Short report: Regional workshop UN Decade of Ocean Science for Sustainable Development, Nairobi, January 27th-29th

From Data to Decision

SUMMARY

Today many coastal ecosystems are at a crossroad. The pace of change is increasing, as is the rate at which we lose species in the terrestrial and marine realm. On the other hand, the amount of data relevant to the conservation and sustainable use of those ecosystems is increasing. Two main issues arise from these developments: a) the need to store, analyse, visualise and integrate those large datasets and b) to create a culture in which data is readily shared with all stakeholders and understandable for decision makers. This report is a contribution to the Regional workshop for the IOC/UNESCO UN Decade of Ocean Science for Sustainable Development in Nairobi from January 27th – 29th. During that workshop the Leibniz Center for Tropical Marine Research (ZMT), CORDIO East Africa and the Nairobi Convention held a special event on biodiversity data handling and management. We conducted this workshop to receive expert opinion on topics relevant to biodiversity data management. The main issues in biodiversity data management, integration and sharing are that were identified were a) a lack of defined and standardised parameters which describe a species occurrence and ideal habitats and environmental conditions, b) a heterogenous legal framework with no clear definitions on how generate, cite or share biodiversity data as well as no incentives to make data openly available and lastly c) a culture among scientists, practitioners and politicians which is not very susceptible to the concept of open data sharing. In a separate round concrete examples were given on how to improve the current situation. Those suggestions included 1.) the definition of shared key biodiversity parameters and essential environmental variables, 2.) a standardization of monitoring efforts itself across regions, 3.) to implement policies that encourage both horizontal and vertical transfer of relevant data and 4.) the establishment of strategic alliances and tap existing resources.

Key points:

- ✓ many coastal ecosystems are at a crossroad and decisive steps are necessary for a sustainable use of those ecosystems and its resources
- ✓ The amount of available data is steadily increasing, and new technologies to collect information are developed
- ✓ There is a lack of defined and standardised parameters which describe a species occurrence and ideal habitats and environmental conditions
- ✓ Legal framework are still very heterogenous with no common and clear definitions on how generate, cite or share biodiversity data
- ✓ The suggested steps to improve the situation of biodiversity data handling might by easy to implement on a technical level, but will need a strong concerted political effort

THE CONTEXT

This report is a contribution to the Regional workshop for the IOC/UNESCO UN Decade of Ocean Science for Sustainable Development in Nairobi from January 27th – 29th. During that workshop the Leibniz Center for Tropical Marine Research (ZMT), CORDIO East Africa and the Nairobi Convention held a special event on biodiversity data handling and management. The feedback from this event, an interactive workshop, led to this report.

Many coastal ecosystems worldwide are at a crossroad now. The pace of environmental change is increasing, as is the rate at which we lose species in the terrestrial and marine realm. On the other hand, the amount of data relevant to the conservation and sustainable use of those ecosystems is increasing. New technologies such as drones, underwater sensors and cameras, as well as citizen science efforts, deliver us a stream of data in near real-time. Two main issues arise from these developments: a) the need to store, analyse, visualise and integrate those large datasets and b) to create a culture in which data is readily shared with all stakeholders and understandable for decision makers.

During the workshop the following 4 questions were asked to get a broad feedback from a diverse group of participants:

1. **What are the data needs for practitioners, policy makers and scientists?**
2. **What is the relationship between local / regional / global institutions working on biodiversity data?**
3. **What are enabling/hindering factors when it comes to data sharing?**
4. **Which activities are needed / desired to promote an improved handling and sharing of data?**
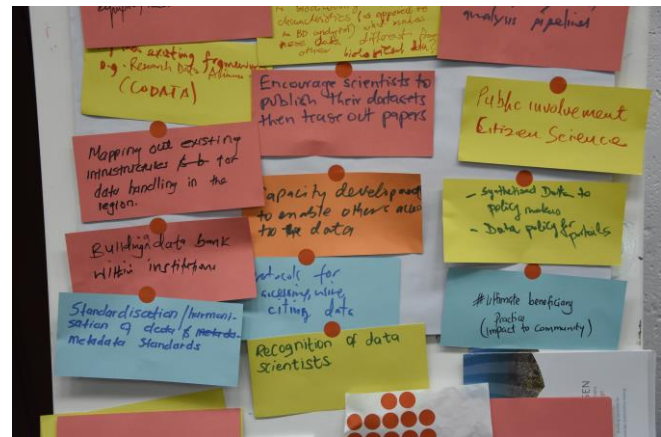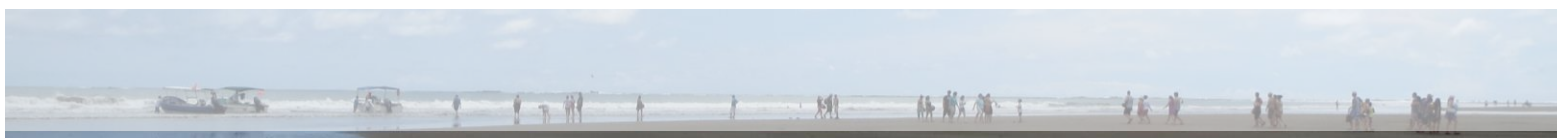

WORKSHOP RESULTS

We received great and inclusive feedback from the participants on the 4 main questions asked during the workshop. Those will be summarized in the following section, before we will provide a more generalized summary and way forward:

What are the data needs for practitioners, policy makers and scientists?

