



ROADMAP FOR THE ALL-ATLANTIC DATA SPACE

- Draft Zero –

This document was mainly developed in the workshop "Producing a Draft Zero Version of the Roadmap for the Implementation of the All-Atlantic Ocean Data Space", which was held online during the Data Infrastructures and Stakeholders Forum, 24-25 May 2022 <https://www.leibniz-zmt.de/de/all-atlantic-data-2030.html>. It is also the result of other activities carried out within the framework of the *Joint Pilot Action All-Atlantic Ocean Data Enterprise 2030* for the All-Atlantic Cooperation for Ocean Research and Innovation (AANCHOR-CSA) Project Work Package 5, Common Standards for Information and Data Sharing.

All-Atlantic Ocean Data Enterprise 2030 (AA-Data2030) in the long term aims to produce a set of recommendations and products to drastically improve the handling and the accessibility of marine data by strengthening the existing networks between the West and the East, and the South and the North of the Atlantic basin. As such, AA-Data2030 promotes a comprehensive assessment of the status of ocean-related data in the Atlantic and provides forward-looking strategic

recommendations and structures for more efficient data to knowledge transfer.

The central objective of AA-Data2030 is to create an all-Atlantic data space to effectively and efficiently provide peer-reviewed Atlantic Ocean data in compliance with the FAIR (Findable, Accessible, Interoperable, and Re-usable) guiding principles for scientific data management, and CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics) principles for indigenous data governance.

The development of the roadmap for the All-Atlantic Data Space initiated by AA-Data2030 embraces the principles of co-design and co-delivery, which to date have proven successful in the development of the Roadmap. Such processes will continue throughout its implementation, under the All-Atlantic Ocean Research Alliance's motto: *Connecting, acting, cooperating!*



In collaboration with the international community

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ALL-ATLANTIC DATA SPACE

By connecting existing data infrastructures around the Atlantic basin and guaranteeing free access to reliable, quality-controlled data in a timely and accessible manner, the all-Atlantic data space will benefit all sectors of society. These include stakeholders at the political and science-policy levels, in the research and university environments, in the maritime/food industry, in maritime engineering, as well as the general public, including schools. Synergies articulated by all partners will have a direct societal impact, which is vital for sustainable development to take place around the Atlantic basin.

We need to act now to promote the following:

- Connecting all regional data networks and guaranteeing their linkages to national and international networks,
- Harmonizing regionally established standards to conform to national and international uniform, reliable minimum standards,
- Improving the capacity in research, innovation, and management for better understanding the data needs, collection, management, sharing, metadata, and communication processes, and
- Providing a greater audience with the necessary skills in data management, thus contributing to increasing ocean data literacy and science data literacy.

Marine knowledge for policy makers:

Ocean observing should become the norm. Policy drivers are needed to further efforts towards the objectives of the UN Ocean Decade in a way to identify (or set up) programmes in those countries across the Atlantic that are strategic in terms of data gathering but not yet engaged in the monitoring, to involve their national scientific communities progressing towards data sharing. The community collaboration must engender trust in the data through documented provenance and employed best practices and standards. Moreover, ocean observing needs to evolve from a niche activity of scientists to a societal norm such as weather or health observations. Data rescue, data archaeology and data ingestion portals must be supported. The issue of opening to sensitive data must also be led by international policy bodies and fit into their agendas.

Report - Standards, best practices, challenges and incentives for maximising the use of ocean data in the Atlantic region. From the Webinar: *Towards an All Atlantic Data Space*, jointly organised by Blue-Cloud AANChOR, the G7 Future of the Seas and Oceans Initiative, iAtlantic, and AtlantECO, in collaboration with EMODnet and Copernicus Marine Service.



The All-Atlantic Data Space is a federation of data infrastructures around the Atlantic. It is a robust, flexible, one-stop, user-friendly interface that allows decision makers and other societal actors to browse and search information relevant for their particular needs. Indeed, accessibility also implies the capacity for the different stakeholders to derive benefit from a resource, in our case, data.

A sustainable structure associated with the different relevant databases is capable of archiving data in a networked and decentralised manner, exchanging them via appropriate interfaces, and making them freely available to the public. Funding as well as a concrete vision for the way forward are needed for the successful implementation of the Roadmap.

COMMON STANDARDS FOR INFORMATION AND DATA SHARING

The creation of the All-Atlantic Data Space will make ocean data and information visible and accessible to all stakeholders, thereby boosting the ocean economy. It will also be able to develop and reinvent itself constantly thanks to the ever-increasing investment in oceans observation and research, and the advent of oceanographic big data.

