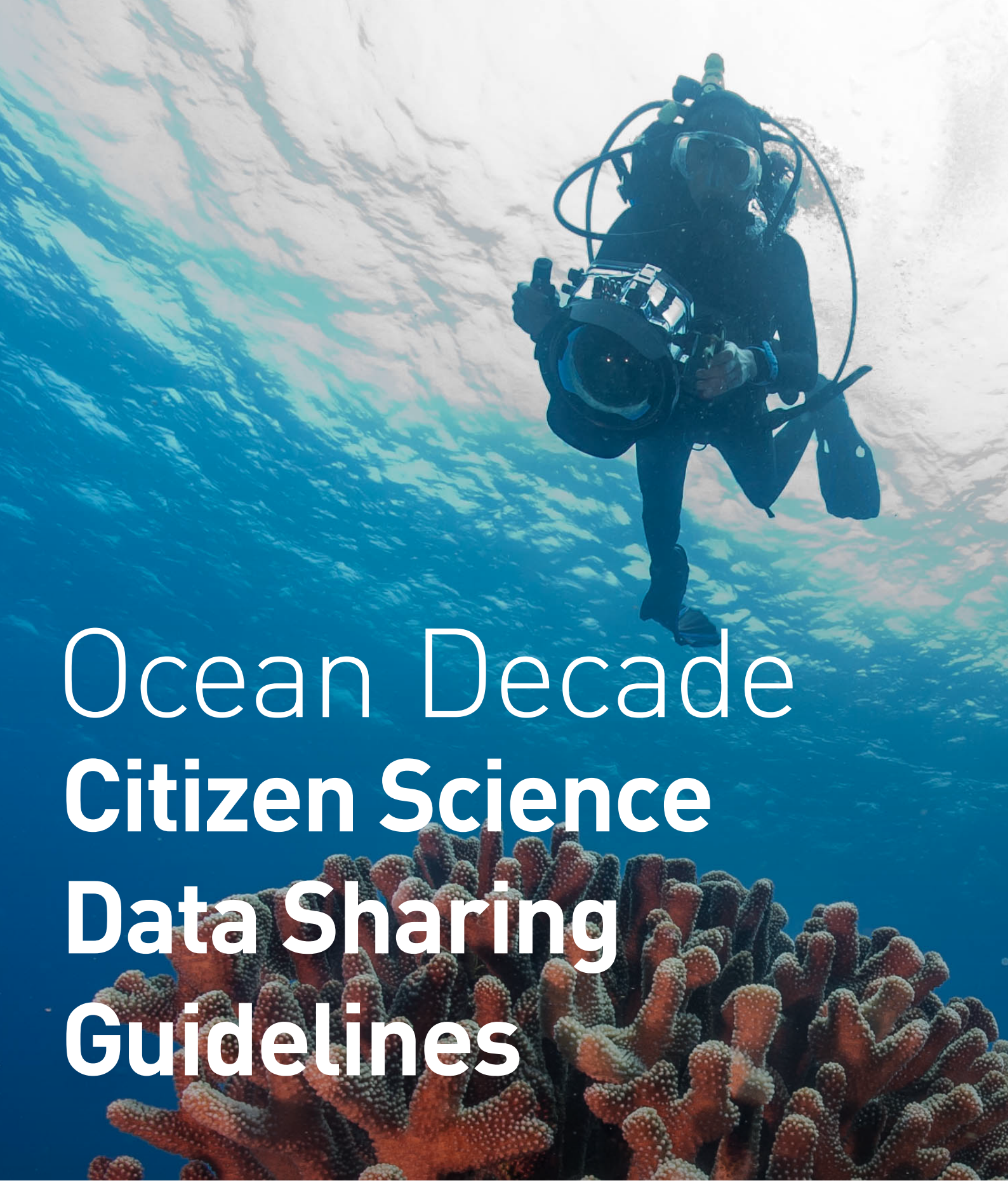


Ocean Decade **Citizen Science Data Sharing Guidelines**

The United Nations
Decade of Ocean Science
For Sustainable Development
2021-2030

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Published in 2026 by the Intergovernmental Oceanographic Commission (IOC) of UNESCO

7, Place de Fontenoy, 75352 Paris 07 SP, France.

For bibliographic purposes, this publication should be cited as follows:

IOC of UNESCO (2026). *Ocean Decade Citizen Science Data Sharing Guidelines*. UNESCO, Paris. (The Ocean Decade Series, 73).

Cover: © Shaun Wolfe / Ocean Image Bank*

Graphic design: UNESCO

(IOC/2026/ODS/73 Rev.)

Acknowledgments

The Intergovernmental Oceanographic Commission (IOC) of UNESCO wishes to thank the following members of the ocean data community for their time and their invaluable contributions to the development of these guidelines:

Decade Coordination Office for Ocean Data Sharing, IOC	Adam Leadbetter Margarita López-Velosa Debbie Pui-Wai Tsang
Decade Coordination Unit, IOC	Peter Burger
EMODnet (Physics, Ingestion) & ETT|DEDAGroup S.p.A.	Antonio Novellino
OutBe S.R.L. & The Ocean Race 1973 S.L.U.	Arianna Liconti
EMBIMOS Research Group Institut de Ciències del Mar (ICM-CSIC)	Vanessa Sarah Salvo Karen Soacha-Godoy Jaume Piera
Nansen Environmental and Remote Sensing Center (NERSC) & Bjerknes Center for Climate Research (BCCR)	Roshin Pappukutty Raj
Citizens of Surf	Natalie Fox
CS-MACH1 (MArine Citizen science data Horizon), Seascape Belgium	Joseph Nolan
European Marine Observation and Data Network (EMODnet)	Kate Larkin

The Decade Coordination Office for Ocean Data Sharing is supported by Fondation ENGIE which enabled this work.

