacity to gather and synthesize scientific, local, and people science and mainstream into decision making processes.

GEF Knowledge Day & Learning Stations[26]

- Experiential peer-to-peer knowledge sharing and learning event; bring in stakeholders such as civil society representatives to discuss priority issues and share lessons and experiences from GEF projects and their integration within national policy frameworks]

Knowledge & Learning[27]

- Developed a publication called “The Art of Knowledge Exchange” which serves as a tool to help knowledge brokers play a more effective role in facilitating knowledge exchange and learning when designing and implementing a GEF project or program.

[26] https://www.thegef.org/what-we-do/topics/gef-knowledge-day-learning-stations
[27] https://www.thegef.org/what-we-do/topics/knowledge-learning

Small Grants Programme[28]

- "Thinking globally and acting locally"
- Objective is to "Catalyze and mobilize civil society actors and local actions needed to address major drivers of environmental degradation and help deliver multiple benefits across the GEF's mandated thematic dimensions, while promoting sustainable development and improved livelihoods."
- GEF provides financial and technical support to local civil society organizations and community-based organizations
- Implement innovative local actions that actress global environmental issues, while also improving livelihoods and reducing poverty
- Designed to mobilize bottom-up actions by empowering local CSOs and CBOs

Small Grants 2023 Report[29]

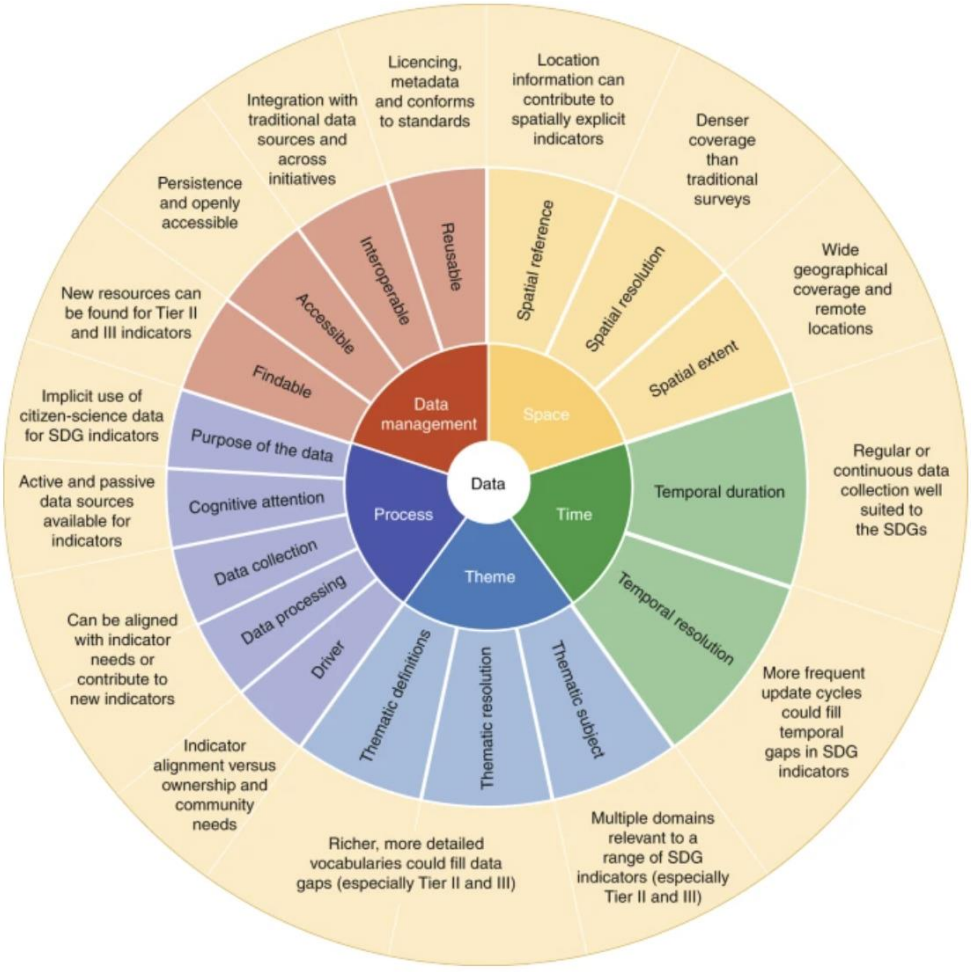
- Scales up local actions that can develop and deliver solutions to multiple challenges
- Promote active leadership of local communities to address critical environment problems for effective stewardship of the environment and sustainable development
- Has evolved into a social inclusion platform with a strong focus on empowering and improving local skills
- International Waters is one of the Focal Areas

[28] https://www.thegef.org/what-we-do/topics/gef-small-grants-programme
[29] https://www.thegef.org/sites/default/files/documents/2024-01/2023_AMR_Infographic-final.pdf

Annex 2 - Major agencies and their policies/approaches to Participatory-Citizen Science

This overview scan provides a brief picture of some of what major GEF agencies are doing to incorporate citizen science into their work. It is not a comprehensive assessment, and the authors would welcome any specific information to update the outlined information. In *Citizen science and the United Nations Sustainable Development Goals*, fritz *et al* (2019) outline various themes where citizen generated data can intersect with formal scientific methods.[30]

- They argue that data produced through citizen science can complement and improve SDG reporting process
- Use citizen science as a new source that can fill data gaps, particularly for long term monitoring or short widespread monitoring.



- Show five dimensions of citizen-science data, their features and their value for SDGs. Including the breadth of possible activities.

[30]Fritz, S., See, L., Carlson, T. et al. Citizen science and the United Nations Sustainable Development Goals. Nat Sustain 2, 922–930 (2019). https://doi.org/10.1038/s41893-019-0390-3 https://www.nature.com/articles/s41893-019-0390-3

- The article categorizes “indicators” in terms of tiers of readily established protocols and how data quality may be preserved.
- Careful consideration is needed to bring in citizen-generated data along side more academic and institutionally generated data, including satellite and new technological methods.
- Conclusion, is supportive of the concept that there is a wide range of possibilities for citizen generate data to contribute to our knowledge base.

UNDP

Overview:

Accelerator Labs (ALs):[31]

- Was built in 2019 to change how UNDP tackles development by “learning what works and what doesn’t” in sustainable development;
- Believe that current development practices must keep up with the pace of change;
- Search for local solutions and forge partnerships to make extraordinary breakthroughs on complex global challenges;
- Have learned firsthand that solutions at grassroot levels often work well in their community contexts;
- 2023 Annual Report highlights accelerated action towards SDGs thorough new ways of working, new and more real-time data, grassroot solutions and diverse partnerships in 115 countries of the Global South;
- Labs engage directly with communities to understand needs and perspectives, co-design interventions and rapidly test new ideas and innovations; all by fostering grassroots participation and ownership;
- In 2023, ALs and partners focused on creating decentralized, bottom-up, citizen-powered and data-driven development solutions and harnessed capabilities and insights of diverse groups of people;
- 90% of data comes from firsthand, primary sources such as interviews, focus groups, and surveys and made quickly available and useful to other practitioners;
- Aim to ground experimentation in community knowledge, needs, and experiences to amplify voices of those closest to the problem;

[31]https://www.undp.org/acceleratorlabs/publications/labs-20-evolving-global-research-and-development-capability-sdgs

- Nearly 80% of learning experiments conducted in 2023 have employed one or several people-centered design approaches (e.g. co-creation, participatory design or sensemaking):
    - Example: Bolivia AL project to empower Indigenous Peoples (IPs) through collective intelligence for climate action. This includes empowering IPs to contribute to national planning, engaging IP communities and municipal decision makers in deliberative workshops, and developing highly localized, inclusive climate adaptation land use plans to bridge the gap between traditional and official knowledge;
- Committed to a bottom-up R&D cycling: each AL chooses a direction for its work based on perceived needs and opportunities in its local context, then shares its work on digital platforms;
    - Integral pillar identified as "Community & People-Centered": Partner with those who are affected by problems, emphasizing inclusivity by amplifying often-overlooked voices, perspectives, and realities;
- Since inception, ALs has mapped more than 6,000 grassroots solutions locally;
- UNDP accelerator lab network has globally experimented with citizen science, leveraging collective intelligence and the observational power of community to better understand complex issues;[32] and,
- Multiple AL programs have identified the benefits of citizen science and co-creating a mapping of national citizen science environmental initiatives. This approach helps strengthen environmental activism in territories, influence the inclusion of new topics on the public agenda, promote evidence-informed public policies, facilitate the co-creation of innovative solutions, and raise awareness of an issue or support behavior changes.[33] Programs include Argentina, India, Bolivia, and Egypt.