Open access to data is essential for the design of management strategies, decision making, and to inform policies to preserve the health of the ocean and to enhance its resilience. Better monitoring also means better forecasting capacities, vital for the improvement of maritime safety, human health and well-being, and the sustainable use of marine resources.

Establishing common standards for information and data sharing to be used by local, regional, and national initiatives in the Atlantic basin, coupled with cloud-computing and the All-Atlantic Data Space, will dramatically improve the Atlantic surveillance system.

Standards and interoperability are key.

There are some good regional examples e.g. EMODnet, where community best practices and standards for marine data and metadata are already applied, in the context of international standards and efforts e.g. IODE. These - together with other examples from across the Atlantic Ocean basin, can be used as best practices and inspiration for other regions to join the momentum towards a fully interoperable All Atlantic Ocean Data space. To achieve this, a change in culture is also the only way to propagate the use of standards and best practices, which already exist, as key components of the FAIR approach towards data management. This goes far beyond data archiving into repositories. A systemic approach towards interoperability and shared (cross-disciplinary) metadata policy is needed: it should not matter where you submit your data to be able to harvest and multiply its impact globally while keeping provenance tracked. Legal interoperability is part of this.

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Freely available data allow the unrestricted exchange of information among partners on both sides of the Atlantic; the identification of complementarities, and the joint prioritization of potential cooperation activities, are core needs.

By using best practices at the early stages of project development, both scientists and decision-makers minimize the risk of user non-compliance, further facilitating the implementation of national data management plans for all scientific research.

More data (e.g. regarding carbon and heat fluxes) and data products (e.g. using multimedia data) are needed in the South Atlantic, as identified during the recent AA-Data 2030 [webinar “Showcasing Data Infrastructures and Operators in Africa”](#), held online on 24 May 2022. Specific needs and gaps for Africa were already documented in the [Ocean Decade Africa Roadmap](#) (see text box below) as highlighted during the same webinar.

Need for training on data collection, analysis and interpretation (including capacity building in programs and software to analyse different environmental datasets)

Inadequate common platforms for data sharing, adaptation of technologies, facilities and infrastructure within Africa

Identified gaps in research programmes on ocean policy agenda in order to analyse objectives, identify priorities, align teaching/research/outreach activities capable of impacting on policy

Need to better manage, develop and transfer know-how within the contributing research community

UNESCO-IOC (2022). The United Nations Decade of Ocean Science for Sustainable Development 2021–2030. [Ocean Decade Africa Roadmap](#). UNESCO, Paris. (The Ocean Decade Series 36).

Communication is paramount to the successful implementation of this Roadmap. Strong communication is needed not only within communities that produce data but also between such communities and the stakeholders that will be making use of the data in question. This may require the establishment of a community of practice that needs to develop a common language both across data-producing communities and vis-à-vis data end users. A related issue refers to the need to strengthen the science-policy interface and to ensure that the data collected and processed are converted into a usable and useful format to be employed by policy- and decision-makers involved in governing the affairs pertaining to the Atlantic.

“(…) There remain many challenges even with such international cooperation. The standardization of data collection, the full sharing of the data and capacity development to enable data collection are all issues that require further effort. (…) Our ocean data collection systems have traditionally focused on physical and chemical data but have paid much less attention to biological data. Nations have also been less willing to share fisheries data, even within the country, thereby limiting our ability to make some of the needed linkages, or to develop an understanding of how fishery systems are changing. In some regions, there has been good organization work to share fisheries data, such as ICES in the Northwest Atlantic, and the Benguela Current Convention (BCC) off southwest Africa. The public-private sector example in Brazil also offers a pathway to enhanced data collection and shared.”

From the conclusions of the All-Atlantic Data & Policy Forum. [E-REPORT of the All-Atlantic Data & Policy Forum, 2021 May 31 \(ONLINE\)](#).

INVEST IN HUMAN RESOURCES

Collecting and disseminating data, freely exchanged within the ocean community, will expand the interactions between the different scientific and societal players and create a solid basis for the development of new cooperation platforms for scientific and technological innovation to serve societal needs and new value chains through shared responsibilities and mutual benefit.

“There are big differences in the infrastructure implementation maturity between Europe, US, Japan, Australia, China and the rest of the world. However, problems that we face do not lie in technology or even governance or policies, as standards exist and well-functioning infrastructures can be used as examples for countries with less mature implementations. The biggest bottleneck here is the lack of human capacity to assimilate all the information and to ingest and implement it. A roadmap for countries, repositories and institutions is a good idea. It can be expected that progress will in some cases be very slow, but this activity should be very inclusive to ensure that there is engagement from as many participants as possible, even if requirements and standards are not fully implemented. The roadmap can help countries who want to move to a higher level of operations and also provide something data repositories or institutions can take to their funding environment. The roadmap could then aid countries scientists to explain what development they are aiming for, what steps they will need to take and what hurdles they will need to overcome to become operationally more mature. It would also be very valuable to ensure that the roadmap explains the benefits that come with such a development.”

