Use and sharing of marine observations and data by industry

Good practice guide

COLUMBUS
KNOWLEDGE TRANSFER FOR BLUE GROWTH

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COLUMBUS

Monitoring and Observation Node

The Horizon 2020 COLUMBUS project aims to identify and transfer unexploited knowledge, generated by EU funded science and technology research, to actors with the potential to capitalise on it resulting in measurable value creation. Marine knowledge is generated, to a large extent, through analyses and application of the data and information obtained through monitoring and observation of seas and oceans. The COLUMBUS project is structured around nine areas of competency, or nodes. The Monitoring and Observation node has been focusing on identifying some of the bottlenecks and challenges to greater uptake and application of marine data and information by users, in particular by industry. Building on the knowledge of the partners involved, significant work has been carried out to engage with actors from the private sector, establishing their general and specific needs and to what extent observatories and marine data-sharing initiatives can or should adapt to meet them. This document is based on desk-top research resulting in COLUMBUS Deliverable D4.1, attendance at trade fairs and workshops, one-on-one meetings with representatives from the private sector, a COLUMBUS brokerage event in the context of SeaTech Week (2016) and contributions from partners' own experience.

Contributing COLUMBUS partners: Seascape Consultants, VLIZ, EuroGOOS, Marine South East, SmartBay Ireland and PLOCAN

ABOUT THIS GUIDE

For some time now, the private sector has been namechecked by marine observatories and public data-sharing initiatives as a target-user of their resources and/or as a potential source of data, with little concomitant targeted development by these initiatives to facilitate this. Experiences in the framework of the Europe Marine Observation and Data Network (EMODnet) reveal that the current business-as-usual scenario is not effective for marine observatories and public data-sharing initiatives to actively engage industry, either as users or providers of data.

The purpose of these guidelines is to (i) raise awareness of the issues which hinder effective engagement of industry with marine observatories and related data-sharing initiatives, (ii) stimulate an informed debate between public data collectors/providers, data portal managers and data users/providers from the private sector, and (iii) formulate possible solutions to overcome some of the identified barriers which ultimately lead to increased use and provision of marine data by and from industry.

The primary target audience for this document and its recommendations are the European marine observatories and public data-sharing initiatives that cite industry as a target user group for their resources. These initiatives should take a pro-active approach in securing better connections with industry to promote data use and sharing practices. However, this information could also be relevant to companies and other stakeholders operating in the blue economy who are collecting, processing and/or using marine data as part of their activities. Considering the overall investment by Member States and the EU in ocean observing and data-management, the additional costs to implement some of the measures outlined in this document would be relatively small but could bring about a step-change in how marine observation data is shared and used in Europe, with benefits for all partners involved.

The challenges and recommendations presented in this document are a compilation of common views and feedback derived from a combination of direct one-to-one meetings with actors from industry as well as workshops and conferences in the context of promoting marine data-sharing and re-use by private sector professionals. As a result, the views presented in this document may not be representative of the entire user base and may even be challenged or contradicted by other stakeholders. Therefore, this publication should be considered a living document which may require regular updating as new insights are gathered and solutions developed.

CURRENT STATUS

The mere collection, safeguarding and sharing of marine observation and monitoring data provides huge societal benefits. Data and information on the state and variability of the marine environment is crucial for understanding changes that may result from human activity, including the effects of human-induced climate change and ocean acidification. Long-term times series are particularly valuable to support both scientific research to elucidate the causes, drivers and impacts of environmental change and, in turn, evidence based policy making. Moreover, they are invaluable for establishing the baselines for accurate resource assessment, essential for spawning private initiative in sectors such as marine renewable energy or aquaculture. Marine data also feed into the provision of ocean forecasts and reanalysis such as those delivered in the Copernicus Marine Service (CMEMS). Access to accurate and adequate data underpins the implementation of the Marine Strategy Framework Directive[1] and supports the implementation of the Maritime Spatial Planning Directive[2].

At the same time, the capacity of marine data and information products to deliver sustainable economic benefits is attracting increasing attention[3,4,5,6]. In its Marine Knowledge 2020 strategy for example, the European Commission recognizes the significant opportunities to be gained from open-access, harmonized marine data "to deliver smart sustainable growth, to assess the health of the marine ecosystem or to protect coastal communities."