Purpose:

This document provides a high-level overview of key principles, existing standards, frameworks, and recommended practices to support citizen science in properly sharing their data. It is part of a broader set of data sharing guidelines available from the IOC and the Ocean Decade.

These guidelines are designed to assist project leaders and data managers involved in Ocean Decade Actions that have a component or focus on citizen science. They also offer practical advice for Data Platforms (IOC-designated National Oceanographic Data Centres and Associated Data Units; or other regional data networks, services, and facilities) on how to integrate citizen science data and how to support these initiatives by providing guidance on ensuring data quality for sharing.

Definitions:

Citizen Science, or also referred to as Community Science, Participatory Science, etc.: Is the participation of the general public — typically volunteers and/or nonprofessional scientists — in the co-production (generation) of scientific knowledge, encompassing a wide range of objectives, methods, and degrees of engagement, often in collaboration with or under the guidance of professional scientists.

Data Platform: This document uses the phrase "Data Platform" as short-hand to mean an IOC-designated National Oceanographic Data Centre or Associated Data Unit; or other local or regional data network, facility, or service which shares data in a manner that is compatible with the IOC's network of data centres and data units.

Decade Action: The different types of tangible initiatives that will be carried out across the globe between 2021 and 2030 to fulfil the Decade vision. Actions can include programmes, projects, activities, or contributions.

Table of contents

1 Introduction: The role of citizen science in ocean observation

Citizen science can be broadly defined as the participation of the general public — typically volunteers and/or nonprofessional scientists — in the generation of scientific knowledge, encompassing a wide range of objectives, methods, and degrees of engagement, often in collaboration with or under the guidance of professional scientists.[1] This participation in ocean science can take many forms such as:[2,3]

- Recreational and professional activities, such as sailing or diving, where participants observe marine biodiversity, collect samples, or record environmental data.
- Designing or deployment of low-cost sensors to monitor variables like sea temperature.
- Data analysis from beach clean-ups to inform and mobilise actions for improved coastal management.
- More advanced roles such as helping to define research questions, validate datasets, contribute to early warning systems for invasive or protected species and water colour.

These different forms of engagement demonstrate how marine citizen science can extend from data collection to shaping scientific agendas and translating knowledge into tangible conservation actions and contribute toward decision-making. It is considered a promising practice for generating data that supports the Sustainable Development Goals (SDGs)[4] and the UN Decade of Ocean Science for Sustainable Development 2021-2030 (hereafter, the Ocean Decade).

[1] Haklay, M., Dörler, D., Heigl, F., Manzoni, M., Hecker, S., Vohland, K. (2021). *What Is Citizen Science? The Challenges of Definition.* In: Vohland, K., et al. The Science of Citizen Science. Springer, Cham. https://doi.org/10.1007/978-3-030-58278-4_2

[2] Soacha Godoy, K. A., Piera, J., Liñán, S., Rodero García, C., Salvador, X., Bardají, R., & Sbragaglia, V. (2022). *The contribution of citizen science and participatory monitoring systems to ocean knowledge and conservation.*

[3] Soacha Godoy, K., Piera, J., Liñán, S., Rodero, C., Salvador, X., Bardají, R., & Sbragaglia, V. (2021). *The four Ws of marine citizen science: What? Who? Why? Where?.* Zenodo. https://doi.org/10.5281/zenodo.5336311

[4] Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., & Fritz, S. (2020). *Mapping citizen science contributions to the UN sustainable development goals*. Sustainability Science, 15(6), 1735-1751.

The European Citizen Science Association (ECSA) created the following key principles that the community believes define good practice in citizen science.[5] Throughout this document, these principles are highlighted to demonstrate how they are applied in real-world data management and data-sharing practices in citizen science projects.

10 PRINCIPLES OF CITIZEN SCIENCE BY THE EUROPEAN CITIZEN SCIENCE ASSOCIATION

1. Citizen science projects actively involve citizens in scientific endeavour that generates new knowledge or understanding. Citizens may act as contributors, collaborators, or as project leader and have a meaningful role in the project.
2. Citizen science projects have a genuine science outcome.
3. Both the professional scientists and the citizen scientists benefit from taking part.
4. Citizen scientists may, if they wish, participate in multiple stages of the scientific process.
5. Citizen scientists receive feedback from the project.
6. Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for.
7. Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format.
8. Citizen scientists are acknowledged in project results and publications.
9. Citizen science programmes are evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.
10. The leaders of citizen science projects take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.