Analysis:

- AL's focus is on making data openly available.
- Could not find policies on citizen science for the UNDP as a whole, but it seems to be a bigger focus in the Accelerator Labs program. Every participating country in ALs has its own autonomy and stance on citizen science. The most vocal and active of these labs is

[32]https://www.undp.org/egypt/blog/every-citizen-scientist-how-can-citizen-science-drive-youth-engagement-development-challenges
[33] https://www.undp.org/latin-america/digitalhub4/projects/collaborative-citizen-science-solutions

Argentina,[34] who focused on citizen science in the 2021-2022 cycle, specifically regarding the environment and its relationship to public policy. The following are benefits identified:

  - Promotes development, activism, and education
  - Promotes the academic sector and its interrelationship with society through participatory co-design and/or data collection
  - Builds partnerships and promotes public policies
  - Helps reach consensus among the public, academia, and CSOs.
- All citizen science projects in AL Argentina are identified as one of the following:
  - Created by Scholars: involve citizens either in early stages (i.e., design) or later stages (i.e., data collection and/or analysis); aim at building advanced knowledge;
  - Created by civil society actors: originate from a particular interest, issue, or local need; projects usually last longer due to genuine interest; projects tend to have a higher chance of scaling and enduring; and,
  - Created collaboratively between academic and public sectors: designed to promote public policy and involve local participation.

UNEP

Overview:

- UNEP has been working with citizen science experts from around the world to develop mechanisms for better utilizing citizen science data for official monitoring of goals;[35]
- Research paper highlighted above in UN section was drafted in collaboration with UNEP as a first step towards using citizen science for monitoring SDGs in a practical way; and,
- Senior coordination officer at UNEP states that more work is needed to strengthen the interface between governments and citizen science organizations; in Europe, an initiative is helping close the gap between citizen science and policy-relevant information.

For people and planet: the UNEP strategy for 2022-2025[36]

[34]https://www.undp.org/sites/g/files/zskgke326/files/2022-07/undp-arg-citizen-science-exploring-english-25.07.22.pdf
[35]https://www.unep.org/news-and-stories/story/untapped-potential-citizen-science-track-progress-sustainable-development
[36] https://www.unep.org/resources/people-and-planet-unep-strategy-2022-2025

- Citizen science mentioned under *Foundational sub-programmes: Science policy*
    - Subheading: *Digitizing scientific knowledge and democratizing availability while anticipating emerging issues through foresight and horizon scanning.*
        - Focus on providing digital tools to better equip decision makers at all levels;
        - Support developing geospatial technologies and offering public knowledge platforms informed by in situ satellite and data modelling sources (including citizen science); and,
        - Aims to communicate scientific information in a language that is accessible to all and can influence decision making and environmental action at all scales.
- Citizen science mentioned under *Digital transformations*
    - Subheading: *Strengthening environmental digital literacy and e-governance capacities of diverse stakeholders to engage in the environmental dimensions of digital transformation, with an emphasis on the Global South.*
        - UNEP seeks to inspire and catalyze citizen science, open innovation, and social collaboration through various digitally oriented challenges, hackathons, conferences, innovation labs, impact hubs, moonshots, and other competitions.

World Water Quality Alliance[37]

- Alliance provides governments and other stakeholders relevant evidence-based assessment, scenarios, solutions, and services on water quality issues;
- Principal Pillars include:
    - *Development Programme of long-term citizen science*
        - Strong emphasis of subsequent co-creation and co-implementation of local policies by society as a whole, represented by the Quintuple Helix (governments & political agencies, academia & research, industry, civil society, and **citizens**); considered a key model for transitioning towards circular economies and development of sustainable communities; and,
        - Projects include collecting and submitting data by citizen scientists.
    - *Citizen Engagement*

[37]https://www.unep.org/explore-topics/water/world-water-quality-alliance-wwqa-partnership-effort/world-water-quality

        - Involvement of citizens in civic processes, such as decision-making, policymaking, and community issue resolution; and more direct participatory activities, such as meetings, engagement with government, and collaborating media projects.
- There are 16 workstreams in this program, one of which being: *Citizen Science for SDG 6.3.2* (improve water quality of rivers, lakes, and aquifers by identifying spatial and temporal trends in water quality)[38]
    - Highlight the importance of citizen science in improving water quality globally;
    - Program comprises of an active working group of specialists and practitioners and is actively testing feasibility of combining citizen data with regulatory data; and,
    - Are currently in progress of creating a policy briefing document with consolidated knowledge about citizen science activities and communication material.

Analysis:

- UNEP policies focus on providing digital tools and data as their strategy for citizen science.
- Research and interest is there but not much action across the agency; all citizen science projects seem to be collaborations with other agencies.

UNIDO

Overview:

Technical Report: *Approaches to participatory policymaking processes*[39]

- Report outlines different approaches, benefits, and recommendations for participatory policymaking processes in industrial environments
- Benefits include integration of local knowledge and expertise; improved actions and decisions; and mutual learning
- Tools include participatory governance evaluation; environment and social impact assessment; digital tools as enablers of participation; and testbeds as enablers of co-creation

[38] https://my.ltb.io/www/#/
[39] https://www.unido.org/sites/default/files/unido-publications/2022-12/PPM-WEB-final.pdf

Analysis:

- No mention of citizen science in policies and strategies, but they clearly involve interested parties in SEIA, amongst others.

IFAD

Overview:

- Strategic document highlights "knowledge building, dissemination, and policy engagement" as a pillar of results delivery[40]
- Developed a paper *Transforming Food Systems: Directions for enhancing the catalytic role of donors*[41] that states that UN statistical systems can present and link food systems-relevant data to channel local knowledge, citizen science, and indigenous genetic resources into research and innovation, using donors to target investment is R&D in food systems

Analysis:

- Strategic Vision document highlights a goal for more inclusive and sustainable rural transformation but has not specified any citizen science approaches;
- There is potential opportunities for citizen science in strategic vision; however, the Strategic Framework does not detail local participation or mention citizen science *per se.*

FAO

Overview:

Strategic Framework 2022-31[42]

- One strategy for transforming agri-food systems is increasing consumer awareness by utilizing social media to shape consumer views and behaviours and facilitate communication between governments and citizens
- Emphasize on supporting activities that assemble, disseminate, and improve uptake of knowledge, technologies, and good practices

[40]https://www.ifad.org/documents/38714170/39132730/IFAD+Strategic+Framework+2016-2025/d43eed79-c827-4ae8-b043-09e65977e22d
[41]https://www.ifad.org/documents/38714170/45265417/GDPRD_whitepaper2022.pdf/3dcd57ef-3615-75a3-fbb2-aa892fd5081b?t=1649329617991
[42]https://openknowledge.fao.org/server/api/core/bitstreams/29404c26-c71d-4982-a899-77bdb2937eef/content

- Key partnership include academic and research institutions, who are critical in improving knowledge dissemination and developing innovative approaches with local ownership
    - Mention of using 'non-traditional sources of data' (could be inferring to citizen science?)
- Have funded multiple projects, studies and papers in support of citizen science and how it can be used as a powerful tool in different sectors, examples include:
    - *Advancing Citizen Science for coastal and ocean research (2017)*[43]
        - Powerful tool for generating scientific knowledge; creates awareness of challenges; increases ocean literacy
        - This paper was done by a Working Group whose aim was to provide new ideas and directions to further the development of Marine Citizen Science
    - *International Treaty on Plant Genetic Resources for Food & Agriculture*[44]
        - Treaty aims: recognizing the enormous contribution of farmers to diversity of crops that feed the world; establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials; ensuring that recipients share benefits they derive from use of these genetic materials.
    - *A citizen science application for improving the spatial distribution of global forests*[45]
        - Several tools used for forest cover monitoring and mapping, including a collaborative portal, mobile applications, and crowdsourcing competitions to encourage locals to participate
        - Data collected was used to validate existing land cover maps

FAO Strategy on Climate Change 2022-2031[46]

- Pillar: Scaling up climate action on the ground (local level)
    - Empowering local actors with knowledge and innovative solutions related to agrifood systems and climate change by promoting peer-to-peer learning (i.e., field schools), education, training, and use of digital technologies to scale up knowledge exchange

[43] https://www.fao.org/fishery/fr/openasfa/ddf17ef4-d836-4c80-b5aa-676010e2096b
[44] https://www.fao.org/plant-treaty/overview/en/
[45]https://foris.fao.org/wfc2015/api/file/557ee43f19b5d67560ebc61e/contents/8e3dc5cc-086e-45cf-b6cc-8d9a1dbc7b58.pdf
[46] https://openknowledge.fao.org/items/7b9bf435-b12b-4abf-94c0-4806d3b97109

- Enhancing and developing new partnerships to support local actors in engaging with relevant partners
- Providing support with accurate information on anticipated climate impacts at a local level
- Integrating local and indigenous knowledge into best practices
- No mention of citizen science / data collection

Coping with water scarcity: an action framework for agriculture and food security[47]

- Participatory groundwater monitoring
  - As farmers experience irrigation water scarcity, some have taken steps to monitor their water resources as part of collective management

Analysis:

- Strategic Framework mentions "non-traditional" sources of data, implying the use of citizen science approaches.
- There are approaches that are related to citizen science mentioned in action frameworks without the explicit use of the term 'citizen science'
- Projects show approaches in citizen science.