From the conclusions of the All-Atlantic Data & Policy Forum. [E-REPORT of the All-Atlantic Data & Policy Forum, 2021 May 31 \(ONLINE\)](#).

Growing a community of stakeholders supporting the All-Atlantic Ocean Data Space also demonstrates the need for capacity development around the Atlantic basin. There is therefore a strong need to invest in the development of people equipped with the skills and competencies to foster the Blue Digital transformation.

One Ocean, different cultures, many practices.

*When dealing with the marine data value chain, the situation varies a lot from pole to pole, East to West. (...) There is a “Community memory” benefitting from software tools and related best practices created across the Atlantic region, but tools themselves are not enough, and a new generation of data managers is needed to lead a change in pace towards a different approach to data sharing. **Data stewards and data managers are more and more needed** - and are we sure all stakeholders get the difference between the two terms? - an element of awareness and recognition must be introduced, for instance via professional curricula on data management with clear indications on the benefits for such skills. Let's focus on an aligned human capacity, then.*

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The creation of a data driven mentality in scientific research is an important pillar of the All-Atlantic Roadmap. Stakeholders sharing common goals regarding data collection, curation, and analysis can influence the creation of guidelines and legislation regarding Atlantic Ocean data processing. The society as whole is invited to participate in this process, promoting data inclusivity and democratisation of the marine sciences.

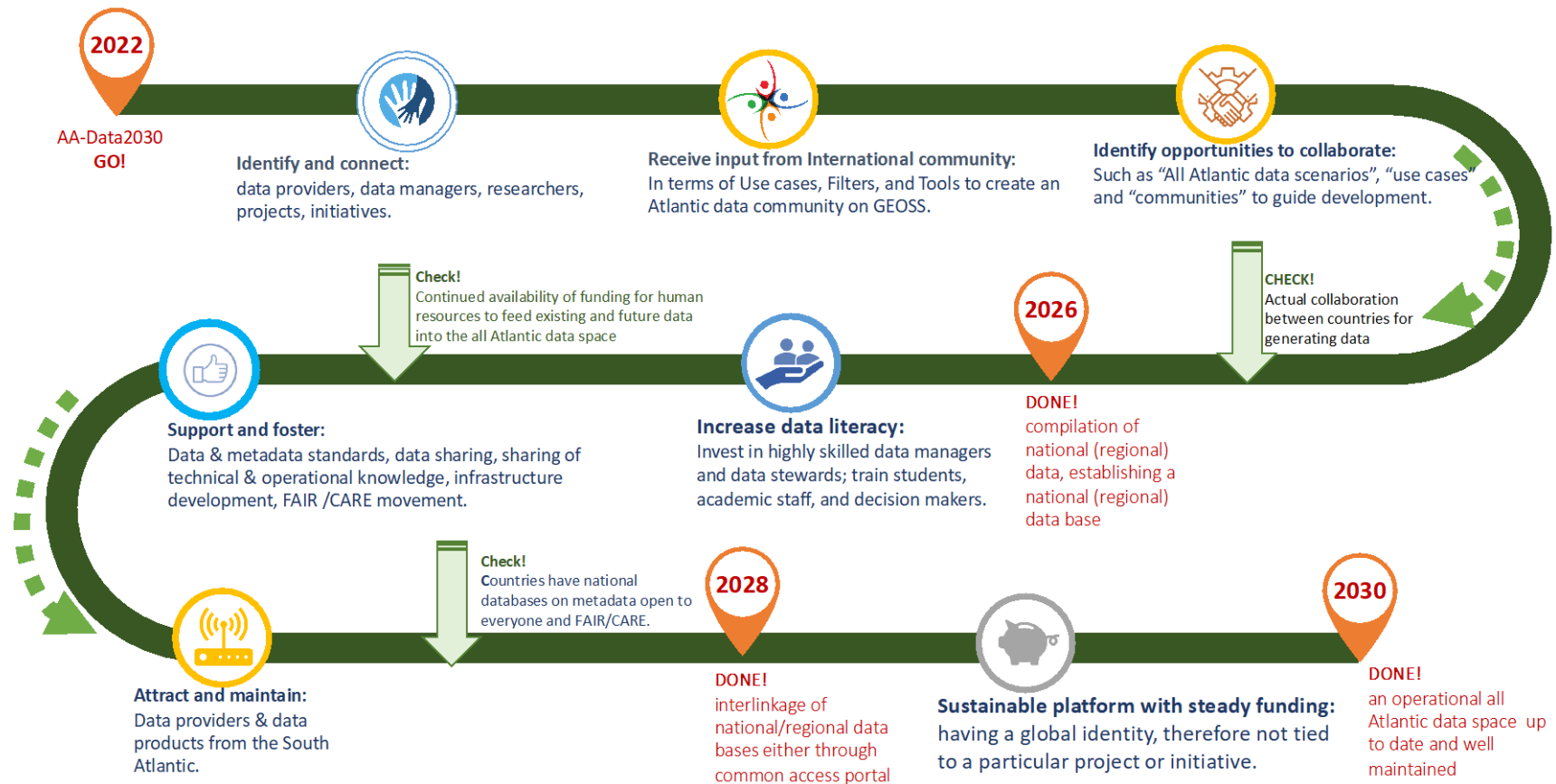
Strengthening Citizen Science for Policy, Equitable Access, Democratization and Critical Data Contributions