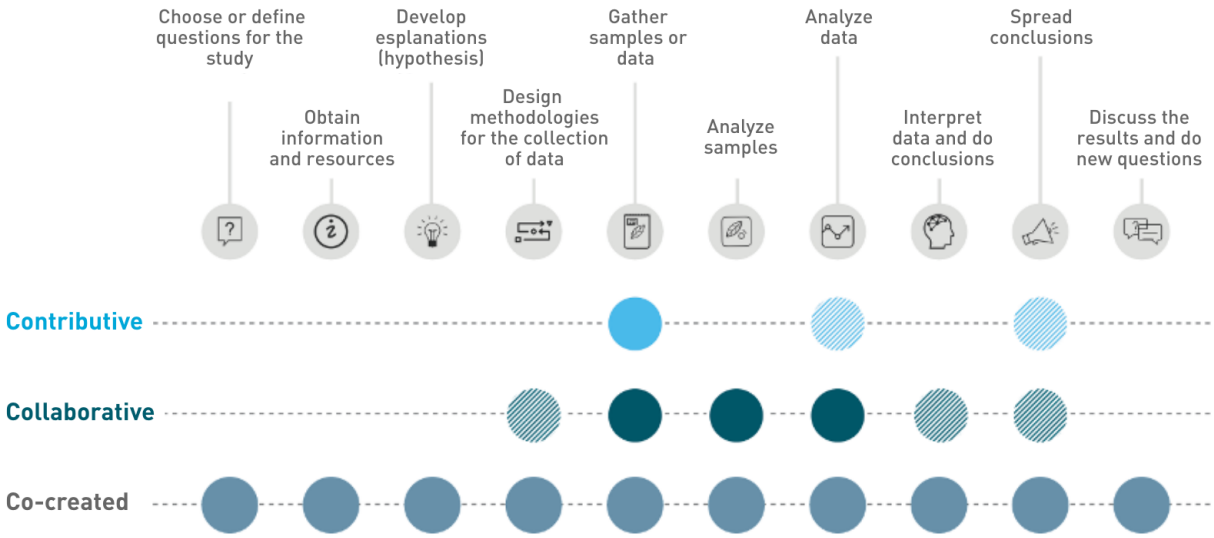
Citizen science initiatives are increasingly engaging the public in collecting valuable environmental measurements and observations that can be utilised independently or in conjunction with other data products to improve research and decision-making capabilities.[6] There are different levels of participation of the public in citizen science as shown in Figure 1[7] ranging from a contributive level, where participants have some participation on specific tasks in the project, to the co-creation level, that actively involves citizens in producing concrete results to tackle local issues.

[5] ECSA (European Citizen Science Association). 2015. *Ten Principles of Citizen Science*. Berlin. http://doi.org/10.17605/OSF.IO/XPR2N

[6] Downs, R. R., Ramapriyan, H. K., Peng, G., & Wei, Y. (2021). *Perspectives on citizen science data quality*. Frontiers in Climate, 3, 615032. https://doi.org/10.3389/fclim.2021.615032

[7] https://www.belspo.be/belspo/CitizenScience/about_en.stm

FIGURE 1



Different levels of participation in citizen science projects and initiatives.[8]

Principle #1:

Citizen science projects actively involve citizens in scientific endeavours that generate new knowledge or understanding. **Citizens may act as contributors, collaborators, or as project leader and have a meaningful role in the project.**[8]

Principle #4:

Citizen scientists may, if they wish, participate in multiple stages of the scientific process. This may include developing the research question, designing the method, gathering and analysing data, communicating the results and taking part in the decision-making processes.

CASE STUDY

In the context of the Ocean Decade, many Actions that involve citizens in different ways have been endorsed and gained recognition as part of campaigns to increase awareness and their reach. Some examples include the MINKA citizen observatory, Citizens of Surf, GIRT Scientific Divers, Ocean Spy, Seakeepers Society, Ocean Citizen Science project, among others.

These Actions have different approaches to integrating citizen scientists into ocean science and conservation. Examples below illustrate the different ways these initiatives enable meaningful contributions from society to ocean science and conservation efforts.

The Estuarine Ecological Knowledge Network (EEKN) is a citizen science initiative that uses the everyday experiences and traditional ecological knowledge of coastal communities with an emphasis on Indigenous and underrepresented groups, to inform estuarine research and policy.

[8] Soacha Godoy, K., Juan, R., & Sindy, M. (2025). *Participatory science: Contribution of knowledge biodiversity*. Zenodo. https://doi.org/10.5281/zenodo.16810810

This initiative emphasises **co-design** by prioritising the perspectives and observations of local communities to plan monitoring and research priorities. It also includes **co-creation** since citizens actively participate as observers and collect real-time ecological information on estuarine conditions.

The International SeaKeepers Society facilitates **co-creation** by enabling yacht owners to provide infrastructure and collect observations with sensors installed by the project; this is an example of co-creation between citizens and the project. This Decade Action can also have a **co-design** approach if the yachting community actively participates in shaping of the activities.

OceanSpy is a digital citizen science platform that invites people to help analyse images from the seabed studied by Ifremer to identify species. This is a clear example of **co-creation**, since citizens contribute directly to identify the species. It also incorporates **co-assessment**, enabling citizens to provide feedback that can improve the platform's quality and the data it generates.

Ensuring the scientific integrity of citizen science data remains one of the most frequently cited challenges in the field, particularly as projects scale in scope, visibility, and impact. Concerns about the accuracy, consistency, and credibility of data collected by nonprofessionals can lead to scepticism from both the scientific community and decision-makers.[9,10] Building trust in data generated by citizen scientists requires thoughtful project design, adequate participant training, robust data quality assurance, and appropriate validation mechanisms.[11,12,13] In this context, data sharing becomes not only a technical practice but also an ethical and social responsibility: it must uphold principles of reproducibility, transparency, and accountability, while acknowledging the contributions of citizen participants. To maximise the value of data generated through citizen science and to address concerns around trust, data stewardship, and responsible sharing, this document outlines a set of guiding principles for ocean data sharing.

Principle #6:

Citizen science is considered a research approach like any other, with limitations and biases that should be considered and controlled for. However, unlike traditional research approaches, citizen science provides opportunity for greater public engagement and democratisation of science.