World Bank

Overview:

Open Data Initiative[48]

- "World Bank was an early champion of open data and open access among multilateral organizations"[49]
  - Since 2010, the Bank—led by its Development Data Group and guided by its Access to Information Policy—has been making high-quality, timely, and reliable statistical data openly available, accessible, and reusable.
  - Open data and open access are two important pillars of Open Science that promote making the entire scientific process more accessible and participatory

[47] https://openknowledge.fao.org/server/api/core/bitstreams/e41cd021-c43a-460b-839e-c1abf8bd3f06/content
[48] https://data.worldbank.org/
[49] https://blogs.worldbank.org/en/opendata/how-citizen-science-can-help-realize-full-potential-data

by sharing research and data, and actively engaging with people outside the scientific community.

- Citizen science is a critical pillar of Open Science
- Increasing our commitment to citizen science invites public engagement before, during, and after development projects can help engage a wider swath of the public with the initiative

Resilience Academy

- Insights from this initiative suggest that one way to push the frontiers of open data even further is by incorporating principles of citizen science into development projects and operations.[50]
- "learning by doing" approach equips young people with the long-term tools, knowledge, and skills they need to address the world's most pressing urban challenges and ensure resilient urban development. This project is demonstrating the many co-benefits that come from hands-on learning, job creation, and data management-related skills
- World Bank still needs to adopt approaches from this initiative into other development projects

World Development Report 2021: Data for Better Lives

- Proposed that by abiding by the principles of citizen science, we can help communities establish new social contract around data stewardship, grounded in the principles of value, trust, and equity.
- Report puts forward a vision of data governance that is multi-stakeholder and collaborative.

Annual Report 2023[51]

- No mention of citizen science, but lots of related approaches.
- *Protecting forests and improving livelihoods in Indonesia* program has strengthened local forest management and established partnerships with communities and 95 forest farmer groups, and provided participants with access to online training and support for agroforestry development, helping them better implement management.

[50] https://blogs.worldbank.org/en/opendata/how-citizen-science-can-help-realize-full-potential-data
[51] https://www.worldbank.org/en/about/annual-report#anchor-annual

- *Financing Locally Led Climate Action Program* enables partnerships between citizens and local governments to assess climate risks and identify inclusive, tailored solutions.
- *Green Accountability Call for Proposals* places citizens and civil society at the heart of climate finance to direct funding, implement solutions, and hold decision-makers accountable for effective and equitable climate action.
- WB actively incorporate technology and agility to amplify citizens' voices in decision-making; civic technology explores diverse ways to boost feedback loop through digital innovation, engaging citizens, communities, civil society groups, and public sector institutions to generate development solutions and improve service delivery. These tools ensure vulnerable communities gain digital literacy.

Analysis:

- High priority for access to information[52]
- Has strategies that have similar approaches to participation and citizen science and implements projects which involve CS.

African Development Bank

Overview:

- Held a series of training sessions for African CSOs in accessing resources of the Africa Climate Change Fund on May 17, 2024. Designed to equip African CSOs with knowledge and skills needed to access funding[53]

The Future of Work: Regional Perspectives (2018)[54]

- Support initiatives, such as "Check my school", that use community monitoring tools to motivate government responsiveness
    - Partner with various network organizations to mobilize, train, and deploy citizen monitors in a different parts of the country.

[52] https://www.worldbank.org/en/access-to-information
[53]https://www.afdb.org/en/news-and-events/press-releases/african-development-bank-strengthens-capacities-civil-society-organisations-access-africa-climate-change-fund-resources-71135
[54]https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/The-Future-of-Work-regional_perspectives.pdf

Policy on Water (2021)[55]

- Follow IWRM Principles, including the water development and management should be a participatory approach, involving users, planners, and policy makers at all levels
- Bank encourages national governments to deepen stakeholder participation in the project cycle
- Encourage comprehensive participatory monitoring practices

The Ten-Year Strategy (2024-2033)[56]

- Vision: "an integrated, prosperous and peaceful Africa driven by its own citizens and representing a dynamic force in the international arena"
    - No mention of citizen science / data collection. Some mention of improve digital technology.

African Water Facility Strategy 2017-2025[57]

- Goal: well-educated citizens and skills revolution underpinned by science, technology and innovation
- Strengthening the participation of local communities in improving water and sanitation management

Analysis:

- No specific mention of citizen science in Annual Reports reviewed, or in strategic programming.
- Efforts done towards citizen science in approaches and strategy reports emphasize building capacity and knowledge in other stakeholders

Inter American Development Bank

Overview:

Innovation Lab[58]

- Promote public-private-community collaboration to identify neglected problems and generate impactful solutions through social innovation;

[55]https://www.afdb.org/en/documents/policy-water
[56] https://www.afdb.org/en/documents/ten-year-strategy-african-development-bank-group-2024-2033
[57] https://www.afdb.org/en/documents/african-water-facility-strategy-2017-2025-0
[58] https://www.bidinnovacion.org/

- Developed a methodology through which citizens define and prioritize their problems, and then connect with those who have the capabilities, interests, and resources to propose solutions;
    - No mention of training citizens to collect data and/or be included in developing solutions past identifying the problem;
    - Projects often include a community engagement strategy, where there maybe possible areas for participatory data gathering;[59]

IDB Group institutional strategy: Transforming for scale and impact[60]

- Empowering citizens by boosting digital transformation of the public sector for greater transparency
- No mention of citizen science and local data collection, but strategic programming infers public participation in projects.

Analysis:

- Many projects focus on digital connectivity and data transparency/availability, including reducing the digital skills and competencies gap in the public[61]
- Did not find mention of data collection done by citizens or public in strategy documents; and,
- No citizen science approaches identified in Annual Report 2023[62]

Asian Development Bank

Overview:

- Technical Assistance team aims to provide knowledge, forums, and tools to directly engage with citizens; will work closely to integrate citizen engagement mechanisms into ADB-financed projects[63]

[59]https://www.bidinnovacion.org/data/publicaciones/BROCHURE-SOCIAL-INNOVATION-DIGITAL.pdf?6139974=
[60]https://www.iadb.org/en/who-we-are/institutional-strategy
[61]https://www.iadb.org/en/search?type=project&query=citizen+science&from=&to=&date_range=&event_type=&news_type=&project_status=&project_sector=&project_subsector=&lending_type=&field_country=All&field_countries=All
[62]https://publications.iadb.org/en/publications/english/viewer/Inter-American-Development-Bank-Annual-Report-2023-The-Year-in-Review.pdf
[63] https://www.adb.org/projects/55266-001/main

- Supported multiple projects that engage citizens in data collection and contribution regard flood data collection[64]

Strategy 2030: Achieving a prosperous, inclusive, resilient, & sustainable Asia and the pacific[65]

- Strengthening collaboration with CSOs
    - Focus will be on operations that use grassroots participatory approaches to target the poor and vulnerable groups, mobilize women and young people, and monitor projects activities and outputs. This includes seeking their inputs and advice on review of major policies

Analysis:

- Lots of presentations, press articles, and blog posts endorsing the benefits of citizen science
- Limited information on citizen science in policies and strategies, but projects and initiatives are starting to engage with citizen science

Development Bank of Lat Am - CAF

Overview:

Annual Report 2023[66]

- Announced a pilot strategy in Colombia that includes improving citizen participation
- Approved 74 regional-scope operations in 2023 which focused on key areas such as citizen participation
- Access to Information and Institutional Transparency Policy (approved in 2022) is first regulatory instrument in this field
    - Promotes and fulfills requests for reliable and timely information from its members, allies. And citizens
    - Committed to strengthening institutional transparency and promoting open access to information about its initiatives and projects
- Milestone includes adopting a technology strategy based on data for cultural knowledge and change

[64]https://seads.adb.org/solutions/how-scientists-and-communities-can-build-partnerships-deal-floods-learning-indonesia
[65]https://www.adb.org/sites/default/files/institutional-document/435391/strategy-2030-main-document.pdf
[66] https://www.caf.com/media/4668518/annual-report-2024.pdf

