United Nations
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Non-paper on existing and potential contributions of IOC-UNESCO to the BBNJ process

September 2020

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Non-Paper on existing and potential future services of the IOC-UNESCO in support of a future ILBI for the conservation and sustainable use of biodiversity beyond national jurisdiction (BBNJ)

September 2020

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LIST OF ACRONYMS

ABMT	Area-based management tools
ABNJ	Areas beyond national jurisdiction
ADU	Associate Data Unit
BBNJ	Biodiversity beyond national jurisdiction
CBTMT	Capacity building and transfer of marine technology
ClHM	Clearing House Mechanism
EIA	Environmental impact assessment
EOV	Essential ocean variable
FAO	Food and Agriculture Organization of the United Nations
GOOS	Global Ocean Observing System
GOSR	Global Ocean Science Report
HAB	Harmful algal bloom
IGC-4	Fourth Session of the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction
IGO	Intergovernmental Organization
ILBI	International legally binding instrument
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
ISA	International Seabed Authority
LDC	Least developed country
LME	Large marine ecosystem
MGR	Marine genetic resources
MPA	Marine protected area
MSP	Marine / maritime spatial planning
OBIS	Ocean Biodiversity Information System
ODIS	Ocean Data & Information System
ODISCat	ODIS Catalogue of Sources
OTGA	OceanTeacher Global Academy
RTRC	Regional Training & Research Centre
SDG	Sustainable Development Goal
SIDS	Small Island Developing State
TMT	Transfer of marine technology
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific & Cultural Organization

KEY MESSAGES OF THE NON-PAPER

1. The success of the new ILBI for BBNJ will be strongly dependent on ocean scintific knowledge and services including information and data, and capacity building and transfer of marine technology (CBTMT).

2. IOC is currently providing important ocean science services relevant to the future ILBI. IOC's existing services related to observations, scientific knowledge, access to data & information, CBTMT, and area-based management will support a future ILBI.

3. IOC is developing a Clearing House Mechanism that could house existing and expanded services from IOC and partners. The CIHM and other existing IOC services could be adapted and/or expanded to provide additonal essential services directly related to the four principal issues identified in the UNGA Resolution 72/249 on the BBNJ process.

4. Significant investments have been made in existing services and it would be cost effective to build on the foundation that exists. Incremental costs to adapt or create expanded services would be significantly less than starting from scratch.

5. An expanded CIHM and other IOC services would facilitate esssential collaboration. Collaboration across the UN system, including with ISA and IMO, and beyond the UN system will be essential for the implementation of the ILBI.

6. The UN Decade of Ocean Science for Sustainable Development represents a unique opportunity to support the BBNJ process. The Ocean Decade provides a framework for significant investment in knowledge generation, CBTMT, and data and knowledge management initiatives that align with the piorities of the BBNJ process.

INTRODUCTION

The Intergovernmental Oceanographic Com-mission (IOC) of UNESCO aims to promote international cooperation and to coordinate programmes in research, services and capacity building. It strives to do this to increase knowledge on the nature and resources of the ocean and coastal areas, and to apply that knowledge for the improvement of management, sustainable development, protection of the marine environment, and the decision-making processes of its 150 Member States. Headquartered in UNESCO in Paris, IOC has regional Sub-commissions, Programme Offices and Project Offices located in the Caribbean, Africa, Europe, Western Pacific, and Eastern Indian Ocean regions.

IOC, established in 1960, is recognised through the United Nations Convention on the Law of the Sea (UNCLOS) as a competent international organization in the fields of Marine Scientific Research (Part XIII) and Transfer of Marine Technology (TMT) (Part XIV). According to its Statutes, the IOC may also act as a joint specialized mechanism of the organizations of the United Nations system that have agreed to use the IOC for discharging certain of their responsibilities in the fields of marine sciences and ocean services.

OBJECTIVES OF THE NON-PAPER

Given its unique role within the UN system and its current suite of services and activities related to ocean science, including capacity building and transfer of marine technology (CBTMT), the IOC could play an important role in the implementation of a future International Legally Binding Instrument (ILBI) for the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ). The potential to make a strong contribution to the BBNJ process was recognised early on by IOC Member States. Since 2015, the IOC Governing Bodies (Assembly and Executive Council) have included a recurrent agenda item on the BBNJ process and adopted decisions supporting the active participation of IOC and its Member States in BBNJ meetings (BBNJ Preparatory Committee and the Intergovernmental Conference sessions since 2018).

With the progress of the BBNJ negotiation process, the scientific services that will potentially be required to support the implementation of the ILBI are becoming clearer. The President's revised draft text of the ILBI (November 2019)[1] that will be considered in the Fourth Session of the Intergovernmental Conference (IGC-4) reinforces the central role of a Clearing-House Mechanism (ClHM) in the agreement, and identifies IOC as a potential manager of the CIHM in association with relevant organizations including the International Seabed Authority (ISA) and the International Maritime Organization (IMO). The President's note introducing the draft text also recalls the four principal topics that were identified in UNGA Resolution 72/249 for negotiations to develop an ILBI namely: (i) marine genetic resources (MGR), including questions on the sharing of benefits; (ii) measures such as area-based management tools (ABMT), including marine protected areas; (iii) environmental impact assessments (EIA); and (iv) capacity-building and the transfer of marine technology (CBTMT).

The IOC has prepared this non-paper for the information of interested participants in the negotiation process. The non-paper has the following objectives:

(i) To describe IOC's existing services of relevance to the implementation of a future ILBI (refer Section 2).

(ii) To identify the potential additional services, including an expanded ClHM that could be developed within IOC to support a future ILBI based on the current draft text (refer Section 3).

(iii) To present an analysis of the potential contribution of the UN Decade of Ocean Science for Sustainable Development (the "Ocean Decade") to the BBNJ process (refer Section 4).

1 United Nations General Assembly (2019) A/CONF.232/2020/3: Revised draft text of an agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction. A Note by the President.

IOC'S EXISTING SERVICES RELEVANT TO THE BBNJ PROCESS

This section provides an overview of the existing IOC ocean science services and is structured around the four key issues of the BBNJ negotiation process, namely:

- CBTMT, including data and information (Part V of the draft ILBI text)
- Marine genetic resources (Part II of the draft ILBI text)
- Area-based management tools (Part III of the draft ILBI text)
- Environmental impact assessments and strategic environmental assessments (Part IV of the draft ILBI text)

This section concludes with a discussion on how these services are being connected via the development of a Clearing House Mechanism (ClHM) which is referenced in Article 51 of the draft ILBI text.

Services related to CBTMT, including data & information[2]

Figure 1 illustrates the range of existing IOC services related to CBTMT. Note that data and information are included as categories of marine technology in keeping with accepted terminology and the proposed definition in the draft negotiation text for BBNJ.

As a general note, in 2004 the IOC published the *Criteria and Guidelines on the Transfer of Marine Technology*, a document cited in several UNGA resolutions, in the Rio+20 document 'The Future We Want', and explicitly referenced in SDG goal 14.a, as well as in the current President's revised draft of the ILBI of November 2019. These criteria and guidelines were developed in direct response to Article 271 of UNCLOS, with the aim of supporting the implementation of Part XIV of UNCLOS. The Guidelines identify a special responsibility for IOC in facilitating the transfer of marine technology and recommend that IOC establish a clearing house mechanism for the transfer of marine technology, to link recipient and donor States.