It further highlights the opportunities to reduce costs for off-shore operators and to open new avenues for innovation. In this context, marine data-sharing initiatives may contribute significantly to the European Blue Growth Strategy[7]. Currently the European Union provides a considerable investment in marine monitoring and observation, data sharing and assembly, as well as downstream services[8]. As a result, significant progress has been made to collect, aggregate and make publicly available the data and information derived from monitoring and observing our European seas and oceans.

However, demonstrating uptake and application of open marine data and information for economic development and innovation purposes by the private sector is a huge challenge for initiatives that profess to deliver to growth in the blue economy, particularly in terms of justifying the continued investment of public funds. Increasingly, there are also mutually beneficial opportunities for industry to share data with these initiatives, but this process too is fraught with complexities. Coastal and ocean observatories and public data-sharing initiatives face common challenges in their efforts to unlock the full societal and economic potential of the wealth of European marine data and observations at European, national, regional or local level and demonstrating their use and positive contribution to sustainable blue growth.

[1] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

[2] Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning

[3] Communication from the Commission: Innovation in the Blue Economy: realising the potential of our seas and oceans for jobs and growth - COM(2014) 254/2 (13/05/2014)

[4] Marine Knowledge 2020: roadmap

[5] The Ocean Enterprise: A study of US business activity in ocean measurement, observation and forecasting. (2016) https://ioos.noaa.gov/project/ocean-enterprise-study/

[6] OECD (2016) The Ocean Economy in 2030, OECD Publishing Paris. http://dx.doi.org/10.1787/9789264251724-en

[7] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2014:254:REV1&from=EN

[8] EOOS Consultation Document 2016 http://www.eoos-ocean.eu/download/promotional_materials/EOOS_ ConsultationDocument_02.12.2016.pdf

[9] A Review of Access to Industry Marine Environmental Data: Report available from the UK Productive Seas Evidence Group (PSEG) http://www.gov.scot/Topics/marine/science/MSCC/PSEG

THE CHALLENGES

" Marine data and information sharing initiatives are not visible to industry"

- Marine observatories and public data-sharing initiatives and their products have limited visibility beyond the marine monitoring and observing community which mainly consists of scientists, operational service providers and actors from public administrations. This significantly restricts the potential user base and diversity of user types. Observatories and public data-sharing initiatives cannot assume that potential users from industry are aware of them or of the relevance of their resources and services. Moreover, without clear information about what is available where and in what format/resolution, industry are less likely to spend resources looking for something that may or may not be available and/or useful to them.

" Public data is for public users"

- There is often a perception in the private sector that public initiatives are only useful for public bodies. Whereas free and open data initiatives are becoming the standard for public users (science, policy and education), data is often considered in the first instance as a strictly commercial commodity by maritime industry, exchanged primarily via a fee based structure. Furthermore, the private sector may have (subjective) concerns about the quality of free data.

- Marine data-sharing initiatives sometimes use data formats and standards which are not commonly used by industry and/or data policies restricting the re-use for commercial purposes. This discourages industry involvement and re-enforces the perception that these data initiatives are for public bodies or scientists only.

" Marine data managers and private sector users speak different languages"

- Marine observatories and public data-sharing initiatives are often built bottom-up by oceanographers, operational service providers and data managers. Their intent and focus is on the observations, the data management and in some cases on the development of data products such as maps. Significant progress has been made by this community in Europe in terms of collecting, integrating and making available marine data and information. However, serving the data and information to industry in a way that promotes user uptake requires a more service oriented approach and adapted skill sets.

- The culture, interests, motivation, ways of working and even language can vary markedly between private and public organisations. A key challenge is to communicate and interact effectively on the needs and challenges for improving marine data provision across these two communities, building functional links between them and finding common ground on issues like terminology, standardization and quality control.

" Availability doesn't imply usability"

- A complex user interface (e.g. for a data portal) will preclude or inhibit non-specialists from the private sector from using these resources. In addition, the private sector may lack the data manipulation tools, and sometimes the expertise, required to fully exploit the available data or to generate the data products they need. Decisions on the allocation of resources are usually taken by management, not technical experts. Aside from offering advanced tools for experts, managers also need to be able to see and understand at a glance what is available and how it can be used.