[9] Kosmala, M., Wiggins, A., Swanson, A., & Simmons, B. (2016). *Assessing data quality in citizen science.* Frontiers in Ecology and the Environment, 14(10), 551–560. https://doi.org/10.1002/fee.1436

[10] Wiggins, A., Newman, G., Stevenson, R. D., & Crowston, K. (2011). *Mechanisms for data quality and validation in citizen science*. Proceedings of the IEEE Seventh International Conference on e-Science. https://doi.org/10.1109/eScienceW.2011.27

[11] Downs, R. R., Ramapriyan, H. K., Peng, G., & Wei, Y. (2021). *Perspectives on citizen science data quality.* Frontiers in Climate, 3, 615032. https://doi.org/10.3389/fclim.2021.615032

[12] https://www.belspo.be/belspo/CitizenScience/about_en.stm

[13] Bonney, R., Phillips, T. B., Ballard, H. L., & Enck, J. W. (2014). *Can citizen science enhance public understanding of science?* Public Understanding of Science, 25(1), 2–16. https://doi.org/10.1177/0963662515607406

2 Guiding framework for ocean data sharing

2.1 Data and information in the Ocean Decade

The Ocean Decade aims to boost ocean science from 2021 to 2030 to change humanity's relationship with the ocean, using a full range of ocean science and knowledge to diagnose problems and generate solutions. To achieve this, different types of data and information will be used, including natural and social sciences, local and Indigenous knowledge, global sensor networks, community-driven research programmes, and citizen science.[14]

The *Ocean Decade Data and Information Strategy* was developed to transform the way ocean data and information is produced, shared, managed and used. It highlights citizen science as a key data source for reaching its objectives. This stresses the importance of proper data management and sharing practices to ensure data quality, so the data contributes to the outcomes of the Ocean Decade.

Read more about the Ocean Decade Data and Information Strategy here

Once the data and information is available and accessible online, it is advisable to follow the FAIR and CARE principles which provide high-level guidance on designing efficient and interlinked data systems.[15]

2.2 FAIR principles (Findable, Accessible, Interoperable, Reusable)

FAIR principles aim to optimise the reuse of data by making it '**F**indable', '**A**ccessible', '**I**nteroperable', and '**R**eusable'. Key elements of FAIR data are rich metadata and documentation, using open or standard formats, having persistent identifiers for data objects, and using licences for reuse.

FAIR principles and good data management practices in citizen science projects ensures quality and increases the value and potential reuse of data, and empowerment of citizen scientists.[16]

Recommended resources

- Research Data Management Challenges in Citizen Science Projects and Recommendations for Library Support Services - Hansen et al., 2021
- FAIR data in citizen science projects a case study by the European Citizen Science Association (ECSA)

[14] UNESCO-IOC. (2023). *Ocean Decade Data & Information Strategy*. Paris, UNESCO. (The Ocean Decade Series, 45)
[15] GO FAIR. (n.d.). *FAIR principles*. https://www.go-fair.org/fair-principles/
[16] Hansen, JS, Gadegaard, S, Hansen, KK, Larsen, AV, Møller, S, Thomsen, GS and Holmstrand, KF. 2021. *Research Data Management Challenges in Citizen Science Projects and Recommendations for Library Support Services. A Scoping Review and Case Study*. Data Science Journal, 20: 25, pp. 1–29. https://doi. org/10.5334/dsj-2021-025

2.3 CARE principles

Although open data and open science have been gaining momentum in recent years, some principles of it might not fully engage with Indigenous Peoples' rights and interests. To better reflect the importance and purpose of data within Indigenous communities, the CARE principles[17] were created, emphasising on the '**C**ollective Benefit', '**A**uthority to Control', '**R**esponsibility', and '**E**thics', hosted by the Global Indigenous Data Alliance. They complement the FAIR principles,[18] and encourage open and other data movements to consider both people and purpose in their advocacy and pursuits.

Indigenous and local knowledge (ILK) offers a deep understanding of the marine environment, including its resources and interactions between species and human activities. Citizen science can be used as a channel for ILK in ecosystem stewardship and conservation. This approach can also increase the global visibility and relevance of ILK.[19]