Access to data through online data sharing platforms

The International Oceanographic Data and Information Exchange (IODE) established by IOC in 1961, facilitates the exchange of oceanographic data and information between participating Member States. The IODE is structured around a global community of national data centres, each established and maintained by IOC Member States. There are 65 data centres that, together with 30 Associate Data Units (ADUs), collect, quality control, and archive millions of ocean observations related to physical, chemical and biological data, and make them available to Member States. In addition, a diverse range of IODE programs and projects have created data centres and infrastructure including the

2 While the IOC and many other United Nations agencies use the term "capacity development" in their daily operations, in this document the term "capacity-building" is employed in order to be consistent with the language in the draft text of the ILBI on BBNJ. IOC Criteria and Guidelines on the Transfer of Marine Technology, 2005. (IOC/INF-1203)

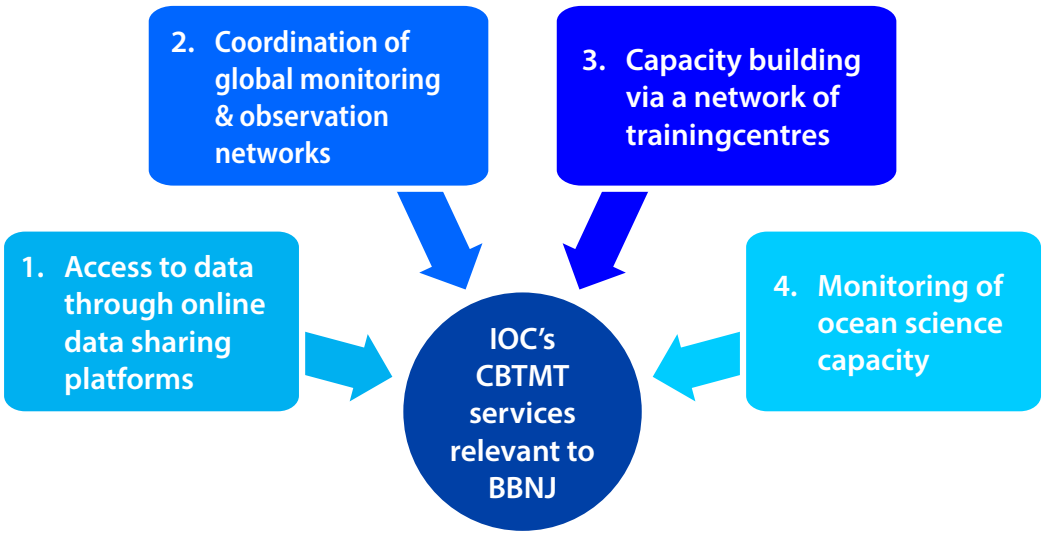


Figure 1: *IOC CBTMT services relevant to BBNJ*

World Ocean Database (WOD), the Global Oceanographic Data Archaeology and Rescue (GODAR), the Global Temperature and Salinity Profile Programme (GTSPP), the Underwater Sea Surface Salinity Data Archiving Project (GOSUD), the International Quality Controlled Ocean Database (IQuOD), the Ocean Biodiversity Information System (OBIS), OceanExpert, Ocean Data Portal (ODP), OceanDocs, the OceanBestPractices System (OBPS) and the OceanTeacher e-learning platform.

The Ocean Data and Information System (ODIS), currently under development, will be an e-environment where users can discover data, data products, data services, information, information products and services provided by Member States and other partners. ODIS will combine projects and systems associated with IODE and other relevant platforms under a larger architectural construct as part of a broad "ocean knowledge" system. One of the ODIS objectives is to foster greater collaboration within the marine community, including scientists, governments, IOC global and regional programmes, IODE Data Centres and ADUs, IGOs, NGOs and ocean industry. As a first step, the ODIS Catalogue of Sources (ODISCat) – an annotated catalogue of online resources serving ocean-related data and information products, has been operationalised.

The General Bathymetric Chart of the Oceans (GEBCO) provides the most authoritative publicly available bathymetry of the world's ocean. It operates under the joint auspices of the International Hydrographic Organization (IHO) and the IOC. GEBCO produces and makes available a range of bathymetric datasets and products including a global bathymetric grid, *a Gazetteer of Undersea Feature Names*, a Web Map Service, and printable maps of ocean bathymetry. Under the umbrella of GEBCO and with the support of the Nippon Foundation, the major project 'Seabed 2030' aims to cooperatively work towards mapping 100% of the topography of the ocean floor by 2030.

The Ocean Biodiversity Information System (OBIS) is a global alliance that maximizes the cooperation of governments and scientific institutions to facilitate free and open access to, and application of, biodiversity and biogeographic data and information on marine life. Currently, more than 30 OBIS nodes around the world connect 1000 institutions from 60 countries. OBIS integrates and quality controls over 60 million observations of over

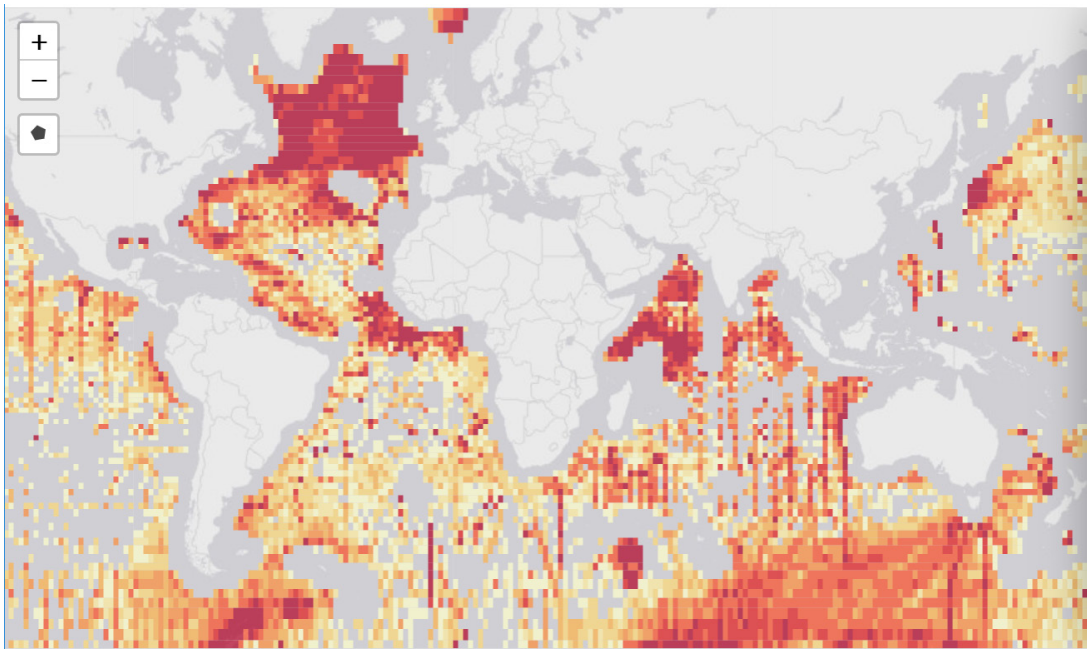


***Figure 2:** Distribution of OBIS records for ABNJ - https://mapper.obis.org/?areaid=1.*

In OBIS only a small fraction of the datasets and species are exclusively from ABNJ (3% and 4% respectively) and a substantial amount of datasets and species cross the outer EEZ boundary (26% and 16% respectively), and are thus not unique to ABNJ. This integrated view is accessible via https://obis.org/area/1, and downloadable via the OBIS mapper