Analysis:

- Focused on using 'citizen participation' without elaboration
- No mention of local data collection

WWF

Overview:

- Key pillar is *Harnessing data and artificial intelligence*; this includes building opens source platforms and tools and closely collaborating with local communities for easy-to-use platforms and transparency[67]
- Another pillar is *Scaling locally driven conservation*; this includes the Russell E. Train Education for Nature Program that provides financial support to individuals and working to enhance the skills, knowledge and expertise needed to address conservation challenges at local and regional scales. This includes training local communities in WWF priority places[68]
- Lots of media and blog posts about the benefits of citizen science
- Projects include:[69]
    - North American Bird Conservation Initiative to track wildlife trends
    - Great Canadian Shoreline Cleanup participants track the amount and type of litter entering our waterways, which is then used to inform policy
    - Water Rangers "empowers people without science training" to sample water in lakes and rivers and upload water quality data into an app
    - The In the Zone Garden Tracker logs native plants in gardens across the Carolinian Zone

WWF Canada Annual Report 2023[70]

- Has supported Nepal's efforts to double wild tiger populations by providing citizen scientists with technical expertise to monitor growing tiger population
- Results show population has tripled

[67] https://www.worldwildlife.org/initiatives/science
[68] Ibid
[69] https://wwf.ca/stories/so-you-want-to-be-a-citizen-scientist/
[70] https://wwf.ca/annual-report-2023/

- Supported Inuit-led analysis along with science-based recommendations and supported community participation for the development of the Nunavut Land Use Plan

Partnered with iNaturalist to develop the app: Seek, an online database for scientists and nature enthusiasts.[71]

- Uses image recognition technology to identify plants and animals which are then logged as observations in a database that helps monitor populations and movements of wildlife across the world
- Rewards you with badges to encourage more observations/data

Analysis:

- Huge advocate for using technology and apps to encourage citizen scientists to collect and share data about the natural world
- Pillars point in the right direction of citizen science and community collaboration
- Lots of projects work with citizen scientists

IUCN

Overview:

- Use citizen science to gather and evaluate information from across the world. and to lead a global assessment on the state of wetlands. Method involves an online survey for the public to complete information on the wetlands nearby. It is 15 minutes and very accessible.[72]

Member: *Adventurers and Scientists for Conservation*[73]

- Specialize in relevant data, including those that are difficult to access, require too large a scale, or are too costly to obtain with traditional methods
- Its citizen science approach includes communities and networks of volunteers, in many cases highly skilled outdoor enthusiasts. The process also includes screening, recruiting, and training individuals to collect data
- Focus areas: Forests, Biodiversity, Climate, Freshwater

[71] https://www.wwf.org.uk/discover-nature-seek-app
[72] https://www.iucn.org/news/water/202008/a-2020-citizen-science-assessment-state-worlds-wetlands
[73] https://iucn.org/our-union/members/iucn-members/adventurers-and-scientists-conservation

- Through involvement with projects, volunteers and communities become informed ambassadors for the species and places with which they work.
- Annual Report 2022
    - Recruit and train outdoor enthusiasts and community members to collect high-quality data worldwide
    - "By engaging a larger constituency of people in this work, we are democratizing science, facilitating opportunities for individuals to directly engage in climate and environmental problem solving."
    - Launching new Community Platform in 2023, a map-based online tool that scientists can post their data collection needs, individuals can post upcoming outdoor activities to facilitate more direct connection between scientific partners and volunteers

Panorama platform[74]

- Shares qualitative information about thousands of tested and replicable solutions in biodiversity conservation and other sustainability projects
- Global community where changemakers share, adopt, and scale-up inspiring solutions for a healthy planet
- Approach includes bridging local knowledge and global policy; values power of grassroots knowledge; aims to amplify local voices and integrating them into significant policy forums; champion peer-to-peer learning
- Network includes GIZ, UNDP, UNEP, World Bank…

IUCN Global Standard for nature-based solutions[75]

- Criterion 5: NbS are based on inclusive, transparent, and empowering governance processes
    - Case study for implementation of urban NbS in Sint Andries show citizens being involved in co-creating and initiating an experiment on identifying spaces for introducing solutions. People with different backgrounds, qualifications, and knowledge systems were included.
    - This led to citizens feeling a strong NbS ownership over the project

[74] https://panorama.solutions/en/about-panorama-solutions
[75] https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf

- Another case study used a participatory approach by engaging with locals and building their capacity to redesign restoration efforts in an area. This project is still being maintained through adaptive management for over 35 years
- No mention of data collection
- IUCN has also collaborated with local NGOs to incorporate Citizen Science. For example, Wildroots in India trains youth to monitor species, particularly birds, through visual ID and the use of information technologies with identification-apps.[76]

(See Annex 1 for additional information on their involvement with Citizen Science).

Analysis:

- IUCN supports citizens particularly in the area of planning
- Host platforms, programs and webinars on citizen science and digital tools[77]
- Overall support many projects that include citizen science practices
- Policy and strategy documents tend to be country-specific

Conservation International

Overview:

- Main approach includes: *Partnering with communities*[78]
    - Work on projects with communities for the protection of their lands
    - Focus on expanding nature-positive economies by partnering with Indigenous and local people who have time-honored methods for sustainable management of lands and waters. CI helps by sharing technology and training to create scalable, nature-based conservation models for vital ecosystems.
    - Facilitate connections to key policy makers, provide access to critical technology and sustainability training, and highlight expertise and experience of Indigenous peoples and local communities
- CI supports full and effective participation of indigenous peoples and local communities in conservation with following initiatives:

[76] https://www.wildrootsindia.in/main/ourworks.php
[77] https://www.iucncongress2020.org/programme/official-programme/session-43317
[78] https://www.conservation.org/priorities/partnering-with-communities

  - [79]Indigenous leaders conservation fellowships provide emerging Indigenous leaders with a robust program of learning opportunities and connections for personal and professional development.
  - Combining watershed management with water, sanitation and hygiene services — collectively known as "WASH" — promotes communities' stewardship of ecosystems and supports their well-being. Our goal is to increase awareness of the connections between resilient communities and freshwater ecosystems at all levels, and promote long-term human health and conservation outcomes.
- Used to host *Wildlife Insights* initiative (no longer); a tool using AI and big data to collect images from camera traps (largest camera-trap database in the world)
  - Users include the public and citizen scientists

2023 Impact Report[80]

- Goal to revitalize Indigenous knowledge

2023 Annual Report[81]

- Lots of collaboration / partnership with local communities

Analysis:

- Lots of initiatives that work alongside Indigenous and local communities, does not specify the use of citizen science approaches

The Nature Conservancy

Overview:

- Identifies local participation as key for a more sustainable world,[82]..."Conservation for the coming decades must be founded in authentic partnerships with the Indigenous Peoples and local communities that have traditionally stewarded these places." - Jennifer Morris, CEO
- Endorses using iNaturalist as a citizen scientist to help conservation efforts

[79] https://www.conservation.org/priorities/partnering-with-communities
[80]https://cicloud.s3.amazonaws.com/docs/default-source/s3-library/publication-pdfs/2023-ci-impact-report-digital-final.pdf?sfvrsn=58f4bf57_2
[81] https://www.conservation.org/about/annual-report
[82]https://www.nature.org/en-us/what-we-do/our-insights/perspectives/setting-the-2022-agenda-partnership-policy-finance/

- Have projects that involve citizen science
    - Monitor coral reefs and fish populations; TNC scientists train community volunteers in scientific monitoring protocols to monitor water quality and fish populations in their communities. This data helps community groups and State agencies fill critical data gaps and develop/access management strategies[83]
    - Berry Blitz Community Science Walks[84] (companion to Wildflower Watch program); TNC collects scientific data on how berry-producing species are responding to climatic changes. Community members are invited on a guided science walk to discover and document ripening and abundance of berries.
    - Wildflower Watch[85]; timing of when plants flower and fruit is critical to the survival of many animals, that timing has shown to shift, which could have a ripple effect throughout the food chain. After a short training, community members help TNC collect data along several popular hiking trails.