CASE STUDY

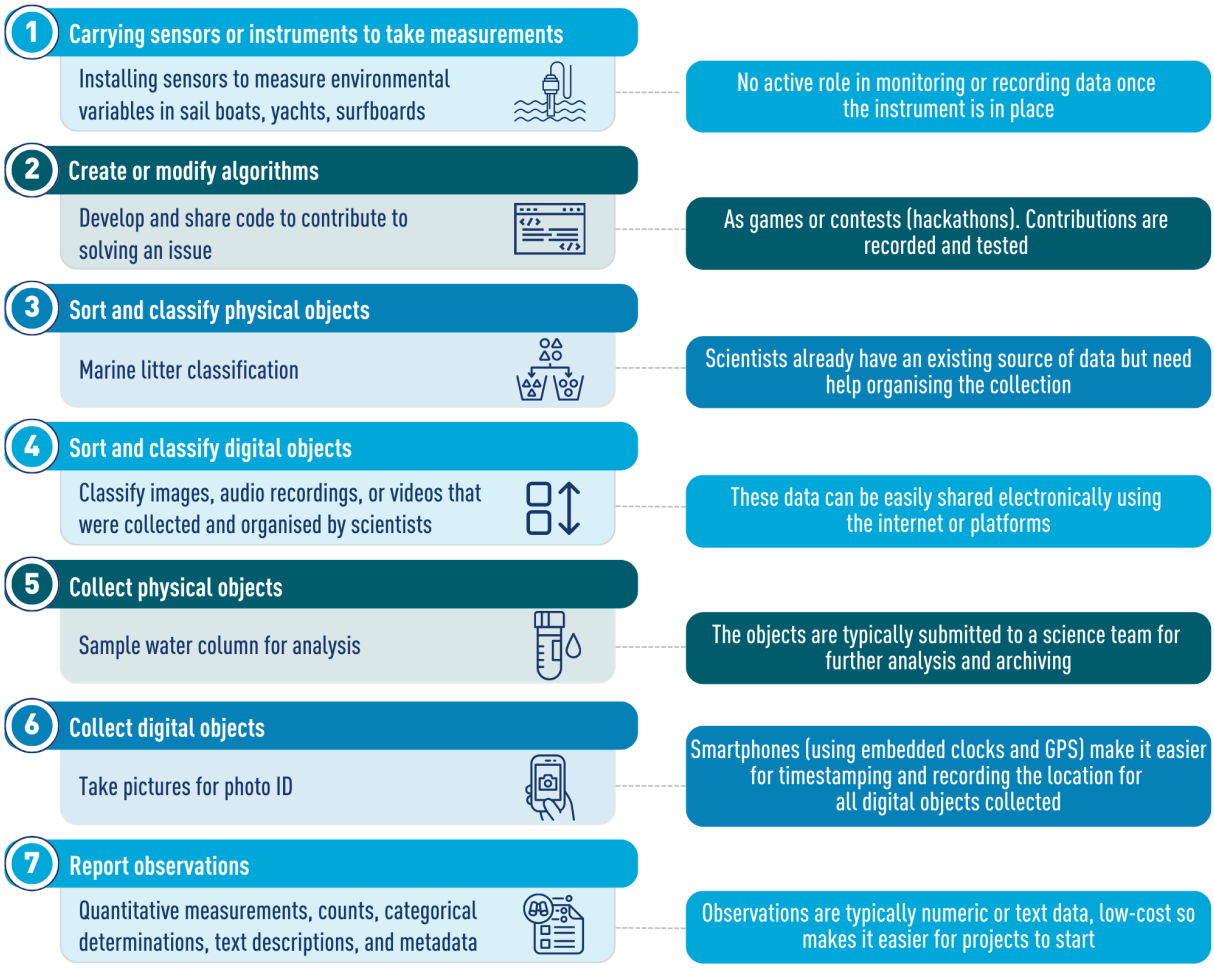
In New Zealand, the National Institute of Water and Atmospheric Research (NIWA) (currently Earth Sciences New Zealand) brings together Indigenous and local knowledge from the Māori tribe and practices with standard scientific methodologies of climate observations, research, and response to human-induced climate change. Find more information here.

[17] https://www.gida-global.org/care
[18] https://www.go-fair.org/fair-principles/
[19] Tengö, M., Austin, B. J., Danielsen, F., & Fernández-Llamazares, Á. (2021). *Creating synergies between citizen science and Indigenous and local knowledge*. BioScience, 71(5), 503-518. https://doi.org/10.1093/biosci/biab023

3 What to share: Types and sources of marine citizen science data

Depending on the involvement of people in the project, researchers have identified seven basic types of data[20] as shown in Figure 2.[21]

FIGURE 2



Types of data according to the participation of people in citizen science projects (Based on Stevenson et al., 2021).[21]

[20] Stevenson, R. D., Suomela, T., Kim, H., & He, Y. (2021). *Seven primary data types in citizen science determine data quality requirements and methods*. Frontiers in Climate, *3*, 645120. https://doi.org/10.3389/fclim.2021.645120
[21] Ibid.

4 Where to share: Data repositories and systems

Citizen science initiatives in marine observation often differ in how they are organised, the scale of their activities, and the level of technical resources available to support data collection and sharing. In some cases, projects are tied to institutional programmes that maintain their own dedicated data portals. In these situations, project managers are responsible for guiding citizen scientists on data handling protocols, including formatting, quality control, and submission procedures. Standardising these workflows helps ensure that data meet the FAIR and CARE data-sharing principles.

For citizen science initiatives that are not connected to an existing data portal, participants and coordinators can still contribute meaningfully by sharing data through recognised global or regional repositories that support the ingestion of citizen-generated content. These platforms can offer technical support for data submission, provide guidance on metadata standards, and ensure long-term storage and discoverability.

It is also beneficial for citizen scientists and project coordinators to engage with regional or thematic citizen science networks, such as the European Citizen Science platform, the European Citizen Science Association, the Ibero-American Network for Participatory Science, Citizen Science Asia, the Association for Advancing Participatory Sciences, and the Marine Citizen Science Data Network developing under the CS-MACH1 project which offer resources, training, and fora to enhance data visibility and collaboration opportunities.

Call to Action

Decade Actions:

- Identify your national or regional data sharing platform (National Oceanographic Data Centre, Associated Data Unit, Regional Data Service).

Data Platforms:

- Plan for the ingestion of citizen science data and how it will be labelled for consumers to assess the quality of the data for their needs.

5 How to share: The process

5.1 Planning

All projects that collect, create, or acquire marine data should have:

- A Data Management Plan (DMP) which outlines how to handle data collected or generated during a project or programme.
- A structure for its ongoing management throughout the data lifecycle, including details on how to access collected/generated data, data processing, quality assurance, licenses, and privacy.

Detailed instructions for compiling a DMP for an ocean project or programme have been published by the IOC.[22]

Call to Action

Decade Actions:

▶ Make sure you have a DMP developed at the beginning of the project that includes all relevant information so the dataset can be reused at any point in time. The DMP should be published and accessible on platforms (e.g. Zenodo).

Data Platforms:

▶ Encourage users to have a DMP when submitting data. This can be achieved by providing templates, examples, and recommended practices to promote its usage.