120,000 marine species integrated from 3000 datasets. It provides free-access to those data by species name, higher taxonomic level, geographic area, depth, time and environmental parameters. OBIS includes a deep-sea node that provides a single integrated access point to high-quality data and information on the diversity, abundance and distribution of all deep-sea organisms and their ecosystem properties, including habitat and environmental characteristics. For ABNJ, OBIS currently holds 4 million observation records of 25,000 marine species, sourced from 877 different datasets **(refer Figure 2)**.

Because many species occur in both ABNJ as well as in areas within national jurisdiction, OBIS has an important role in characterizing, studying, understanding and informing management of biodiversity of the whole ocean system, bringing cohesion across institutional, disciplinary and ecosystem silos. OBIS also contributes to a concerted global approach to marine biodiversity and ecosystem monitoring through guidelines on standards and best practices.

Coordination of global monitoring and observation networks

The Global Ocean Observing System (GOOS) which is co-sponsored by IOC (lead agency), the World Meteorological Organization, the International Science Council and the United Nations Environment Programme, is a sustained collaborative system of ocean observations, encompassing in situ networks and satellite systems managed by governments, UN agencies, and research institutes. Created in 1991, GOOS provides continuous and long-term ocean observations

around climate, operational services and marine ecosystem health in order to contribute to sustainable development, safety, wellbeing and prosperity. GOOS has convened expert panels to develop specifications for Essential Ocean Variables (EOVs) including a Biological and Ecosystems EOV Panel that, working in collaboration with OBIS, focuses on the living ocean and its central role in human life.

The Harmful Algae Bloom Programme aims to foster and promote co-operative research to improve the understanding and prediction of harmful algal bloom (HAB) events including knowledge to manage and mitigate the impacts of HABs in the context of climate change. The Programme addresses the scientific and societal challenges of harmful algal blooms through the application of advanced and cost-effective technologies, training and capacity building, and curates information about harmful algal events and species in the Harmful Algal Information System (HAIS).

IOC also plays a lead role in the coordination of several programmes responsible for monitoring and studying ocean acidification and its effects. IOC houses part of the Secretariat of the Global Ocean Acidification Observing Network (GOA-ON). This network aims to improve the understanding and measurement of global ocean acidification and its effects on the ocean and manages an ocean acidification data portal.

IOC coordinates the Global Ocean Oxygen Network (GO_2NE) that aims to provide a global and multidisciplinary view of deoxygenation, with a focus on understanding its multiple aspects and impacts. Its activities include communication with other established networks and working groups (e.g. IOCCP, GOOS, IGMETS, GOA-ON, GlobalHAB, WESTPAC O2NE), improving observations systems, identifying and filling knowledge gaps, as well as developing related capacity development activities.

Capacity building via a network of training centres

IOC's approach to capacity building is documented in the IOC Capacity Development Strategy 2015–2021. Specific initiatives that are of direct relevance to BBNJ are as follows.

The OceanTeacher Global Academy (OTGA) aims at building capacity related to ocean research, observations and services in IOC Member States with a focus on least developed countries (LDCs) and Small Island Developing States (SIDS). The OTGA comprises a global network of Regional Training Centres and aims to optimise the use of technical capacity already existing in the regions where the centres are located. The OTGA project has successfully delivered over 220 courses and instructed over 3,000 learners from 130 countries and the OceanTeacher e-Learning Platform has currently more than 6,500 registered users globally. The second phase of OTGA (OTGA-2) is now underway and will include the establishment of new centres as well as new initiatives to support the 2030 Agenda and its SDGs and the implementation of the UN Decade of Ocean Science for Sustainable Development. A strong focus will be given to the use of the OceanTeacher e-Learning Platform, enabling all those interested to learn anytime, anywhere. Course materials from OTGA are made available through IODE.

The IOC regional network of Research Training and Research Centres (RTRCs) was initiated in 2008 by IOC Member States in the Western Pacific region. It aims to improve national and regional capacity on marine science through the establishment of RTRCs in national oceanographic institutes or universities, and regular provision of training and research opportunities to young scientists mainly from developing countries. There are currently five operational training and research centres in the network: (i) Regional Training and Research

Centre on Ocean Dynamics and Climate in the First Institute of Oceanography, China; (ii) Regional Training and Research Centre on Marine Biodiversity and Ecosystem Health in the Indonesian Institute of Sciences; (iii) Reef Management and Restoration in the University of the Philippines; (iv) Marine Toxins and Food Security in the Institute of Oceanography, Vietnam Academy of Science and Technology; and (v) Plastic Marine Debris and Microplastics in the East China Normal University.

Monitoring of Ocean Science Capacity

The Global Ocean Science Report (GOSR) assesses the status, trends and gaps in ocean science capacity at the national, regional and global scales, including human and technical resources and capacity. The GOSR identifies and quantifies the key elements of ocean science, providing a resource for policymakers, academics and other stakeholders seeking to harness the potential of ocean science and to advance international collaboration in ocean science and technology. The 2020 version of the GOSR will be part of a transformative process to develop the required human and technical capacity in ocean science in the context of the United Nations Decade of Ocean Science for Sustainable Development, in order to contribute to the 2030 Agenda at large, and SDG14 in particular.

Services related to marine genetic resources

IOC provides access to marine genetic resource (MGR) related data and information, notably through the uploading of data from genomic studies into OBIS. A new initiative titled Pacific Islands Marine Bioinvasions Alert Network (PacMAN) will address a sub-set of issues around marine genetic resources and bioinvasions over the next three years. This initiative aims to increase capacity of Member States to: (i) use international standards and best practices to detect marine invasive species with novel technologies (e.g. DNA metabarcoding); (ii) develop and operationalise marine invasive species early warning systems, based on real-time detections, distribution pathways and habitat suitability models; and (iii) communicate and use the information from the marine invasive species early warning system to implement national and international policy responses. This project will expand the capabilities of OBIS in dealing with 'omics[3] data, and will generate best practices on the sharing of marine genetic resources for research, conservation and environmental monitoring, including for access and benefit-sharing and CBTMT, and will be an important show-case to inform the BBNJ process.