Goals for 2030[86]

- Support 45 million local stewards: partner with Indigenous and local communities to learn from and support their leadership in stewarding the environment

2023 Annual Report[87]

- Lots of examples of local stewards and community-based projects without mention of citizen science and local data collection

Analysis:

- Lots of reference to local consultation, but not citizen science approaches mentioned for data collection
- Lots of project with citizen science; but not included in policies / strategies

[83]https://www.nature.org/en-us/about-us/where-we-work/united-states/hawaii/stories-in-hawaii/leading-with-science-to-improve-conservation/
[84] https://www.nature.org/en-us/get-involved/how-to-help/events/wyoming-berry-blitz/
[85]https://www.nature.org/en-us/about-us/where-we-work/united-states/wyoming/stories-in-wyoming/wyoming-wildflower-watch/
[86] https://www.nature.org/en-us/what-we-do/our-priorities/
[87] https://www.nature.org/content/dam/tnc/nature/en/documents/2023_Protect_Annual_Report_FINAL.pdf

Annex 3 - Case studies of CPS in GEF

Citizen-Participatory Science has been used in the GEF, and in particular

: its global membership engages with a diverse array of talented and experienced professionals and organizations well placed to expand citizen science efforts. Note this is a very short scan of the GEF Project Portfolio.

Environmental Monitoring in the Black Sea[88]	
Overview	Objective(s): Help improve protection of the Black Sea environment. There are many opportunities to be involved in the Black Sea conservation through clean-up campaigns, dolphins monitoring campaigns and using the application “Black Sea Savebook” for environmental monitoring of the coastal areas by citizens.[89] Black Sea Savebook:[90] Mobile application released as an interactive tool for young citizen researchers. This game promotes collecting data by having users: – Look for and make photos of found so called “Environmental sentinels” – mollusks and algae, which are the indicators of good environmental status of the Black Sea coast; – Identify and mark dolphins if any; – Get additional points and awards for collected beach litter. All data collected will be georeferenced and used by the scientists as additional informational source about the status of the Black Sea. Georgian Youth have been included in dolphin monitoring along the Black Sea coast.[91] Every ten days, a team of young citizen scientists monitor the presence of dolphins using specialized protocols and have recorded the appearance of these mammals at numerous locations.
Analysis	Created a fun and interactive way for citizens to engage with useful scientific data collection in the form of a game.
Focal Area	IW

[88] https://emblasproject.org/
[89]https://emblasproject.org/wp-content/uploads/2021/07/Summary-on-EMBLAS-Project-findings-gaps-and-recommendations.pdf
[90] https://emblasproject.org/gallery/%EF%BB%BFblack-sea-savebook-released-new-updated-version
[91] https://emblasproject.org/archives/7978

Transforming Climate Knowledge with and for Society[92]	
Overview	TRACKS Project focuses on communities in northeast Bangladesh, where there is high uncertainty about climate variation, particularly associated with the monsoon and its impacts on the community. The project studies how these communities can bring together and communicate the best quality knowledge that they have to support local adaptation; using climate science, but also their own local and traditional knowledge and know-how. Implemented an innovative approach that brought together climate scientists, government actors, and local enterprises and people as a group of peers. It mobilized high-quality knowledge about current climate variability in northeast Bangladesh and its impacts on communities. 'Climate investigators' brought their own story of the local climate, based on their knowledge and experience, and negotiated what is most important. The group's main goal was to assemble a set of key indicators for measuring the impacts of climate variation on communities in northeast Bangladesh, which might range from rain-gauge readings, to when certain wild animal species return to the fields. The climate investigators then monitored these indicators for a year to test their quality for supporting community adaptation to climate change.
Analysis	Gave power to community members to use their own local knowledge to determine key indicators for them to then monitor together.
Focal Area	Climate Change Adaptation

Zhenphen Group Bhutan project[93]	
Overview	CBO completed a project to create an inclusive and accessible environment for persons with disabilities (PwDs) within Bhutans' Royal Botanical Garden in collaboration with the National Biodiversity Centre. It actively involved 15 (PwDs) in all stages of project planning and implementation. The project fostered environmental awareness among PwDs, engaging them in bird-watching programs as part of a citizen science effort, offering GPS training, and producing informative videos that emphasized the significance of nature for PwDs.
Analysis	
Focal Area	Part of small grants program

[92] https://www.uib.no/en/rg/tracks/79601/transforming-climate-knowledge-and-society
[93] https://www.thegef.org/sites/default/files/documents/2024-01/2023_AMR_Infographic-final.pdf (p. 17)

International Commission for the Protection of the Danube River[94]	
Overview[95]	GEF has supported activities of the ICPDR which has worked to implement the EU's Water Framework Directive by developing a truly integrated approach to the management of the river basin and its resources. This includes improving data collection and analysis, cross-sector dialogues, increased public participation, and have created greater awareness. A key benefit by the ICPDR is the platform it provides for all Danube countries to work together. Large focus on makes scientific data and findings available to the public, but no mention on citizen science and data collection.
Analysis	An initial scope does not show that
Focal Area	IW

[94]https://www.icpdr.org/about-icpdr/partners/icpdr-partner-gef-will-expand-ocean-support-new-high-seas-treaty
[95] https://www.icpdr.org/sites/default/files/nodes/documents/a_shared_river.pdf

Part 3 - Case studies of CBS outside of GEF

The following is a brief scan of the use of Citizen Science in various situations around the world outside of the GEF portfolio.

Mapping Water Sources in Kenya[96]	
Agency	UNDP: Accelerator Labs
Overview	**Problem:** Frequency of severe floods and droughts in the Tana River basin has increased, resulting in devastating impacts on local communities who rely on the river for drinking water, irrigation, and fishing. The droughts also trigger livestock migration as cattle move in search of water and new pastures. This has caused friction between cattle herders and farmers. Sustainable water governance and resource management through multi-stakeholder engagement is necessary. There is also a significant gap in data around water levels, use, and access to water points. **Project:** AL worked with Tana River County and national government officials to develop a collaborative community mapping platform. Platform combines data on water infrastructure collected by "water scouts" from herder communities with other existing datasets. 43 scouts were recruited and trained as community data stewards. Data collection process wawa co-designed with 100 people from Kipini West Ward and Wayu Ward, including reps from herder communities, farmers, government officials, and the private sector. The data is imported to a platform used by county government officials and will eventually be accessible through a public dashboard. This will be used by decision makers at national and county levels and by citizens to advocate for water infrastructure projects. Scouts mapped 1,243 existing water sources and 684 social amenities in 15 different wards across the country. Rich qualitative data was also collected about community perceptions on climate change, including insights into impacts of water scarcity.
Analysis	• Involving the water scout network and co-designing the data collection process helped overcome existing tensions over resources. • Data collection unearthed beneficial local practices for adoption, such as households using plant extracts to treat water quality as a sustainable non-toxic alternative to chemical coagulants • Working with local scouts led to faster data collection because of their good knowledge of the local area, this has generated interest of county governments in mobilizing community networks to collect data on issues beyond water infrastructure, such as supporting a planned livestock census • Public data will support herders and farmers to make better decisions during droughts and floods

[96] https://www.undp.org/acceleratorlabs/untapped/case-studies/mapping-water-sources-in-Kenya

	• A key challenge emerged early on: varying data literacy levels amongst local communities. To address this challenge, the AL developed an easily-deployed protocol using appropriate technologies for local context, including several free, open-source tools. For example: ○ Allowed offline data collection ○ Maintained engagement throughout the process using existing communication channels on Whatsapp ○ Brought together herders, farmers, and government officials at several points during design and prototyping process to openly discuss where dialogue and data might reduce tensions

Green Fins initiative[97]	
Agency	UNEP
Overview	**Problem:** A 70-90% decrease in live coral reefs by 2050 may occur without drastic action to limit global warming. Studies have shown a correlation between coral reef degradation and large numbers of tourists driven to popular locations. **Project:** This initiative has partnered with the Professional Association of Diving Instructors (PADI) to educate divers in engaging in an ocean-conscious lifestyle. Some locations have taken a further step, such as in the Dominican Republic, where dive operators are actively contributing to citizen science by conducting reef health and marine mammal monitoring. Data collected is analyzed and used locally by marine park managers, fisheries and environment managers, and international organizations (i.e., UNEP) to help better monitor and care for coral reefs.
Analysis	Utilizing recreational activity in collaboration with data collection.

Nature Map Earth[98]	
Agency	UNEP-WCMC (World Conservation Monitoring Center)
Overview	**Problem:** World is losing biodiversity, carbons stocks, and ecosystem services at unprecedented rates. **Project:** Initiative has developed new spatial data on distribution of species, carbon stocks, and clean water. Modelling has been supported by new primary observations generated through a citizen-science campaign on iNaturalist, exceeding 34,000 new submissions and generating 2,100 new species records. All data, methods, and findings are shared openly.
Analysis	Using digital tools to facilitate local data collection to fill data gaps. Have designed an interactive web platform to facilitate peer-review and consultation for maximum transparency.