- Data quality is of paramount importance and must be indicated clearly to allow industry to make decisions on its usability for their purposes. Poor quality data may have potential for application where none other is available. However, it should be flagged as such.

" Industry may be less likely to make long term decisions based on short term initiatives"

- The main question for most users is whether the provided data is fit for purpose. Nevertheless, in many cases, companies appear to be less likely to rely on data from short term initiatives or projects which are perceived to be time limited. Actors from industry often have specific requirements with regard to the temporal and spatial resolution of the data, data quality and continuity of service. In relation to real-time data, data gaps must be avoided. Industry is much more likely to rely on consistent and dependable data and in many cases it is of limited use to them otherwise.

- A platform that is perceived as a 'work in progress' may be off-putting for industry who may not see them as 'market ready' or reliable.

" Industry represents a diversity of actors with a diversity of needs"

- Often, offshore and coastal operators need very detailed data and custom-made products at much higher level of complexity than what is offered by public data repositories. In particular data provided by regional and pan-European data aggregators and portals may be too coarse for industry purposes, especially when they aim for wider geographic coverage, and this is not always clearly communicated.

- Marine observatories and public data-sharing initiatives are not able to develop specific products and solutions to address all of the many and various needs of the diverse potential user base. Some initiatives focus on particular target users and develop specific data products which may restrict usability to a certain segment of users. Other initiatives may cater for a wider and more diverse user group and will therefore develop more generic products which may limit their usefulness for specific applications. There is also the danger of 'market disruption' when a public initiative develops and makes available for free a data product or service which one or more companies are providing at a cost. While this may be perceived as a threat, some argue that open access data products or services conflicting with similar private data products or services have the potential to promote further development in the data product market, by increasing the accessibility of the underlying datasets and pushing innovation to a higher level of data integration and processing.

- Too often, the strategic development of marine observatories and public data-sharing initiatives predominantly relies on the opinion of data managers and scientists who may not always know what industry needs now or in the future. There are current and future applications for marine data that cannot be imagined by those developing public data-sharing platforms.

" Europe's marine data and information sharing landscape is too complex"

- In Europe, marine observations and data are acquired by a very wide range of organisations in the framework of different monitoring and observing efforts at national, regional and pan-European level which are not always well connected and coordinated. In addition, there is a proliferation of marine data-sharing portals, already operational or in development, offering a diverse range of services, access to data and delivery of processed information and products resulting from these data acquisition and management activities. This proliferation and fragmentation in efforts leads to confusion about the scope and interoperability of these systems both for external users, as well as for those directly involved. Users ask themselves 'which is best?' and this will depend on their specific needs. If it is not easy to assess which service provides data fit for its purpose, companies may be reluctant to allocate resources to exploring this complexity in the hope that the data they need is available somewhere.

- Whilst a traditional 'marine knowledge' value chain of sorts can be visualised, from data collection, to data-sharing, to intermediaries developing value added data or data products or services through to end-users in the more traditional maritime sectors, the reality is much more complicated and non-linear. Understanding this can help to maximise the potential of marine data.

" Industry are largely willing to share data but there are barriers"

- Whilst the will is often there, the private sector is reserved or prevented from sharing data for various reasons. These include, but are not limited to:
  - Ownership of the data: data held by industry is often the property of their end-user clients;
  - Licensing issues: license agreements to carry out environmental assessments may include caveats preventing public sharing of the data and/or the data may be required in formats (e.g. written reports) that obstruct sharing;
  - Commercial interests: strategic data providing them with a competitive advantage cannot be shared until they have been fully exploited;
  - Cost issues: in the absence of a clear and immediate return, the private sector may be reluctant to share data that they have collected at a cost and which may reduce costs for competitors;
  - Liability issues: companies may fear potential liability issues from 3rd party use of their data;
  - Concerns about how the data will be used: some offshore and coastal operators may be hesitant to share (environmental data) which could be used against them (e.g. to show environmental impacts of their activities);
  - Capacity issues: SMEs and even larger companies may lack the human resources and expertise to carry out data management and successfully submit data to public repositories for re-use;

- Anonymity: companies may want to avoid visibility of their activities to competitors, for example through reference to data origins (in some cases this may actually be an advantage as it would allow advertising activities to potential customers).