5.1.1 Methods/instruments: Cost-effective technologies in marine observation

The increasing adoption of cost-effective sensors and technologies in marine observation, driven by affordable components, open-source hardware, and IoT connectivity, is transforming citizen science initiatives by making data collection more accessible, scalable, and inclusive.[23] These systems, ranging from smart surfboard fins and equipped buoys to open-source Automated Underwater Vehicles (AUVs), are delivering reliable ocean measurements at a more affordable cost than traditional equipment.

CASE STUDY

The Submersible technology to advance reef science Decade Action led by 2DegreesC aims to create a citizen science network of scuba divers that collect environmental data during their immersions using a low-cost oceanographic device attached to their gear. This sensor measures conductivity, temperature, depth and light (CTD-L) with great accuracy and the collected data is intended for sharing with global repositories.

[22] https://unesdoc.unesco.org/ark:/48223/pf0000256544

[23] Marcelli, M., Piermattei, V., Gerin, R., Brunetti, F., Pietrosemoli, E., Addo, S., Boudaya L., Coleman, R., Nubi, O. A., Jojannes, R., Sarker, S., Sohou, Z., Zennaro, M., Whiltshire, K., & Crise, A. (2021). *Toward the widespread application of low-cost technologies in coastal ocean observing (Internet of Things for the Ocean)*. Mediterranean Marine Science, 22(2), 255–269. https://doi.org/10.12681/mms.25060

CASE STUDY

The Solutions for Cost-effective Ocean Observation (SCOOP) project offers a directory of cost-effective observation technologies, methodologies and best practices that can be widely deployed to benefit coastal resilience globally, particularly in nations with funding challenges and limited capacity. In the longer-term, this will contribute to sustained observations of the coastal ocean that are vital both to the global scientific community and also to local stakeholders to plan, mitigate and adapt to climate change.

Call to Action

Decade Actions: To ensure that the data collected is trustworthy, usable, and contributes meaningfully to larger scientific and decision-making processes:

- When selecting cost-effective technologies, it is important to consider whether the sensors have undergone validation against reference instruments.
- Make sure the sensors include clear information about how accurate the measurements are and how the sensor was calibrated.

Data Platforms:

- Offer tools or guidance to users for validating low-cost sensor data before it's shared.

5.2 Data collection

The data collection process has a substantial impact on data quality. To ensure that the data collected is useful, it is advised to follow some considerations:[24]

Call to Action

Decade Actions:

- Discover and follow standardised data collection protocols (research for recommended practices and other projects) for your topic of interest. Train citizen scientists and use appropriate data collection tools to maximise the quality of the data created.
- Before launching the project, run a pilot to test how clear and user-friendly your protocols and questions are, and to assess the accuracy of the data collected.
- Keep databases clean and ready to use, follow standard data entry practices. Using multiple choice questions or limiting responses to numbers within a specific range can ensure consistency in data.

Data Platforms:

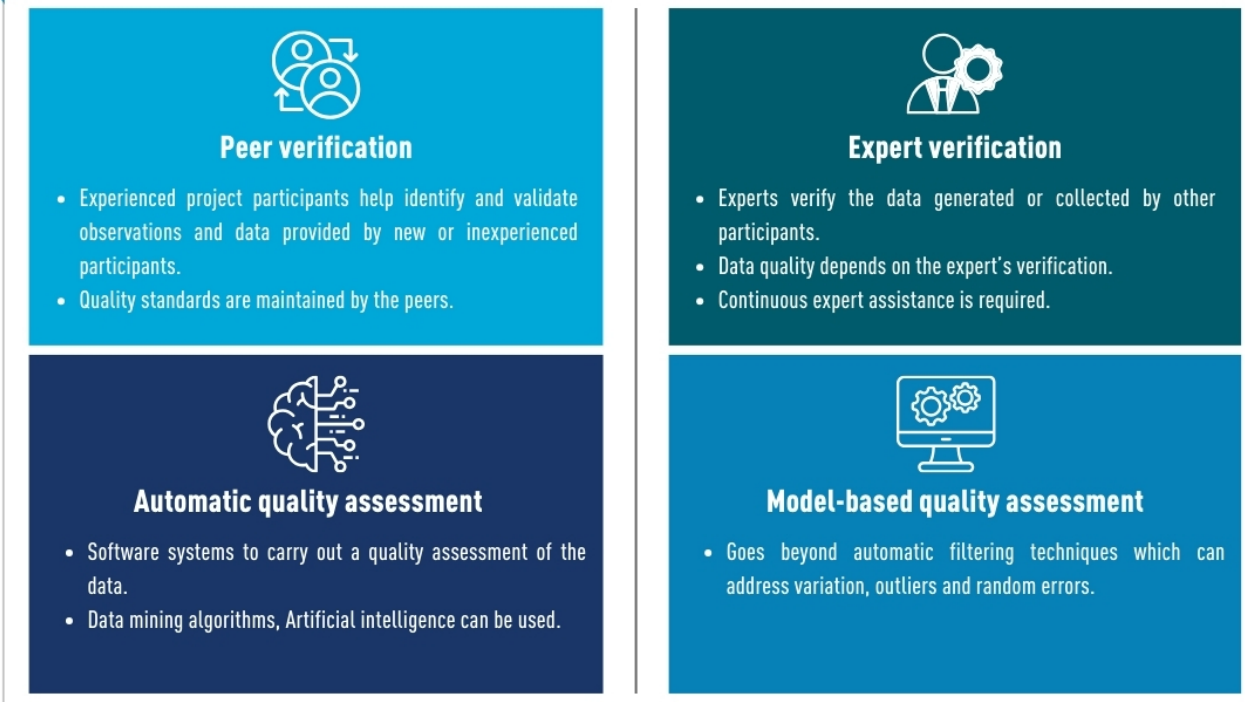
- Offer FAQ sections with some examples of protocols, or use cases that projects can reuse or adapt.