[97] https://www.unep.org/news-and-stories/story/citizen-scientists-dive-ocean-conservation
[98] https://naturemap.earth/about/

Family Farming Knowledge Platform[99]	
Agency	FAO
Overview	**Situation:** Family farms produce more than 80% of the world's food in value terms, showing their central importance in world food security. Public policies that recognize diversity and complexity of the challenges faced by family farms are key to ending hunger and achieving inclusive and efficient agricultural and food systems. **Project:** This platform gathers digitized quality information on family farming from around the world, including national laws & regulations, public policies, best practices, relevant data and statistics, researches, articles, and publications. This information is then used to better inform policy makers, family farmers' organizations, development experts, and local stakeholders in the field and at the grassroots level. The platform welcomes all contributions that are factual, notable, verifiable, and neutrality presented. Easy online access fosters knowledge and information dissemination for concrete actions and policy making.
Analysis	This platform follows a similar approach to the *One Million Voices initiative* that uses citizen science in agroecology to bring smallholder farmers, farm workers and food consumers together while generating knowledge and data on agroecology.[100]

Andhra Pradesh Farmer Managed Groundwater System Project[101]	
Agency	FAO
Overview	**Problem:** Inadequate groundwater management in seven drought-prone districts. **Project:** Aim to empower farmers in monitoring and managing groundwater resources through the establishment of monitoring committees. Nearly 6500 farmers in 643 communities have been trained to collect data fundamental to the understanding of groundwater hydrology. These committees then disseminated the information to the entire farming community in each hydrological unit and acted as pressure groups. This resulted in water-saving and water-harvesting projects and a substantial reduction in groundwater abstraction owing to crop diversification, irrigation, water-saving techniques, and improved profitability. A key outcome was farmer-to-farmer outreach, with an approximate outreach of 1 million farmers.
Analysis	A key outcome was farmer-to-farmer outreach, with an approximate outreach of 1 million farmers. Overall success story in citizen science.

[99] https://www.fao.org/family-farming/background/en/
[100] https://www.fao.org/family-farming/detail/en/c/1644218/
[101]https://www.fao.org/climate-smart-agriculture-sourcebook/enabling-frameworks/module-c1-capacity-development/c1-case-studies/case-study-c111-the-andhra-pradesh-farmer-managed-groundwater-systems-apfamgs-project/fr/

Resilience Academy[102]	
Agency	World Bank
Overview	The Resilience Academy aims to equip young people with the tools, knowledge, and skills to address the world's most pressing urban challenges and ensure resilient urban development (in Tanzania). The Academy students learn conceptual and practical data collection and management skills combined with workplace skills on community engagement and mapping, and carry out activities to solve real problems in their communities.
Analysis	World Bank needs to adopt these approaches into other projects & strategies. Lessons Learned: ● Shift from an expert-centric approach and importing unaffordable tools, towards training everyday citizens to use tools they already have and can easily access (i.e., everyday and innovative technology). ● Focus on increasing scale and commitment to skill-building ambitions to build capacity of the public rather than technical experts; this is a long-term investment. ● Citizens should be empowered to co-create and deliver real-world solutions; benefits of learning-by-doing leads to greater acceptance and sustainability of services ● Support & encourage funding for technology infrastructure and encourage funding for open data to facilitate collection, hosting, and management

Code for Africa[103]	
Agency	World Bank
Overview	**Problem:** Reliable, up-to-date air quality data is scarce in Africa. **Project:** Continent's largest non-profit network of indigenous civic technology and open data labs, with full-time staff in 20 countries. This project works to build open source digital democracy and citizen science tools and data to help locals make better informed decisions. This is done by building shared infrastructure, such as a non-government open data portal, and repositories of civic technologies and evidentiary documents. This project also seed-funds initiatives, such as Africa's largest civic drone network, a misinformation fighting fact-checking network, investigative environmental journalism watchdog, a water advocacy network, and a women data science community.
Analysis	Lots of ongoing experimentation and research with low-cost technologies that help grassroot communities and civic watchdogs track and analyze in near real-time, granular data on local air quality.

[102] https://resilienceacademy.ac.tz/
[103] https://pubdocs.worldbank.org/en/350971612892223257/CfA-Final-Report.pdf

Revitalizing Informal Settlements and their Environments (RISE): citizen science project[104]	
Agency	Asian Development Bank: Southeast Asia Development Solutions (SEADS)
Overview	In Makassar, South Sulawesi, Indonesia, we partnered with community members to collect photos of floods throughout the past 2 years. RISE has documented floods throughout the rainy seasons of 2018, 2019, 2020 through the help of local volunteers who have sent in more than 2,800 photos. These images have allowed scientists to better understand floods and design more resilient infrastructure.
Analysis	Focuses on local data collection while recognizing importance for science to connect with local knowledge and adaptation strategies.

Reforestation in Terai Arc Landscape - Anti Poaching Unit[105]	
Agency	WWF Nepal
Overview	Local Community Forest Coordination Committee recruited locals to join in the conservation work as part of the Anti Poaching Unit. Tasks include setting up and maintaining camera traps to monitor wildlife movement and assessing the vegetation of new research sites. Each citizen scientist is assigned 2-3 sites in their local area to visit every other day and maintain the camera traps and download any pictures to send for analysis. Tigers are the focus of the work here.
Analysis	Great example of recruiting locals and training them in data collection and conservation tasks in their own area.

Water Rangers[106]	
Agency	WWF
Overview	Empowering citizens and scientists to learn about, test, and act to protect our waterways. They combine empowering technology and water testing tools that can be applied to local contexts. The open-data platform helps anyone learn about water testing and provides tools to groups so that they can respond to local issues. Test kits are designed to be easy-to-use, affordable and accurate, without requiring a lab to process them and are used across Canada as a tool to fill data gaps and to provide local education. Water Rangers uses the power of good user-experience design and crowdsourcing to build tools that help communities grow their capacity to test water and share data for data deficient regions.

[104]https://seads.adb.org/solutions/how-scientists-and-communities-can-build-partnerships-deal-floods-learning-indonesia
[105] https://www.worldwildlife.org/stories/citizen-scientists-help-conserve-nepal-s-tigers-from-behind-the-lens
[106] https://techhub.wwf.ca/innovator/citizen-science-tools-for-water-quality-monitoring/

Analysis	Excellent program using technology, open-data platform, and accessible tools.

Wild & Scenic Rivers[107]	
Agency	Adventure Scientists
Overview	Citizen scientists collect water temperature, pH, salinity, and other water quality metrics to help guide management of US rivers. In 2022, 115 volunteer teams were recruited, trained and managed, who surveyed 169 rivers across 20 states. Data from this project has already helped build strong interagency collaborations, and inform decision-making surrounding activities such as timber extraction, grazing practices, and fire management planning.
Analysis	

Mexican Coral Reefs[108]	
Agency	Adventure Scientists
Overview	Objective is to collect critical data to understand how to make reefs more resilient to climate change and human pressures. Project is a multi-year effort to monitor coral reef systems throughout the central Mexican Pacific coast.Divers were recruited and trained to gather high-quality data from the reefs to understand how climate change and human pressure are impacting these coral communities.
Analysis	

National Lake Blitz[109]	
Agency	Living Lakes Canada
Overview	Annual volunteer citizen science program with the goal of encouraging the widespread monitoring of lakes across Canada with the access of tools and support. Volunteers collect temperature readings, shoreline photos, color of the water, etc. at their chosen lake from May to Sept. All of that data is then added to an interactive map for all to access. A field guide and kit is provided to all volunteers.
Analysis	

[107] https://www.adventurescientists.org/rivers.html
[108] https://www.adventurescientists.org/2022-annual-report.html
[109] https://livinglakescanada.ca/our-programs/lakes/lake-blitz/

Annex 4 - Findings from 10th GEF Biennial International Water Conference Clinic on "Citizen Science".

On 25th of September 2024 a technical clinic entitled "How to use Participatory – Citizen Science to improve knowledge and engagement: opportunities and limitations for IW projects" was facilitated by Adventure Scientists to explore key issues and concerns around PCS. Using some case studies from Adventure Scientists and IW Projects the clinic discussed how Participatory-Citizen Science can be used to enhance the delivery of IW projects. The clinic outlined different sources and types of data, methods of data collection; the use of technology, data storage and access; community training needs; use as a tool for community engagement and ownership; and project design – including post project monitoring. Some advantages and limitations to employing Participatory Citizen Science were discussed, and in particular the challenges of incorporating PCS into IW projects. The main focus of the session was to identify opportunities and needs within the IW framework and support that may be needed from IW-LEARN, or others to enhance the use of PCS in specific projects.