Services related to area-based management tools

In 2017, IOC and the European Commission developed a Joint Maritime/Marine Spatial Planning (MSP) Roadmap to accelerate MSP processes worldwide. The MSPglobal Initiative, which is coordinated by IOC, addresses the following priority actions of the MSP Roadmap: (i) transboundary MSP processes; (ii) sustainable blue economy; (iii) ecosystem-based MSP processes; and (iv) capacity building. MSPglobal provides technical assistance in MSP to Governments and encourages multi-sectoral and transboundary approaches to ocean management by facilitating multi-stakeholder participation towards sustainable blue economy strategies. While currently focused primarily on waters within national jurisdictions, there is scope

3 omics refers to a field of study in biology ending in -omics, such as genomics, proteomics or metabolomics.

to draw on expertise developed during this initiative - both in terms of technical expertise as well as experience in capacity development and communications - to develop MSP approaches for ABNJ that could contribute to the implementation of ABMT. An MSP Forum was created as part of the initiative to build mutual understanding and improve global communication around MSP.

IOC houses the Project Coordination Unit for the GEF funded International Waters Learning Exchange and Resource Network (IW:LEARN) programme that works with the managers of large marine ecosystem (LME) projects. LMEs are relatively large areas of ocean space of 200,000 km^2 or more that are characterised by their unique undersea topography, current and water mass structure, marine productivity, and food chain interactions. Globally, 66 large marine ecosystems (LMEs) cover nearly 25% of the world's oceans and are important mechanisms for the management and coordination of the world's most productive nearshore marine ecosystems. The IW:LEARN programme is working to improve global ecosystem-based governance of LMEs and their coasts by generating and sharing data and knowledge, building capacity, harnessing public and private partners and supporting south-to-south and north-to-south learning and exchanges. Because LMEs are typically transboundary and can extend beyond national jurisdiction, they may provide useful pilot projects for implementation of transboundary management under the ILBI.

Services related to environmental impact assessments

Scientific observation data that are standardized and made accessible through IODE systems, from global monitoring and observation networks coordinated by IOC and from the GOSR are used in environmental impact assessments and other highly influential scientific assessments across the global ocean. Data from OBIS and the World Ocean Database along with other data assets from the IODE network of National Oceanographic Data Centres provide a reliable and trustworthy source of data for EIA processes including within ABNJ.

Bringing the services together through development of a Clearing-House Mechanism

As a central part of the recently initiated Ocean InfoHub project, IOC is developing a ClHM whose primary purpose is to provide Member States and other partners with direct and rapid access to relevant sources of data, information, data products and services, and practical expertise in the transfer of marine technology. The Ocean InfoHub ClHM also aims to facilitate effective scientific, technical and financial cooperation. The architecture and the different elements of the this ClHM are being built with the flexibility in mind to address the needs of a future ILBI for BBNJ including to support the work of any new bodies to be set up by the instrument (i.e. Decision Body and Scientific Technical Body) **(refer Box 1)**.

The Ocean InfoHub ClHM will provide an openly accessible web-based platform that is designed to network stakeholders according to their interests, needs, and capacities in a transparent manner. This ClHM is one of data, information, and knowledge – meaning that it is not just a passive computer system but rather a proactive network of people who provide input into the ongoing development in an agile way with scientists who contribute to and use data and information on biodiversity in many creative ways and in response to national and regional needs identified by stakeholders and end-users.

Box 1:

Clearing House Mechanism Elements identified in the draft ILBI for BBNJ

Article 51 of the draft ILBI text identifies the suggested elements of a ClHM to serve the ILBI. While it is anticipated that the specific modalities of operation will be identified by a decision-making body such as the Conference of the Parties, the text gives an indication of the specific services that the ClHM might provide. While some text is still bracketed, and thus unresolved, it is possible to anticipate that the ClHM would serve as a centralized platform to enable access to data and information on: (i) activities and scientific knowledge related to marine genetic resources (MGR) of areas beyond national jurisdiction; (ii) sharing of monetary and non-monetary benefits; (iii) environmental impact assessments (EIA); (iv) opportunities for CBTMT; and (v) research collaboration and training opportunities. The draft text also states that the ClHM should provide a matchmaking service to link supply and demand, promote linkages to other existing ClHMs and data platforms, and recognise the specific circumstances of SIDS.

Content available through the Ocean InfoHub ClHM will be structured around ODISCat and will include IOC-coordinated data and observations sources and CBTMT resources discussed in the previous sections, as well as significant non-IOC resources. Designated member state experts, regional and international organizations (UN and others) will provide these additional data sources. Based on principles of interoperability between distributed resources, the initiative will support interlinkages with existing clearing-house mechanisms operating across temporal and spatial scales including private sector and NGO resources. In order to test the concept of the Ocean InfoHub ClHM as an entry point to data and information, a first prototype was developed within the framework of the Caribbean Marine Atlas (Phase 2) project.

The Ocean InfoHub ClHM will have an important matchmaking function. A key characteristic of this ClHM in comparison with a data portal is the presence of a human-brokerage function whose objective is to match demand and supply for example in relation to CBTMT or specific data and information requests.

Collectively, the Ocean InfoHub ClHM's features are geared to support users with easy access to data, information and knowledge resources, but also the ability to establish regional "views" of content to tailor user experience to local needs. The ClHM has a specific focus on users in SIDS and LDCs, including landlocked developing states, many of which have not been able to establish or develop their own capabilities in marine science and related technology and infrastructure.

The Ocean InfoHub ClHM will facilitate the transfer of valuable insight from groups that are typically seen as only recipients of data, information, and knowledge products. The ClHM will implement technologies to allow indigenous and local knowledge holders to transfer their knowledge such that it will influence networked information systems. The ClHM will seek out and welcome partners who can contribute this kind of information, acknowledging and respecting indigenous ownership rights.

The Ocean InfoHub ClHM will also focus on early career scientists, prioritizing the transfer of content types of special use to

them (e.g. travel/study grants, training and education opportunities, mentoring) as well as encouraging them to contribute content.

Finally, attention will be given to remedying gender disparity by enhanced focus on opportunities for women and girls. Leveraged activities in training, internships and mentoring initiatives will promote and encourage participation of women, particularly in scientific and technical disciplines and careers where women are currently underrepresented.