RECOMMENDATIONS

There is a need for a systems change in how marine observatories and public data-sharing initiatives engage with industry. The following recommendations are designed to overcome some of the most important gaps and barriers outlined above. Taken together they represent the basic components of a strategy to open significant opportunities for maritime industry to both benefit from and engage with public marine data initiatives. This can ensure optimum return on public investment in marine data provision, notably in support of meeting key EU policy goals under the Blue Growth Strategy, the Marine Strategy Framework Directive and the Maritime Spatial Planning Directive.
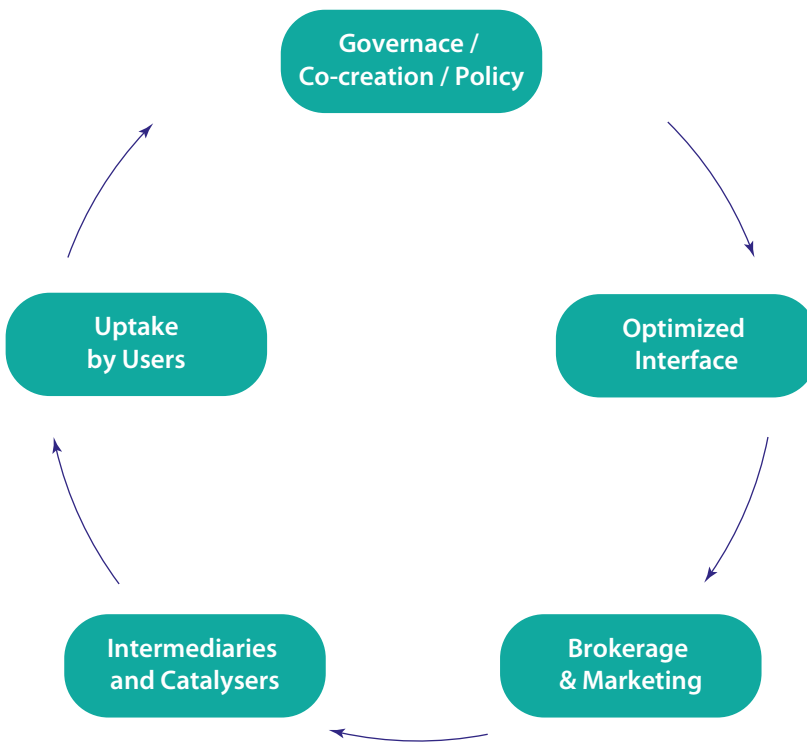

Figure 2: Industry must be involved in all stages of the life cycle of public marine data-sharing initiatives

Industry must be involved in the entire life cycle and embedded in the governance

- Any marine observatory or public data-sharing initiative that seriously considers industry as a targeted user group must involve industry at an early stage in its strategic planning and throughout its development (Figure 1).

Successful examples of private sector engagement in coastal and marine observatories show **involvement of industry at all stages of operation and decision making**[10]. This is the only way to secure sufficient buy-in from the private sector and ensure that systems are developed catering for the needs of the private sector.

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[10] Best Practices in Stakeholder Engagement, Data Dissemination and Exploitation. Martin-Miguez *et al* 2016 AtlantOS project report

Communications and marketing must be active, imaginative and targeted

- Marine observatories and public data-sharing initiatives need to break out of the traditional oceanographic marine monitoring and observing communities and be present and visible in fora that attract industry, such as sector specific conferences or ocean business exhibitions. This requires a **pro-active and outside-of-the-box approach** to explore also fora beyond the traditional marine and maritime sectors and raise the visibility of these initiatives and their resources with a range of entirely new customers for example, digital innovation start-ups or entrepreneurs. Effective communication also requires those responsible to take a pro-active approach to learn the language and culture of private sector actors.

- Companies may not be looking for marine data to solve a particular problem they face themselves but may be able to develop innovative applications from it for others. But

first they need to know it exists and understand the potential. It is impossible to envisage all potential users, it is therefore recommendable that public marine data-sharing platforms, whether linked to an observatory or not, develop a **portfolio of actual use case examples** to showcase the potential of what is on offer.

• There is a need to establish, in a strategic way, the right communication tools, fora and modes of interaction to help break barriers and improve coordination between different actors in the value chain. This also requires development of smart user platforms and better use of dedicated brokers (see also 'brokerage' below).