The sessions answered the following questions from the perspective of practitioners in the IW projects:

1 **How can participatory citizen science be used and what are some of the main benefits?**
- Sustainability of community engagement (South China Sea SAP project)
- Continuing capacity building and increasing the number of trained community members (South China Sea SAP project)
- Helpful in monitoring health, status, and trends for coral reefs (Indonesia)
- Help to develop methodologies to integrate scientific knowledge with traditional knowledge and use them both for decision making
- Streamline data collection for certain programs (CI projects)
- Taking videos for monitoring so that they can be assessed by AI (CI projects)
- Community based monitoring, developing clear roles for community members and enhancing their support and sustained interests (CI projects)
- Cost savings to obtain data for decision making. It is a cheaper ways to monitor for many programs.
- AI and machine learning can help enhance the quality of PCS.
- Advance community ownership, including community law enforcement – for example around marine fisheries,
- Sense of pride for communities, making people feel they are contributing and important.
- Many different types of PCS such as water monitoring, species detection, increasing the area covered by surveys, Producing fast data over wide areas, ability to analyse and monitor different areas at the same time if certain parameters are time sensitive.

- An opportunity for deeper education and awareness building of technical issues. For example in the GEF Putumayo project communities are being involved in monitoring mercury and are learning about the hazards and sources of mercury.
- PCS can help identify hotspots for pollutants, or biodiversity hotspots for protection.

2 What are the main challenges in implementing PCS?

- There is a general lack of understanding how to engage communities in a more systematic way.
- Standard data collection, particularly across countries, culture and languages is difficult. There is a big need to determine and devise methods to standardised collection and use of data. There is often a challenge to validate information that is added.
- There is often difficulty bringing a traditional knowledge to an equivalent level of acceptance for decision-making as scientific knowledge.
- Science should be seen as a methodology, for example the scientific method, as opposed to a type of knowledge.
- It is not always easy to ensure that communities get something out of their participation, beyond perhaps being paid small amounts to take samples. In many cases community collectors are not even paid. So some form of continued learning and improvement in their job potential would be beneficial.
- The use of data, and who gets access to the data is often a difficult situation to deal with, both at the international level, but also if you are dealing with local communities and using their traditional knowledge. Perhaps concerns good areas for fishing or areas where they think, certain species may exist. Communities are reluctant to divulge some information if they think it may negatively affect them.
- There is a challenge with having the national level project partners, or executing agencies sometimes understanding the role of communities and local people. Including Indigenous Peoples. It is often just left at a level of cheap data collection.

3. What can IWLEARN do to assist projects enhance PCS?

- IWLEARN could produce a guidance document, or website, for projects to use to enhance PCS in their projects. There should be a standard set of principles developed for PCS in GEF projects.
- Build on the success of other existing program such as Mangrove Watch or Seagrass Watch.
- It could conduct training and capacity building for educators and national partner organisations to improve the use and profile of PCS. Develop online sessions about successes and failures whereby projects can share their experiences and have their questions answered.
- Promote technologies which lend themselves to PCS.
- Build on experiences that GEF projects are already doing successfully.
- Create a specific twinning program for PCS application. Make sure that it also includes local communities, not just national agencies and international partners.

- Include PCS in a “sharing ideas day“ for enhancing awareness about community involvement at the national levels.
- IWLEARN could create a database of case studies where there are examples of where PCS is considered on the level playing field as scientific data, or to showcase different approaches in different settings. A case studies that show how difficult decisions were done regarding PCS implementation.
- Understanding benefit sharing and data sharing when it relates to local communities is important.
- Examples of the legal aspects of incorporating PCS, or engaging the public in data collection.

Annex 5 - Citizen Science Resources from IUCN Projects

NatureServe's 2012-2016 Strategic Plan

Calls for better communication of trends in the distribution and condition of species and ecosystems across the Americas. We believe a coordinated strategy of collaborating with citizen scientists will provide an important, cost-effective means for rapidly increasing the number of observations needed to document patterns of biodiversity and habitats in a rapidly changing world, including potential declines or conservation successes.
https://www.natureserve.org/about-us/our-strategies-and-goals/natureserve-releases-citizen-science-strategy

IUCN Conservation Congress – Marseille 2021

Digital tools for empowering citizen science-based conservation

Citizen science is emerging as a highly interesting resource for all fields of academic research as an inexpensive source of raw data. However, the potential of citizen science can go much beyond the populating of data sets and can extrapolate into becoming a decision-turning force at regional or even at global scale. The controversial phenomenon of social networking, when properly channeled by properly designed digital tools, can be used to increase knowledge and awareness on urgent conservation issues.
https://www.iucncongress2020.org/programme/official-programme/session-43317

IUCN 24/8/2023

Citizen science provides information for the declaration of areas of importance for sharks and rays

The International Union for Conservation of Nature (IUCN) has recognized the value of 14 coastal areas of the Spanish Mediterranean coast as Important Shark and Ray Areas (ISRA). The data provided by citizens in "Observadores del Mar" have been taken into account for the establishment of these areas.
In the Mediterranean Sea, 65 important zones have been established, 14 of which are on the Spanish coast, which represents 20% of the total zones admitted.»
https://www.iucnssg.org/news/citizen-science-provides-information-for-the-declaration-of-areas-of-importance-for-sharks-and-rays

IUCN - August 2020

A 2020 'Citizen-Science' Assessment of the State of the World's Wetlands

The World Wetland Network (www.worldwetnet.org), the Ramsar Section of the Society of Wetland Scientists (www.sws.org), the Cobra Collective (www.cobracollective.org) and the International Union for Conservation of Nature (IUCN) (www.iucn.org) have come together to gather and evaluate information from across the world and to lead a global assessment based on 'citizen-science' on the state of wetlands. This is a repeat of the 2017 survey which is reported on in the Wetlands journal here: https://link.springer.com/article/10.1007/s13157-020-01267-8
https://www.iucn.org/news/water/202008/a-2020-citizen-science-assessment-state-worlds-wetlands

IUCN - April 2023

UBC (April 20, 2023) Global seahorse conservation platform celebrates citizen science milestone. *UBC Science.* (Article)

Seahorse, a global platform for seahorse science and conservation developed by UBC researchers, has reached a significant milestone with 10,000 observations submitted by community scientists. The 10,000th observation was made by Dennis Rabeling, a long-time and enthusiastic contributor to iSeahorse, of the short-snouted seahorse (Hippocampus hippocampus). The milestone highlights the hard work and dedication of people worldwide who have reported sightings of seahorses in the wild and reflects the potential of community science to advance conservation.

https://science.ubc.ca/news/global-seahorse-conservation-platform-celebrates-citizen-science-milestone

IUCN - August 2019

The three powers of citizen science for nature conservation

With the rise of digital connectedness and low-cost sensor technologies, opportunities for citizen science — active public involvement in scientific research — have taken off. Citizen science is growing bigger, more ambitious and more networked. IUCN NL has been tapping into this potential to support the landscape approaches of its Southern partner organizations.

https://www.iucn.nl/en/blog/the-three-powers-of-citizen-science-for-nature-conservation/

IUCN Conservation Congress – Marseille 2021

BiObserva: Citizen science to integrate biodiversity into the business world

More than 3 years of successful participation and collaboration of companies, NGOs, and with the voluntary involvement of employees, adaptation of citizen science methodology applied to biodiversity management in the company. More than 400 sites, 500 participants, 106,000 observations of birds and flora, public and company data.

https://www.iucncongress2020.org/programme/official-programme/session-43350

National Oceanic and Marine Administration

National Marine Sanctuaries

Citizen science is a term that describes projects in which volunteers partner with scientists to answer real-world questions. These volunteers can work with scientists to identify research questions, collect and analyze data, interpret results, make new discoveries, develop technologies and applications, as well as solve complex problems.