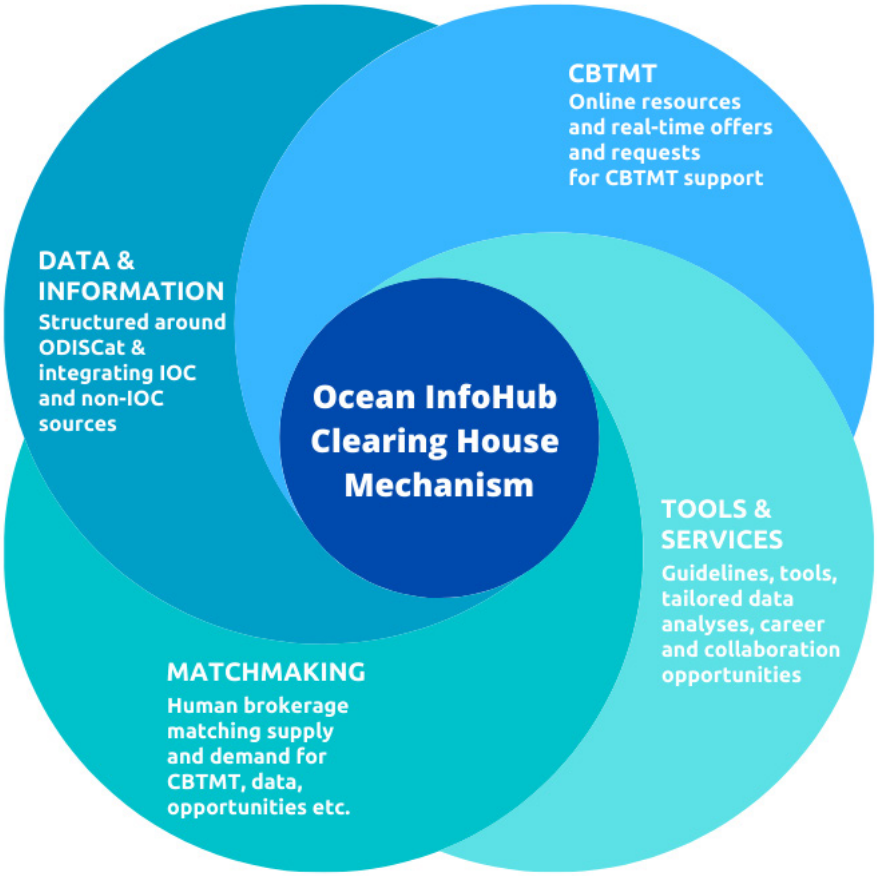


Figure 3: *Elements of Ocean InfoHub Clearing House Mechanism*

POTENTIAL NEW IOC SERVICES TO SUPPORT A FUTURE ILBI FOR BBNJ

UNCLOS recognises IOC as a competent international organization in the fields of marine scientific research, and transfer of marine technology. Through its data and information, capacity development, ocean science and observations, and MSP/LME programmes, IOC coordinates a broad portfolio of collaborative data, information and knowledge infrastructure. The previous sections have demonstrated the breadth of the existing IOC services that could contribute to the implementation of a future ILBI for BBNJ. This section identifies adapted, expanded or new services that IOC could develop – either alone or in partnership – to increase its contribution to the implementation of a future ILBI. An expanded ClHM, building on the work commenced to develop the Ocean InfoHub ClHM, would be central to the delivery of these services. The ability of IOC to develop and deliver these services is enabled by its unique position with the global community and its proven capability to convene the scientific, ocean regulatory, and philanthropic communities toward problem solving and capacity development.

Services to support CBTMT, including data & information

Improving ocean scientific data and information to support the implementation of the BBNJ agreement

Better scientific knowledge of poorly known deep-sea ABNJ, including the (meso) pelagic, is vital for their conservation and sustainable use, and thus for the implementation of a future ILBI. There are still major gaps in our understanding of the deep sea and open ocean, and of the biodiversity present in these areas. Even where data is available, it is often fragmented and discovering existing data and making it openly accessible through global databases remains a challenge. There is thus a need for ongoing collaboration both to improve the scientific data and information available for ABNJ, and to make data widely available in a timely fashion for instance via a ClHM.

GOOS has long been a driver for initiating, coordinating and globalizing ocean observations. GOOS already provides extensive information about ocean physics, climate, and biochemistry, globally-coordinated observation but monitoring of marine biodiversity still requires further development. There are ongoing collaborative efforts under the GOOS Biology and Ecosystems Panel (GOOS BioEco) and the Marine Biodiversity Observation Network (MBON) of the Group on Earth Observations to address global ocean biodiversity monitoring, including through the development of biological and ecosystem EOVs, but these efforts require further support. Of particular importance for the BBNJ process is the incorporation of deep sea and microbial ocean observation into the biological EOVs.

The next generation of ocean observation will build on existing efforts, but bring in new technologies and innovation through advances in artificial intelligence and machine learning, which can drive increasingly rapid

and consistent classification and processing of underwater imagery and marine fauna especially in the deep ocean. Advanced methods in 'omics and environmental DNA will help monitor species and populations, while miniature genomic processors attached to autonomous vehicles will be able to sequence DNA remotely. All of this will lead to massive increase in information.

Making this information available and accessible in a meaningful format to support a future BBNJ agreement will be challenging and will involve building on existing databases, making them interoperable with other relevant databases, improving global standards and best practices, and packaging data into products that address the needs of the user community.

Building on the ongoing work of GOOS, including the Deep Ocean Observation Strategy, OBIS – including the OBIS Deep-sea node, as well as established collaborations with the International Seabed Authority and the International Maritime Organization and with existing global networks such as INDEEP and the Deep-Ocean Stewardship Initiative (DOSI), IOC can facilitate improved availability and access to ABNJ biodiversity data. Specifically, IOC together with partners, could undertake the following tasks:

Facilitating ongoing ABNJ observation, monitoring and scientific research

- **Facilitating biological ocean observation and monitoring in the long term, including in ABNJ,** building on work already done by OBIS, the GOOS BioEco and the Marine Biodiversity Observation Network (MBON) towards the development of biological EOVs. To fully serve a future BBNJ agreement, it is important that the biological EOVs include plankton, microbes, fish, marine mammals, birds and turtles, deep-sea corals and other deep-sea biodiversity in collaboration with the Deep Ocean Observing Strategy (DOOS).
- **Identifying gaps in currently accessible ABNJ-related data**, and working with global scientific networks to fill these gaps. This may include addressing geographic gaps and taxonomic gaps, including data relating to the deep-sea and to microbial diversity.
- **Facilitating the use of international data standards and best practices,** including a repository of best practices to support both biodiversity research and governance for BBNJ (cf. IODE/GOOS Ocean Best Practices System).

Facilitating data discovery, interoperability and open access to data via an expanded version of the Ocean InfoHub ClHM

- **Facilitating discovery of ABNJ biodiversity data that has not yet been incorporated into OBIS or other related databases**, undertaking quality control, and making these data accessible. This could be done in collaboration with the ISA and regional and national OBIS nodes as well as the deep-sea scientific community at large.
- **Improving interoperability of existing databases of relevance to ABNJ** to enable access to a variety of data. The existing databases may include OBIS, ISA's DeepData, World Register of Marine Species (WoRMS), Global Biodiversity Information Facility (GBIF) and the Sequence Read Archives under the International Nucleotide Sequence Database Collaboration (INSDC), as well as other relevant global, regional and sub-regional databases. Networks such as the Global Genome Biodiversity Network (GGBN), the Global Omics

Observatory Network (GLOMICON), the Genomic Standards Consortium (GSC) and the Genomic Observatories (GOs) Network in collaboration with IODE and its OBIS can play a central role here.

- **Improving access to socio-economic data relating to ABNJ,** including human uses of the ocean. This could be undertaken in collaboration with partners including the FAO, IMO, ISA, the private sector and other agencies that hold relevant data and information.
- **Making available published scientific research papers and reports of relevance to ABNJ**. This could be done, for example, through the IODE OceanDocs (https://www.oceandocs.org/) linked to the ODIS Catalogue of Sources.
- **Improving the ability to visualize and produce maps via tools** overlaying different types of data through an online GIS system. For example, an online GIS that builds on the OBISMapper (https://mapper.obis.org/) could enable viewing and overlaying biological data with human use data in order to support management decisions.
- **Regularly including in the Global Ocean Science Report (GOSR) information of relevance to the BBNJ agreement and reporting such data**. Future iterations of the GOSR can provide updated information about the status and trends of science and science capacity as it relates to deep-sea research, including the (meso)pelagic. The GOSR can become an important tool for taking stock of national, regional and global ocean science capacity for fulfilling obligations relevant to the BBNJ agreement, and as a result, also provide an analysis of gaps in science and scientific capacity that will need to be addressed.