[24] General Services Administration. (n.d.). *Step 4: Collect, manage, and analyze data*. CitizenScience.gov. https://www.citizenscience.gov/toolkit/howto/step4/

5.3 Data validation and quality control

Data collected in citizen science projects should be subject to validation and verification before being used, this is done during and after data is generated. Some approaches can be:[25]

FIGURE 3



Validation methods used in different citizen science projects (Based on Balázs et al., 2021).

Some tools that can be used for quality control include:

- Taxon match tool by the World Register of Marine Species (WoRMS).
- Data quality control guidance in the Ocean Biodiversity Information System (OBIS) Manual.
- Different platforms like QGIS or Google Earth to check coordinates of data points.
- Data validation against reference climatological datasets, including spike detection, cleaning, and flagging of anomalous values.

[25] Balázs, B., Mooney, P., Nováková, E., Bastin, L., & Arsanjani, J. J. (2021). *Data quality in citizen science*. The science of citizen science. 139(10.1007), 978-3.

Call to Action

Decade Actions:

- Decide, document, and make available the methods used to assess, assure, and control the quality of data gathered from citizen science initiatives.
- Highlight the appropriate uses of the data being collected, and applications for which the data may not be appropriate.
- Include guidance and examples in the data entry process to help participants submit accurate information.
- Consider quality control mechanisms like expert review, photo submissions and paper data sheets submitted along with online entry.[26]
- Prioritise trainings on marine citizen science data validation and quality control skills, tools, and processes.

Data Platforms:

- Align methods for describing data quality with regional or global best practices.
- Provide quality control/assurance flags alongside data using well-known flagging schemes.
- Publish contextual metadata for dataset use alongside data.

Principle #9:

Citizen science programmes are **evaluated for their scientific output, data quality, participant experience and wider societal or policy impact.**

5.4 Metadata and standards

Metadata is the data that provides information about other data. When publishing a dataset, the metadata record should also be published and comply with standards, so it provides detailed information to ensure reuse through time.[27]

Data standards are the "rules" for formatting data, so it is consistent across datasets. Adherence to them allows the data to be interoperable and reusable, and to be shared with national and international repositories.[28] Meaning that data will have a greater impact in contributing to essential ocean variables (EOVs) and to the Ocean Decade for example.

[26] Wiggins, A., Newman, G., Stevenson, R. D., & Crowston, K. (2011, December). *Mechanisms for data quality and validation in citizen science*. In 2011 IEEE Seventh international conference on e-Science Workshops (pp. 14-19). IEEE.
[27] Marine Environmental Data and Information Network (MEDIN). (n.d.). *Best practice: Citizen science data*. DASSH. https://www.dassh.ac.uk/citizen-science/best-practice
[28] Ibid.

PPSR Core is a set of global, transdisciplinary data and metadata standards to use in citizen science projects. It is maintained by an international group of volunteers from the Citizen Science Association, its sister organisations and the Data & Metadata Working Group.[29]

Call to Action

Decade Actions:

- Work with the Data Platform who will archive and publish your citizen science data to understand their metadata requirements prior to the later stages of the data lifecycle.

Data Platforms:

- Use community defined controlled vocabularies to describe datasets being published, and how they might contribute to wider initiatives such as EOVs.
- Follow best practice by the IOC and International Oceanographic Data and Information Exchange (IODE) Programme on the assignment of Digital Object Identifiers (DOIs) to datasets to allow them to be cited in academic literature and reports, including tracking metrics of their reuse.

Principle #7:

Citizen science project data and meta-data are made publicly available and where possible, results are published in an open access format. Data sharing may occur during or after the project, unless there are security or privacy concerns that prevent this.

[29] https://core.citizenscience.org/

5.5 Data sharing and publication

Sharing data needs transparency, clear documentation, appropriate licensing, and open, FAIR platforms. This improves data discoverability and reusability. There are many benefits to data archiving in data repositories, where they can be aggregated with data from other citizen science projects and contribute to other research.

Call to Action

Decade Actions:

- When sharing citizen science data, it is advised to use existing platforms or repositories instead of establishing new platforms. iNaturalist, OpenStreetMap, Marine Debris tracker, OBIS, the European Marine Observation and Data Network (EMODnet), and others already offer existing platforms that ensure standards and sharing within platforms and repositories.
- Submit data to an appropriate data platform to act as the repository for your data.
- To ensure long-term data preservation, it is advisable to have more than one copy and to use different media technologies, as well as preserving raw data and metadata to allow reprocessing.[30]

Data Platforms:

- Ensure the long-term storage, archival, and appropriate access to the data.

[30] Danielsen, F., Pirhofer-Walzl, K., Adrian, T., Kapijimpanga, D., Burgess, N. D., Jensen, P. M., et al. (2013). *Linking public participation in scientific research to the indicators and needs of international environmental agreements.* Conserv. Lett. 7, 12–24. https://doi.org/10.1111/conl.12024

Citizen science in action

The MINKA Citizen Science Observatory is a citizen science infrastructure where people can contribute to different parameters through their own local community; currently, biodiversity observations (both inland and marine) is the more mature variable. However, MINKA includes EOVs such as water temperature and marine litter in addition to marine species. The marine species data collected by the Spanish community has been included in the City of Barcelona's biodiversity atlas, and is integrated into global repositories such as the Global Biodiversity Information Facility (GBIF) and EMODnet. This ensures that data taken from citizens is available for reuse and can contribute to informed policy. All guidelines on how to use, data sharing and citation, local project development, and identification consensus process are openly available in the EMBIMOS Zenodo community in different languages.