*Citizen participation in decision-making should be considered as a way to make the policy process more transparent and accessible. By actively supporting **citizen science initiatives**, policymakers are able to **open up and democratise marine observation science, thus, co-creating a new type of self-driven, sustainable and cost-efficient observatory concept**. This will not only foster scientific education but also appeal to a citizen's natural willingness to contribute to society and offer channels to have their voices heard. Additionally, robust citizen science project data can be a critical element within scientific research and as such have substantial impact on various policies and programmes.*

Trust and reciprocity are key to ensuring citizen involvement in science. Mechanisms to provide feedback to citizens need to be put in place to showcase the impact made by their contribution and to further stimulate their engagement. Citizens must also be equipped with easy-to-use systems to upload and download data and encouraged to use cheap sensors to move from pure visual observations to sensor-based ones.

*It is recommended that **policy makers should join efforts to create a new generation of evidence-based national, European and transcontinental (All Atlantic) public policies**, given the data originated from the assessment and forecasting of environmental and socio-economic impacts of the interaction between ocean circulation, microbiomes and plastics. It is up to these policies to have an anticipatory and preventive content. This is the only way to predict future impacts and mitigate potential risks, either in the marine environment or in the socioeconomic context of people who depend on the sea for the development of their economic activities.*

Policy brief: [Nourishing Blue Economy and Sharing Ocean Knowledge - Ocean information for sustainable development](#), 15 October 2021. DOI 10.5281/zenodo.5576120



AA-Data2030 nurtures a fundamental mind-set shift, by promoting a collaborative attitude that derives from the understanding that there is an individual interest in contributing to the protection of a common good: the Atlantic Ocean. All tools exist, but the inner sentiment that we will only reach our common goal together must be interiorised.

The challenge lies in the diversity of the countries involved! They differ in terms of culture, economic situation and prospects, a framework that supports scientific activities, and the maturity of their research data infrastructure. This diversity means that countries will reach the shared goals defining the All-Atlantic Data Space at their own pace. This, however, may require increased support for some countries, but also the equitable sharing of knowledge and learning between different Atlantic regions, as each of the regions important and valuable lessons to share.

Recommendation for EU marine data services All Atlantic and global ocean data space:

Regional marine data services provide a vital resource for the UN Ocean Decade, offering integrated and standardised marine data, information and knowledge that underpins evidence-based ocean governance, conservation and management, scientific research, operations at sea and more. However, such data services are fully dependent on the data collection and data sharing efforts of ocean observation, marine monitoring and wider data collection initiatives. The EU marine data services EMODnet and Copernicus Marine Service and the wider community call upon all stakeholders to:

1 - increase efforts to coordinate data collection e.g., in Europe through the European Ocean Observing system (EOOS);

2 - increase the sharing of data (in situ observations e.g., marine environmental, human activity, other) with national, regional e.g., EMODnet, Copernicus Marine Service, and international data services;

3 - build upon existing partnerships to expand the cross-regional dialogue to share best practices, know-how and work towards a global community of connected and interoperable regional marine data services, to serve the All-Atlantic and Global Ocean Data Spaces.

Such efforts are the foundation for a future interoperable EU marine data space, All-Atlantic Data Enterprise 2030 and Global Ocean Data Ecosystem that can offer user-friendly transparent and accessible ocean data, information and knowledge for the benefit of all.

[EU marine data services for the All-Atlantic and Global Ocean Data Spaces](#) Webinar 11 May 2022, co-organised by EMODnet and Copernicus Marine Service, with the support of the European Commission in the framework of AANCHOR. Satellite activity of the Ocean Decade Laboratory [“An Accessible Ocean”, 10 – 12 May 2022.](#)

WAY FORWARD:

Presentation of AA-Data2030 vision in Washington, to be included in the “All-Atlantic Ocean Research & Innovation Alliance Declaration”.



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