Capacity building and transfer of technology to support BBNJ

Capacity building and the transfer of technology (CBTMT) will be essential elements of the enabling framework of a future BBNJ agreement. CBTMT initiatives will ensure that all countries can participate in implementing the provisions of an agreement and have equitable access to benefits generated through implementation of the agreement. CBTMT is also one of the key services that IOC can provide for the BBNJ agreement. Building on its existing services, IOC could provide or facilitate the following new services:

Facilitating ABNJ related capacity building and technology transfer

- **Providing distance-learning, blended and face-to-face courses on ABNJ-relevant topics through OTGA**. Themes of relevance might include legal and policy-related topics on UNCLOS and the BBNJ agreement; topics related to ocean science in ABNJ in collaboration with OBIS and GOOS; and ABNJ literacy courses for teachers and the public. It should be noted that UN DOALOS is already using OTGA for training courses in legal aspects of marine scientific research. Other courses could be developed around topics of specific relevance to MGRs, ABMT and EIA and are discussed further below.
- **Expanding on the WESTPAC model of a regional network of Training and Research Centres on Marine Science**, both within the Western Pacific region and in other regions, in support to UNCLOS, Part XIV,

Article 276. In the WESTPAC region, RTRCs could incorporate further topics of relevance to the BBNJ agreement, such as the ABMTs, utilizing existing regional scientific capacity in deep-sea research. In other regions, similar networks could be developed based on existing institutions, as well as regional priorities and needs.

- **Making available information about research collaborations including planned research cruises in ABNJ via an expanded version of the Ocean InfoHub ClHM**, as a means of providing support to the professional development of early career ocean scientists and scientists from LDCs or SIDS with traditionally less access to research vessels.

- **Developing a specific BBNJ node for CBTMT in an expanded version of the Ocean InfoHub ClHM** to collate CBTMT offers and requests related to BBNJ and ABNJ, and to facilitate matchmaking of supply and demand.

- **Building on the OceanExpert network, creating networks of practitioners on different ABNJ-relevant topics and facilitating access to these networks via an expanded version of the Ocean InfoHub ClHM.** This could include networks for MGR, ABMT and EIA practitioners as well as networks of legal/policy practitioners in collaboration with UN DOALOS, networks of social scientists, and networks of marine scientists and taxonomists working in ABNJ. In each case, social media or web-based platforms could be used to facilitate communication. Each community might develop its own best practices and guidance on their topics of expertise.

Facilitating specific MGR-related capacity building and technology transfer

- **Providing capacity building, including hands-on training courses, relating to MGRs**. The OTGA could coordinate the development of training materials for both e-learning and (regional) face-to-face training on topics relevant to MGRs, ranging from the science of MGRs, to 'omics applications and bio discovery. WESTPAC RTRCs could provide hands on trainings on conventional and molecular analysis for marine biodiversity (DNA and e-DNA).

- **Developing a human network of MGR practitioners** that can provide support and dialogue for colleagues working in various MGR-related fields. A human network would allow exchange of experience and best practices, and allow members to use online platforms to address questions on relevant topics (e.g. webinars).

Facilitating specific ABMT-related capacity building and technology transfer

- **Undertaking capacity building, including training courses, relating to MSP in ABNJ** and in situations where MSP straddles jurisdictions. The IOC is well positioned to draw on the experiences of the MSPglobal Initiative and additional pilot projects to develop training materials for both e-learning and regional face-to-face training on this topic.

- **Developing a human network of MSP practitioners and facilitating access via an expanded version of the Ocean InfoHub ClHM** that can provide support and dialogue for colleagues working on similar issues. The human network could build on the efforts of

MSP Forum and provide a venue for MSP-related discussion related to ABNJ, and an avenue for practitioners to collaborate and exchange experiences on specific MSP-related topics.

Facilitating specific EIA-related capacity building and technology transfer

- **Developing EIA specific training courses** as part of the OTGA, including e-learning and face-to-face courses. Training courses would include collecting appropriate data and information for environmental impact assessments; the conduct of and evaluation of EIA in ABNJ and in areas straddling jurisdictions; incorporating cumulative and transboundary impacts into EIA; undertaking monitoring and enforcement of EIA; and incorporating climate change impacts into EIA

Services to support marine genetic resources

The biological diversity of the ocean is a source of novel genes and natural products with applications in medicine, food, materials and energy, and across a wide array of bio-based industries. Marine genetic resources (MGRs) have generated commercial interest, but access to them, particularly from ABNJ, remains highly uneven across nations. Marine microbes are often the focus for bioprospecting activities, and represent the majority of patent applications from ABNJ. Furthering the interest in MGRs are emerging 'omics techniques, which are facilitating the rapid discovery and characterization of previously obscure microorganisms.

While marine bio discovery, including in relation to pharmaceuticals, enzymes and cosmetics, remains the focus of many countries' aspirations in regards to MGRs, there are also other MGR-based 'omics applications that are transformative in their ability to contribute to advancing sustainable blue economies. MGR-based omics tools can be used across fisheries management, aquaculture development, food and water safety, species and habitat conservation, seafood consumer protection, and natural products discovery. IOC is already exploring these tools as part of the Pacific Islands Marine Bioinvasions Alert Network (PacMAN) described in the previous section.

In the context of these new developments, it is expected that IOC can provide a number of new services ranging from improving available data and information relating to MGRs and their commercial use to initiatives relating to the role that 'omics tools could play in developing national blue economies. Specifically, IOC could facilitate the following new services:

Improving available data and information relevant to MGRs via an expanded version of the Ocean InfoHub ClHM

- **Improving available data and information on marine genetic resources**, including through collaboration between OBIS and other repositories such as the Sequence Read Archives under the International Nucleotide Sequence Database Collaboration (e.g. GenBANK), WoRMS, GBIF and ISA's DeepData.

- **Creating greater interoperability between databases of importance to MGRs (OBIS, GenBANK etc.)** through initiatives such as the Global Genome Biodiversity Network (GGBN), the Global Omics Observatory Network (GLOMICON), the Genomic Standards Consortium (GSC) and the Genomic Observatories (GOs) Network.

- **Making available information on patents that relate to MGRs sourced from ABNJ** by combining OBIS data with information from the World Intellectual Property Organization (WIPO) patent database. This will allow the tracking of commercial interest as it relates to MGRs sourced from ABNJ.

Developing new MGR-based 'omics applications and pilot projects

- **Expanding or adapting the Pacific Islands Marine Bioinvasions Alert Network (PacMAN) initiative to other areas of the world** depending on interest and need in other regions.
- **Collaborating with regional and SIDS organizations and other partners to develop additional 'omics applications that meet user needs**. These applications may include, for example, detection of harmful algal blooms (building on the Harmful Algal Bloom Programme), sustainable fisheries management, and advancing natural products discovery.