OBIS is the world's largest global open-access infrastructure for marine biodiversity data supported by a community of 36 Nodes and over 6,000 contributors worldwide. This infrastructure provides accessible, high-quality, and interoperable marine biodiversity data, along with innovative, fit-for-purpose services, to support the needs of science, policy, and society. They have different datasets produced by citizen science projects such as Programa Poseidon, Jellyfish Observations, Seawatchers, and eDNA Expeditions.

6 Ethical and legal considerations

When collecting data through citizen science, there can be legal concerns about privacy, security, and how the data is used. Ethical and legal aspects must be considered, especially regarding Personally Identifiable Information (PII) and General Data Protection Regulation (GDPR) compliance. When participants don't agree to the data policy of the project, alternatives like pseudonymisation or anonymisation should be considered.

Call to Action

Decade Actions:

- Avoid collecting unnecessary personal information when gathering personal data.
- Ensure compliance with local data protection laws in your region.
- Clearly communicate how data will be used, stored, and shared. Offer alternatives for participants who prefer not to share their data.
- Consider the location(s) where data collection is occurring and if there are any legal issues with data collection or sharing due to the jurisdiction the location(s) fall under.

Data Platforms:

- Request metadata to include information about presence of PII.
- Share the platforms privacy and data governance policy.

Recommended resources

- CSA Webinar: Approaching informed consent in citizen science: Legal and ethical issues
- Otters Workshop: Legal issues regarding citizen generated data for the water domain

Principle #10:

The leaders of citizen science projects **take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities.**

7 Data attribution and citation

Proper attribution and citation of data are essential components of transparent citizen science. It is important to properly identify and credit data sources. To achieve this, the use of persistent identifiers (PIDs), such as Digital Object Identifiers (DOIs), is increasingly important in citizen science.

Call to Action

Decade Actions:

- Make sure to assign DOIs to your datasets.
- Clearly define the type of license your dataset is going to have (CC, ODC, ODbL, etc). When possible, we recommend the use of CC0 or CC-BY or equivalents.
- When reusing a dataset, make sure to cite it properly and attribute according to the license.

Data Platforms:

- Promote citation and use of DOIs in the platform, include reminders and guides for people to use, and recognise recommended citation practices.
- Assign a DOI or other PID to all published datasets.
- Ensure metadata links to the DOI.
- Provide guidance to users on how to cite datasets.

Principle #8:

Citizen scientists are **acknowledged in project results and publications.**

8 Capacity development

Proper attribution and citation of data are essential components of transparent citizen science. It is important to properly identify and credit data sources. To achieve this, the use of persistent identifiers (PIDs), such as Digital Object Identifiers (DOIs), is increasingly important in citizen science.

To ensure effective ocean data sharing within marine citizen science projects, it is important to provide targeted training that equip participants with the necessary skills for data collection, management, and sharing. User-friendly tools, clear guidelines, and technical support should be made available to empower both citizen scientists and project managers to enhance engagement.

Examples of training platforms:

- OceanTeacher Global Academy (OTGA)
- EU citizen science platform training resources
- The citizen science hub at the U.S. National Oceanic and Atmospheric Administration (NOAA)
- The Association for Advancing Participatory Sciences resource centre
- Trainings via the CS-MACH1 project

The Ocean Decade Capacity Development Facility supports partners involved in current and future Decade Actions by identifying and addressing their capacity development needs. Particular emphasis is placed on empowering Small Island Developing States (SIDS), Least Developed Countries (LDCs), and Early Career Ocean Professionals (ECOPs). You can learn more about the Capacity Development Facility on the Ocean Decade website.

9 Citizen science flagship initiatives under the IOC

The Ocean Decade

The Ocean Decade actively promotes and amplifies citizen science as a valuable contributor to ocean knowledge and stewardship. Visit the GenOcean website, the official Ocean Decade citizen science campaign, to discover ways the public can engage with ocean science and contribute to meaningful actions for the ocean we want.

eDNA expeditions

UNESCO's Environmental DNA (eDNA) Expeditions is a global citizen science initiative designed to enhance understanding of marine biodiversity and assess how climate change is influencing the distribution of marine life across UNESCO World Heritage marine sites. A central part of the initiative is to move eDNA sampling and sequencing toward a more standardised approach and guarantee open access to the data. This is being addressed by making data openly available on OBIS, implemented by the IOC and IODE Programme.[31]

Find the Open Science eDNA Protocols here

Launch of the eDNA Expeditions II project on 12 June 2025 aboard the Statsraad Lehmkuhl in Nice, France. © IOC

[31] https://www.unesco.org/en/about-edna-expeditions?hub=66910

10 Additional resources

- Go FAIR resources
- CARE Principles for Indigenous Data Governance, Carroll et al., 2020
- Citizen science Best Practice Guidance, Marine Biological Association
- Marine Conservation Society Citizen Science Projects
- Marine Biodiversity Citizen Science Strategy 2023-2028, Ireland's National Biodiversity Data Centre
- Citizen Science for all. A guide for Citizen Science Practitioners, a Bürger Schaffen Wissen (GEWISS) publication
- Biodiversa Citizen Science Toolkit
- Choosing and Using Citizen Science: a guide to when and how to use citizen science to monitor biodiversity and the environment
- CS-MACH1 project

For further information
visit our website:
oceandecade.org

Or follow us on social media:

UNOceanDecade
unoceandecade
OceanDecade
UN-Ocean-Decade

#OceanDecade

unesco
Intergovernmental
Oceanographic
Commission

with the support of:

Fondation ENGIE