In 2023, 4,753 of our volunteers supported national marine sanctuary citizen science efforts helping to answer real-world scientific questions with a total of 36,020 hours, which is equivalent to $1.15M or the time of 20 full-time federal employees.

https://www.noaa.gov/

Springer Nature – Biodiversity and Conservation - March 2023

Overcoming biases and identifying opportunities for citizen science to contribute more to global macroinvertebrate conservation

Citizen Science (CS) provides valuable data to assist professional scientists in making informed decisions on macroinvertebrate conservation. However, CS is not developed nor implemented uniformly across the globe, and there are biases and challenges in the extent that it can contribute to global macroinvertebrate conservation. Here, a meta-analysis was performed using 107 Citizen Science Projects (CSPs) to identify underlying biases related to taxon representativity, country wealth, and demographic participation.

https://link.springer.com/article/10.1007/s10531-023-02595-x

Communications Earth and Environment - 2023

Participatory monitoring drives biodiversity knowledge in global protected areas

Protected areas are central in strategies to conserve biodiversity. Effective area-based conservation relies on biodiversity data, but the current biodiversity knowledge base is insufficient and limited by geographic and taxonomic biases. Public participation in biodiversity monitoring such as via community-based monitoring or citizen science increases data collection but also contributes to replicating these biases or introducing new ones. Here we examine how participatory monitoring has changed the landscape of open biodiversity knowledge in protected areas using biodiversity data shared on the Global Biodiversity Information Facility. We highlight a growing dominance of participatory monitoring within protected areas. We find that patterns in geographic, taxonomic, and threatened species coverage differ from non-participatory monitoring, suggesting complementarity between the two approaches. The relative contribution of participatory monitoring varies with characteristics of both protected areas and monitoring programs. We synthesize these results to derive context-specific strategies for extending the conservation impact of participatory biodiversity monitoring.
https://www.nature.com/articles/s43247-023-00906-2

Mongabay 2017

An evolving IUCN Red List needs to be both innovative and rigorous (commentary)

A recent Biological Conservation study suggested that using citizen science data in Red List assessments could help estimate the range bird species inhabit more accurately. When it comes to the importance of citizen science, IUCN couldn't be more in agreement with the authors of the study. But just as it is important to embrace cutting-edge technologies, it is also fundamental to respect the rigorous system for assessing extinction risk for the Red List. Ramesh et al. made a fundamental error by confusing two definitions normally used in assessments.
https://news.mongabay.com/2017/05/an-evolving-iucn-red-list-needs-to-be-both-innovative-and-rigorous/

Nature, October 2019

Citizen science and the United Nations Sustainable Development Goals

The article afirms that traditional data sources are not sufficient for measuring the United Nations Sustainable Development Goals. New and non-traditional sources of data are required. Citizen science is an emerging example of a non-traditional data source that is already making a contribution. In this Perspective, they present a roadmap that outlines how citizen science can be integrated into the formal Sustainable Development Goals reporting mechanisms.
https://www.nature.com/articles/s41893-019-0390-3

Annex 6 – Key Roles and Strategic Actions

Role of the GEF International Waters Focal Area and IW Learn - UNESCO

- **Development of Toolkits, Guidelines, and Online Resources**
  The creation of specialized toolkits and guidelines tailored to GEF projects is critical to ensuring the successful integration of PCS. These resources should focus on providing practical advice on how to implement PCS in diverse environmental contexts, with particular emphasis on benefit-sharing with local communities and Indigenous Peoples. Developing a dedicated online platform will allow for consistent dissemination of these resources, providing practitioners with easy access to standardized principles, case studies, and best practices for implementing PCS. This framework will help align projects with GEF's goals of inclusivity and effective community engagement, ensuring that all stakeholders have access to the tools needed for successful PCS integration.

- **Capacity Building and Training Programs**
  Equipping project teams, educators, and local partners with the skills required for PCS is essential for its long-term success. By organizing training programs focused on data collection, validation, and community engagement, the GEF can ensure that project participants are well-prepared to implement PCS initiatives. These programs should prioritize hands-on training, as well as knowledge exchange through online forums where teams can share lessons learned from previous projects. By fostering this collaborative learning environment, the GEF can raise the profile of PCS and build a global network of well-trained practitioners capable of managing and expanding PCS in various contexts.

- **Centralized Platform for PCS Resources**
  A centralized platform that serves as a repository for PCS-related resources would be invaluable in fostering cross-project collaboration and knowledge sharing. This platform could feature case studies, toolkits, and best practices, helping project teams navigate the complexities of PCS integration. Importantly, the platform could serve as a space for documenting challenges faced in PCS projects and how they were addressed, helping future initiatives avoid similar pitfalls. Such a resource would also allow for real-time updates on new developments in PCS methodologies and emerging technologies, ensuring that all projects have access to the latest information.

- **Strengthening Regional Cooperation through PCS**
  PCS has the potential to bridge gaps between countries and regions in the management of shared water resources. By providing a common platform for data collection and community engagement, PCS can foster regional cooperation in transboundary water management, leading to more effective and coordinated conservation efforts. GEF's IWLEARN platform can play a critical role in promoting these discussions by facilitating workshops, webinars, and regional dialogues focused on PCS. This will allow countries

to align their goals and approaches, making it easier to achieve collaborative solutions to complex water management issues.

- **Region-Specific Workshops and Webinars**
  To ensure that PCS is effectively integrated into IW projects across different contexts, region-specific workshops and webinars should be organized. These training sessions would address the unique challenges faced by local teams in different regions, providing tailored guidance on how to overcome barriers to PCS implementation. By sharing best practices in community engagement, benefit-sharing, and data management, these workshops can enhance the capacity of local teams to implement PCS successfully. Moreover, webinars would provide a valuable platform for ongoing learning and collaboration, allowing project teams to stay connected and informed throughout the project lifecycle.

- **Securing Sustainable Funding for PCS Initiatives**
  For PCS initiatives to succeed in the long term, it is crucial to secure sustainable funding. IWLEARN and GEF can provide guidance on how projects can tap into diverse funding streams, including private sector partnerships and innovative financing mechanisms. By offering detailed advice on funding strategies, GEF can help projects ensure their financial sustainability, enabling PCS efforts to continue and expand over time. Securing long-term funding is key to maintaining the momentum of PCS initiatives and ensuring their ongoing contributions to water management and conservation.

- **Leveraging Existing PCS Programs**
  Building on the success of well-established PCS programs is another vital step in advancing PCS within GEF projects. By leveraging the lessons learned from existing initiatives, project teams can avoid duplication of efforts and adopt proven frameworks for implementing PCS. This approach ensures that PCS efforts are efficient and impactful, drawing from a strong foundation of previous experience. Expanding existing programs will also help GEF projects scale up their PCS efforts, allowing for broader community engagement and more comprehensive data collection across regions and ecosystems.

Role of the Independent Evaluation Office (IEO)

- The IEO of the GEF plays a pivotal role in enhancing the evaluation processes of GEF projects by integrating PCS. The localized and real-time data generated by citizen scientists can provide valuable insights into environmental changes, community engagement, and biodiversity impacts. Localized data can complement traditional scientific data, offering a more nuanced understanding of project outcomes. Moreover, the IEO can help standardize PCS data collection and validation methods, ensuring that the data generated is reliable and useful for evaluation purposes. By incorporating PCS into its evaluation framework, the IEO can make more informed decisions that enhance the design and implementation of future GEF projects.

Role of the Science and Technical Advisory Panel (STAP)

- STAP provides critical scientific and technical guidance to GEF projects, ensuring that PCS is integrated into project monitoring and evaluation in a scientifically rigorous manner. STAP's technical note on citizen science highlights the value of PCS as a complementary tool to traditional scientific methods, emphasizing the importance of standardizing PCS methodologies to ensure data reliability. As GEF projects increasingly explore the use of PCS, STAP's guidance will remain essential for ensuring that citizen science is not only effectively integrated but also held to high scientific standards. STAP's role in shaping the technical foundations of PCS will be instrumental in ensuring that GEF projects benefit from high-quality data and community engagement.

Role of Grassroots Organizations

- Grassroots organizations, Indigenous Peoples, and local communities play a pivotal role in advancing Participatory Citizen Science (PCS) by bring invaluable traditional knowledge and firsthand experiences to monitoring, providing context that often complements conventional scientific methods. Their deep connection to local ecosystems allows them to contribute unique insights into biodiversity, land use, and water management, fostering more accurate and culturally relevant data collection. Indigenous Peoples and other grassroots communities are also key to ensuring that PCS initiatives are inclusive, empowering, and respectful of local customs and needs. By actively involving them in data gathering, decision-making, and conservation efforts, PCS not only enriches scientific outcomes but also promotes community stewardship of natural resources, contributing to the long-term sustainability and equity of projects.

- **Role of Civil Society Organizations (CSOs)**
  Civil Society Organizations play a vital role in mobilizing community participation and ensuring that local voices are integrated into PCS initiatives. By leveraging their grassroots networks and expertise in community dynamics, CSOs enhance transparency and foster trust between local stakeholders and project implementers. Their advocacy for policy changes that support citizen science can amplify the impact of GEF initiatives. Collaborating with CSOs allows GEF to tap into local knowledge and resources, ultimately strengthening the effectiveness and sustainability of PCS efforts.

- **Role of the GEF Implementing Agencies**
  Implementing agencies provide essential technical support, capacity building, and financial resources, ensuring that PCS initiatives align with global environmental standards and goals. They also help to bridge the gap between local communities, grassroots organizations, and national governments, ensuring that citizen-generated data is incorporated into official assessments and decision-making processes. Through their collaboration with local stakeholders, GEF Implementing Agencies ensure that PCS initiatives are effectively integrated into the broader international waters governance framework, helping to scale up successful models across regions and ecosystems. Their role is key to ensuring that PCS efforts are sustainable, inclusive, and aligned with both community needs and global goals.