Services to support area based management tools

Application of area based management tools (ABMTs) depends on knowledge of the marine biodiversity, including species, habitats and, where possible, genetic diversity present in a given area. Their design is also reliant on information on species connectivity, as well as the vulnerability of species to external stressors, including climate change. In addition, information relating to human uses and other socio-economic factors is important for the application of ABMTs.

There is currently very little experience in the practical application of ABMTs in ABNJ, particularly at a regional scale. OBIS data has been used in the identification of Ecologically or Biologically Significant Areas (EBSAs) under the Convention on Biological Diversity (CBD), thus providing a scientific basis for the application of ABMTs. In order to be effective, marine spatial planning (MSP) will require the participation of multiple sectoral agencies, stakeholders and organizations. New types of ABMTs, such as mobile Marine Protected Areas (MPAs), may be required to protect oceanographic features and pelagic migratory species. In addition, all management action in the ocean, including in ABNJ, will be undertaken in the context of multiple human pressures including climate change and ocean acidification (OA), requiring the ability to map human uses and model the potential impacts of climate change and OA.

IOC could assist in the application of ABMTs, including MSP and MPAs, through the following new services, which could be undertaken by IOC in partnership with relevant organizations and data providers:

Making a vast range of existing and new data, information and knowledge related to ABMT available via an expanded version of the Ocean InfoHub including:

- **Data and information relating to occurrence and distribution of marine biodiversity in ABNJ, and the connectivity between species and ecosystems.** While a great deal of data already exists in OBIS, undertaking area-based management would also benefit from increased and more rapid data sharing practices, particularly for data from the deep seabed, and the open ocean, including the mesopelagic and bathypelagic zones, as well as of microbial and genetic diversity. These data will assist countries in collaboratively selecting priority areas for protection and management in accordance with a future BBNJ agreement.

- **Information about the human uses of ABNJ, including socio-economic data.** Understanding the human landscape of ABNJ, including how ABNJ is connected with biodiversity and human communities in coastal areas, is important to ensure that all stakeholders are represented in area-based management.

- **Information on existing ABMTs in ABNJ.** This information already exists for Marine Protected Areas in the Protected Planet database managed by UNEP's World Conservation Monitoring Centre (UNEP-WCMC) with support from IUCN and its World Commission on Protected Areas (WCPA), and at the FAO (fisheries closed areas, Vulnerable Marine Ecosystems: VMEs), IMO (shipping measures and Particularly Sensitive Sea Area: PSSAs), and the ISA (reference zones for seabed mining and Areas of Particular Environmental Interest: APEIs). In addition, MPAs within national jurisdiction could be incorporated to account for connectivity, including World Heritage marine sites and Marine Biosphere Reserves. CBD's Ecologically or Biologically Significant Areas (or EBSAs), though not management measures, could also be incorporated.

- **Making available data on climate change and ocean acidification, including models and future projections.** Climate change and ocean acidification data will help inform area-based management in the longer term, in particular in better managing for resilience and in putting in place dynamic management measures.

- **Allowing users to generate map-based products to facilitate ABM using the above data layers via newly developed tools.** This could build on technology and infrastructure such as the OBIS Mapper, and integrated via the IOC's ClHM starting with a global inventory of GIS services/layers and through cooperation with IODE's International Coastal Atlas Network (ICAN) and public-private partnerships such as with European Systems Research Institute (ESRI).

Supporting pilot projects and disseminating knowledge

- **Facilitating transboundary to ABNJ collaboration in Marine Spatial Planning.** Building on the existing MSPglobal Initiative and in support of the Joint Roadmap to accelerate MSP worldwide, IOC could work with governments, regional organizations, LME projects and donors to further develop MSP pilot projects that extend into ABNJ. These pilot projects might straddle jurisdictions, or might be situated entirely in ABNJ. Pilot projects have the potential to provide important practical experience on the application of MSP in ABNJ and in situations where MSP straddles jurisdictions.

- **Developing good practice guidance for collaborative MSP in ABNJ** based on the outcomes of the above pilot projects, and the International guidance on MSP in cross-border context (currently in preparation). Practical how-to guidance will be valuable for other governments and regional organizations planning or undertaking collaborative MSP activities in ABNJ.

Services to support environmental impact assessment

When an activity requiring an EIA is proposed, the required data, particularly biodiversity data, will need to be as detailed as possible to ensure that potential impacts are understood, and that connectivity with other ecosystems downstream, as well as in three dimensions, is accounted for. Impacts created by the interaction of multiple stressors, including from climate change and ocean acidification, will also need to be accounted for.

To date, most EIAs in marine areas have been conducted in areas within national jurisdiction. In ABNJ, there have been a limited number of EIAs conducted for deep-sea mining exploration, some high seas fisheries, and ocean fertilization activities. Guidelines based on best practice exist at the Convention on Biological Diversity (on biodiversity-relevant EIAs in marine and coastal areas), FAO (on deep-sea fisheries in the high seas), ISA (seabed mining), IMO (operating guidelines for shipping) and the International Association of Impact Assessment.

IOC could assist countries in implementing the EIA provisions of the BBNJ agreement by working with partners to improve access to data and data products (e.g. maps, models and statistics); making available information relevant to the EIA process; and providing capacity building and technology transfer related to EIAs. Specifically, IOC could increase the availability of information, data and knowledge related to EIAs via an expanded version of the Ocean InfoHub ClHM including:

Data and information relevant for undertaking EIAs in the ABNJ via the ClHM. This would include data relating to biodiversity in marine areas, bathymetry, physical and chemical oceanographic data, as well as data related to climate change and ocean acidification. Important data include distribution of species and habitats, the conservation status of those species, genetic diversity where available, important areas for fisheries and other uses; as well as information about ocean currents, connectivity, population dynamics, and climate change. While some of these data are already available in OBIS and other databases, other data will need to be actively discovered and made compatible.

Knowledge of the impacts of specific activities on marine biodiversity, including through environmental models and extrapolations. In particular, it may be possible to use animal tracking data with environmental, physical oceanographic and climate/OA data and develop models to better understand connectivity between habitats, including how impacts may straddle jurisdictions, as well as cumulative impacts. Better understanding of three-dimensional transmission of impacts is also important. IOC may be able to undertake pilot projects related to the use of environmental models for EIA purposes.

- *Information and documentation related to EIAs.* This would include documentation relating to all stages of a specific EIA, including the scoping, reporting, evaluating and monitoring phases; EIA principles, guidelines, guidance and best practice including information that is already available from organizations such as the CBD, the FAO, the ISA and IMO, as well as regional organizations; and enhanced information sharing in regards to EIAs that have already been undertaken including information about EIAs conducted by countries and proponents in areas within national jurisdiction regionally. While this information is not directly related to ABNJ, it will enhance understanding of how activities within and beyond national jurisdiction are connected.