Develop the user interface with the user in mind

• Many target users of marine data portals, including those from the private sector, do not have time to explore complicated webpages with lots of project related background

information. In addition, it may be difficult for potential users to process very specific terminology or technical descriptions due to the different focus, skills and technical language used by those providing the service.

- It is important to consider whether the data is made available in a way in which users can find, visualize, and understand what is on offer. This requires clear understanding of the needs of those actors in terms of ICT tools and exchange formats. The complexity of the data, products and services as well as the data portal architecture should not be reflected in the complexity of the interface and its functionalities. It should be made instantly clear to all potential users what is offered and how to access it. If data interrogation tools are required to access and use the data, then the initiative should consider making these available or at least linking to where they can be obtained[10].

Brokerage

- When actively engaging with the private sector, **one-to-one meetings** appear to be very effective in obtaining specific targeted user feedback, to develop use cases and to encourage user uptake within a specific sector or application area. The downside of such meetings is that they are very time/resource intensive and provide feedback which may not be representative for a wider community of users.

- To complement one-to-one interactions, **stakeholder/user workshops or other public fora** are often very useful to validate and enrich the information obtained via one-to-one interactions and to discuss more generic bottlenecks and opportunities with a wider audience. The disadvantage of workshops and larger meetings is that private companies may not always be willing to openly share their experiences, requirements and opinions in the presence of their competitors.

- Brokerage should be **targeted at the appropriate level**. For example, the technical experts within companies may be best placed to 'pitch' a new idea to their management as

they know the culture in their organisations. Profiling a company before a meeting and considering how they might use the data or information products makes for a more productive exchange. Presenting use case examples and practical data product applications can trigger interest where there may previously have been none. Larger observatories and marine-data-sharing initiatives may consider **including people with experience of marketing or knowledge transfer** on their team.

Engage with intermediaries and catalysts

- Marine observatories and public data-sharing initiatives cannot develop to meet the needs of all users. This is the economic niche of a whole range of **specialised, intermediary, small to medium sized enterprises** (SMEs) who provide value-added products and services to specific sectors and develop tailored solutions for specific end-users in the maritime sector.

- To leverage the maximum potential of the publicly available data resources and to multiply the potential user base, there is a significant role for maritime clusters in connecting marine data initiatives with industry and vice versa. **Maritime clusters** in particular are important as a bridge between the private and public sectors as they deal with both and have a good understanding of their culture, language, needs and concerns.

- Marine data may have applications beyond the marine and maritime sectors and this should also be explored. Innovative users of marine data include digital technology companies. **Digital research and technology hubs** can explore and mine big/linked data and make connections with innovative start-ups and SMEs, generating interest from new communities and novel applications.

Signpost the landscape for users

At European level there is a need for defragmentation of marine data and information sharing initiatives.

- In the short term, initiatives must explain what is their focus and purpose and indicate clearly what they do and do not provide.

- In the medium term, initiatives should map the overlaps, collaborations and complementarities with other systems and provide this information to the users.

- In the longer term there is a need for a joint roadmap, agreed by the responsible coordinating and funding bodies at the European Commission level, to set out the strategic framework.

Product development should be driven by the user base

- When prioritizing products to be developed, marine observatories and data sharing initiatives should consider, **'who are the users'**? If they have clearly defined user base or specific sectors of users, then they can develop specific products for these sectors or user application areas.

- If it is less clear who their user base is, or if their user base is very broad, then they should avoid developing very specific products for one or a limited number of specific companies unless to demonstrate the power of open data-sharing. Rather, the focus should be on products which are useful for as many potential customers as possible, in particular when this product or service is unlikely to be developed by a commercial player.

- As much as possible, the **underlying raw data used to produce a product** (e.g. a map) **should also be made available for download** so that users may develop their own product which may be more suited for their needs.

- Public initiatives should provide a clear **portfolio of what data products are available** now and what will be made available in the future. This allows the private sector to make

decisions on product development, knowing that a 'free' version will not soon become available from a public initiative.