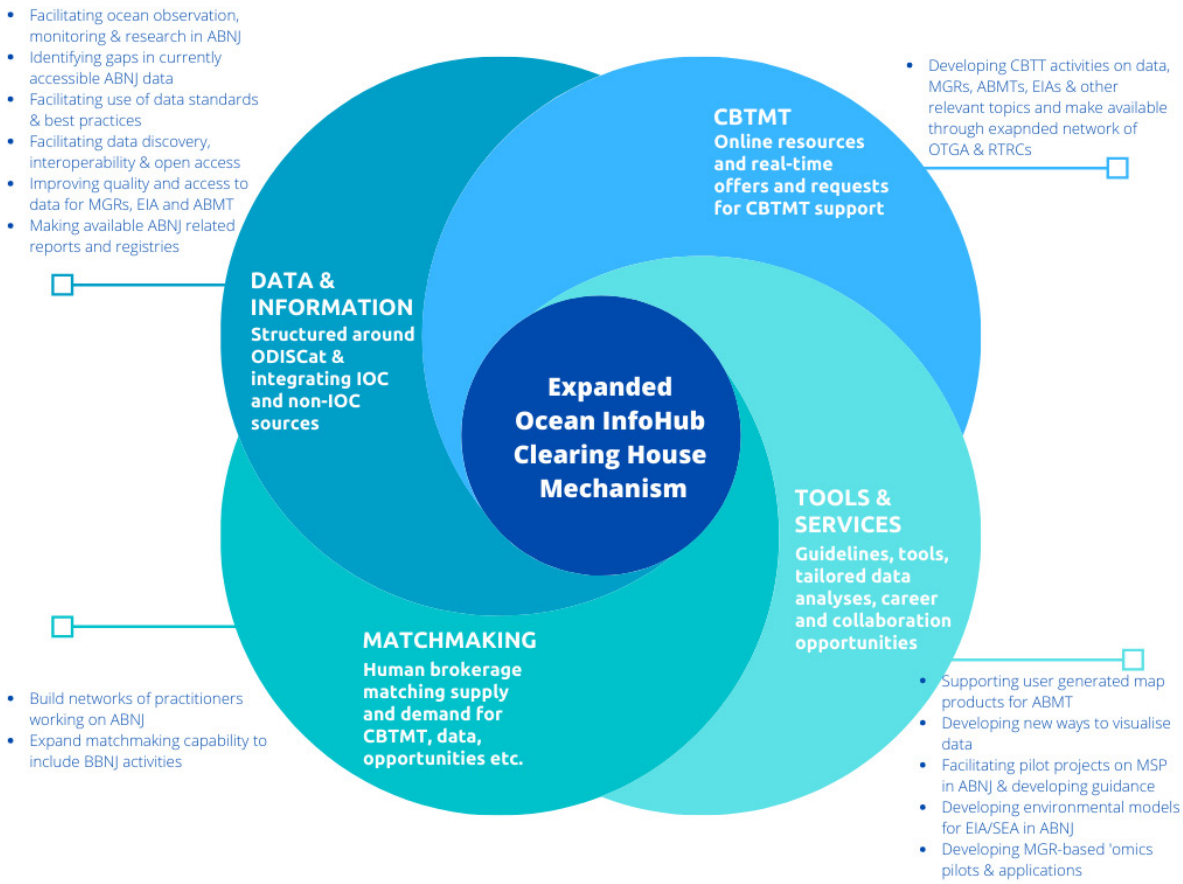
Linking new IOC services through an expanded ClHM

The draft BBNJ negotiation text (Article 51) envisages that a CIHM will play a central role in connecting a wide range of services required to serve a future ILBI. The Ocean InfoHub ClHM currently under development by IOC will integrate a range of existing IOC and non-IOC services that will already contribute to a number of requirements to serve the new ILBI. The ClHM is also being developed with flexibility in mind to ensure that it can accommodate future needs, including additional and expanded services of IOC and partners, associated with a future ILBI. Figure 4 overleaf demonstrates how the proposed new services that are discussed in the previous section could fit into the overall architecture of an expanded version of the Ocean InfoHub CIHM.

RESOURCE NEEDS FOR ADAPTED AND NEW SERVICES

Significant investments have already been made in the development of the suite of existing IOC services described in Section 2. Even without including the substantial investment costs in GOOS infrastructure which are dispersed across numerous partners a 'back of the envelope' estimate indicates that over USD8 million has been invested in the progressive development of the existing services described in this non-paper. Building on existing services to provide the additional BBNJ-related services outlined above in Section 3 will take an additional investment of resources in both development costs and increased operational costs. New resources will need to be identified by IOC and its partners for this investment as there are currently no secured resources to cover the additional costs. Attention will need to be paid to the sustainability of such funding sources - particularly in relation to coverage of operating costs, to avoid existing challenges associated with trying to match project based funding cycles to long-term investments and operational costs. However, the incremental investment required to create the expanded services will be significantly less than the cost of starting from scratch and it will thus be more cost-effective to build on existing infrastructure, programmes, expertise and human networks already in place.

Figure 3: ***Integration of identified new services in an expanded Ocean InfoHub CIHM***



THE OCEAN DECADE AND THE BBNJ PROCESS

The IOC has been mandated by the UN General Assembly to lead the preparation phase of the UN Decade of Ocean Science for Sustainable Development 2021 – 2030 (the Ocean Decade). The Ocean Decade has the vision of 'the science we need for the ocean we want'. It will provide a global convening framework for a wide and diverse range of ocean stakeholders to work toward common scientific priorities and address the most pressing needs for knowledge generation and application to achieve sustainable development. The Ocean Decade will focus significant efforts on CBTMT and data and knowledge management, given their critical importance in creating a robust enabling environment for ocean science.

The Ocean Decade has the potential to greatly increase the available scientific knowledge about the entire ocean, including the currently poorly known areas of the deep sea, including the (meso)pelagic, beyond national jurisdiction. The Ocean Decade also presents an important opportunity to advance CBTMT, engage and synergise partnerships across diverse ocean actor groups, and improve data management and accessibility practices and policies that are tailored to ABNJ priorities. In doing so, the Ocean Decade can build synergies between the 2030 Agenda and the BBNJ agreement, and advance coordination and collaboration between national, regional and global agencies and stakeholders working on ocean science and management. The Ocean Decade aims to leave no one behind in progress towards a sustainable ocean, and as such, geographical, generational and gender diversity will be addressed in all actions carried out as part of the Decade.

The activities foreseen over the course of the Ocean Decade has the potential to improve the scientific basis for BBNJ governance, and can greatly assist in achieving the potential new services listed in the preceding sections. For example, the Decade could accelerate knowledge about currently under-studied ocean ecosystems and processes, help develop a comprehensive digital atlas of the entire ocean, expand observations infrastructure in ABNJ, enhance understanding of the connectivity between environmental and human processes, increase knowledge, applications and services related to MGR, and improve forecasts and predictive capacity. All of the above will contribute towards the ability of countries to implement a future ILBI for example by deploying area-based management, undertaking EIAs in ABNJ, and allowing them to better understand the impacts of multiple stressors, including climate change, on species and ecosystems in the ocean.

IOC has recently submitted the Ocean Decade Implementation Plan to the 75th session of the UNGA and will soon be launching the first Call for Decade Actions to start the process of identifying the initiatives and contributions that will be carried out by diverse partners over the next ten years.

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