Cultivate creative and innovative ways to facilitate data-sharing by private sector actors

- Common data-sharing policies include incentives for data-owners such as the provision of Digital Object Identifiers (DOIs), recognition of data owner, and traceability. In contrast to the scientific community and government bodies, these incentives may not always be of interest to the private sector. Therefore, additional **dedicated data-sharing policies and approaches to incentivise the private sector** and address their specific needs should be developed. Ways forward include, stating clearly the added-value and benefits of sharing data, provision of services in return for data which could support in-house data management, the development of a data-sharing 'green label' in recognition of corporate social responsibility.

- **Offering services** to assist with the efficient transfer of data from companies to public repositories for re-use (data ingestion) and quality control industry data, thus removing costs associated with data-sharing for the private sector, may also promote data-sharing by industry.

- Strategic data, which provides the company with a competitive advantage, often accounts for a minority of the data that is collected during projects. Offering a flexible data ingestion process which allows non-strategic data to be made instantly available but which includes a **moratorium** on strategic data should be considered.

- Insuring of **anonymity of ownership** to protect proprietary interests or removing perceived liability may also be of interest. Whilst most public data-sharing initiatives will not make available data-at-a-cost, sometimes flagging that data as available by negotiation may at least prevent duplicated efforts by other parties.

CONCLUSION:
Moving from Promise to Reality

An effective marine observation and data-sharing system, delivering societal and economic benefits requires the coordination of efforts between multiple sectors in the value chain. These include the scientific community, oceanographic data centres, federated data infrastructures, national and regional agencies and authorities with competency for marine environment and maritime economy, actors from civil society and the private sector.

This document focuses on the challenges faced by marine observatories and public data-sharing initiatives when engaging with industry and measures that can be taken to overcome these barriers. It is clear that these challenges are strongly interlinked and that possible mitigating measures may in fact counteract each other as interest from various stakeholder communities and sectors may be different.

The challenges and recommendations in this document are based on feedback derived from one-to-one meetings with actors from industry and a series of workshops focusing on facilitating uptake of publicly available marine data and information resources. Several of these issues may be well known or understood by some of the actors, but often they are not fully taken into account. This compilation therefore serves to raise awareness and inform those stakeholders active in the marine knowledge value chain who seek better understanding of these issues. More specifically, it is intended to provide guidance to marine observatories and associated data-sharing platforms on how to improve their engagement activities with the private sector.

The main conclusion is that there is a need for a systems change in how marine observatories and associated data and information sharing initiatives engage with industry, if it is their intention to do so. Some barriers require further analysis and discussion, but there are already many actions that can be undertaken to improve the situation on the short and medium term:

- Industry representatives should be included in the governance and take part in the entire cycle of decision making, development and operation of marine observation and data-sharing initiatives.

- There is a need for marine data-sharing initiatives to take a more pro-active approach and move out of the comfort zone of the traditional oceanographic marine monitoring and observing communities. This involves, among others, developing a more service oriented approach, learning new communication skills and language, being present and more visible in fora that attract industry and to exploit creative technologies.

- Data, products and services offered by marine observation and data initiatives should be presented in a user-friendly, attractive and intuitive way which is adapted to the target users. If users from different communities or sectors are targeted, options to adjust the interface depending on the visitor should be considered.

- Clear, succinct and open communication is critical: it should be instantly clear for industry what data, products and services are offered and what may be made available in the future. Equally important is to provide information on what is not available and the limitations of the resources offered.

- More efforts should be made to build upon early achievements and successes: presenting use case examples can trigger interest where there may previously have been none.

- There is a significant role for maritime clusters in connecting marine data initiatives with industry and vice versa. Maritime clusters are an important bridge between private and public sector as they deal with both and

have a good understanding of their culture, language, needs and concerns.

- At European level there is a need for de-fragmentation of the plethora of marine observation and data and information sharing initiatives as well as online data portals. In the longer term, there is a need for a joint roadmap, agreed by the responsible coordinating and funding bodies including at the European Commission level, to set out the strategic framework.

- Dedicated data-sharing policies to incentivise the private sector and address their specific needs should be developed. Ways forward could include: stating clearly the added-value or benefits of sharing data, moratorium on commercially sensitive data, provision of services in return for data which could support in-house data management, the development of a data-sharing 'green label' in recognition of corporate social responsibility.

It is clear that Implementation of the recommendations will require increased commitment and investment of time and resources, both from industry and from marine observation and data initiatives, but should provide both with significant returns over time.

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