We split the responses by status groups for clarity. **Policy makers** placed a strong emphasis on the economic valuation of marine resources. Underlying data should enable them not only to estimate the inherent value of certain ecosystems, such as coral reefs, seagrasses or mangrove forests but also assist in evaluate future blue carbon initiatives. One of the key aspects concerning data needs for practitioners was that data should be easily accessible and digestible, also in terms of data visualisation. Some of the needs were shared by **practitioners**, who emphasized standardized long-term data on key performance indicators relevant to the status of marine resources, e.g. population trends. Additionally, the data should be easily understandable for management purposes. **Scientists** on the other hand were interested in primary data on species and their habitats. This data should be accessible through a user-friendly data repository, while issues should be routed through a clearing house mechanism, such as offered by the UNEP Nairobi Convention. Participants also mentioned topics and issues, which they identified as relevant to **society**. To include raw and metadata was mentioned several times, as well as the necessity to create long-term standardized data for comparative studies. Those datasets should be as large and inclusive as possible, and openly shared. It was also mentioned several times that this data should have an impact on society, strengthen policies on marine conservation and sustainable resource use and increase ocean literacy.

ZMT
MeerWissen
African-German Partners
for Ocean Knowledge
Federal Ministry
for Economic Cooperation
and Development
CORDIO
East Africa
Nairobi Convention

What is the relationship between local / regional / global institutions working on biodiversity data?

Standardization was an issue that was mentioned several times among participants when it comes to the data which is collected and the indicators the data feed into. Without standardized data collection there would be no way for smaller local databases to feed into global ones, and the data would not be comparable or interoperable. This is an even more central issue as the relationships between institutions and databases, bot horizontally and vertically, were often characterized as "disconnected" or not well functioning. Moreover, the roles local and global databases fulfil are different but inherently interconnected. Local databases and institutions working with biodiversity identified as key players when it comes to creating spatially and temporally high resolution data, while global databases are often seen as aggregators that make sense of the larger picture and enable policy makers to compare different regions and look for similarities or differences, e.g. why certain measures are successful in some areas but fail in others. Interoperability and an open access to the data across all levels was a second big point. The available data should be easy to identify and access from various sources, and not hidden in small databases that are not readily available through web portals etc.. This could be solved through shared APIs (application programming interfaces), so that the different database could forward search queries and access each other's data, which have the additional benefit of creating redundancies and backups for the datasets.

What are enabling/hindering factors when it comes to data sharing?

Obviously we are required to make faster and better informed decisions in conservation as the pace of environmental change is unprecedented and biodiversity loss occurs at a dramatic rate. The amount of data needed and being generated is increasing and often heterogeneous, and the data itself needs to be interoperable and comparable on larger scales to be of use. This puts a big strains on individual institution and calls for transformative changes in the way we generate, analyse, use and share data. Many of the goals and interests are apparently shared, therefore .,smd ölkjfdsl Institutional funding will need to be increased to meet that demand in both technology as well as skilled personnel. While some great efforts in creating legal and binding frameworks to share data

more openly are already promoted on a regional level trough institutions such as IOC/UNESCO, The Nairobi Convention or COI-IOC, a strengthening of open access in legal frameworks and setting common standards on data management would simplify an open exchange of information. On the other hand there are several **hindering factors and barriers** when it comes to data sharing. Data and metadata are often collected, analysed and stored in various formats and according to different standards, which makes it inherently complicated to compare datasets from different sources. This goes along with often conflicting interests when the data is generated by research. Research data is your only capital when the goal is a career in academia, which frequently leads to a focus on publications and a delay in data sharing until the publications are accepted or published. Often data collected through research project is also not always adequate to answer policy-relevant questions. Additionally collecting, analysing and storing large datasets can also be an expensive endeavour, so those who covered the initial costs of producing that data might not always be willing to immediately disclose the results. On top of institutional barriers there are sometimes legal frameworks that slow down or outright prevent an open sharing of data.

Which activities are needed / desired to promote an improved handling and sharing of data?

One of the main goals of the workshop was also to collect expert opinion on which concrete steps can be taken to improve biodiversity data handling, management and sharing. Among the recommendations two main stories merged: 1.) **the need for an inventory** on information, institutions and policies already dealing with biodiversity data handling and management. A first step can be a map or database of existing institutions and infrastructure in the region, including the type of data that is collected or stored and the policies which are in place. This database could serve as a one stop solution for users and policy makers to quickly get an overview of existing data and institutions dealing with biodiversity data. In an additional step, the database could ultimately be transformed in a platform for expert to also exchange on best practice cases or develop common data handling, integration and sharing protocols and politics. This goes along with the identification of necessary data handling and analytical skills. The last efforts would directly into 2.) the **development of suitable data handling and sharing**
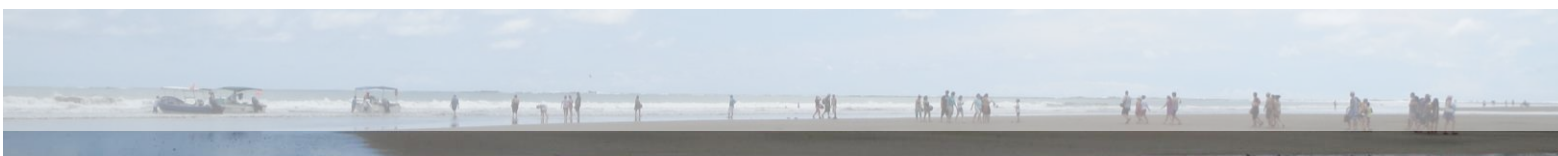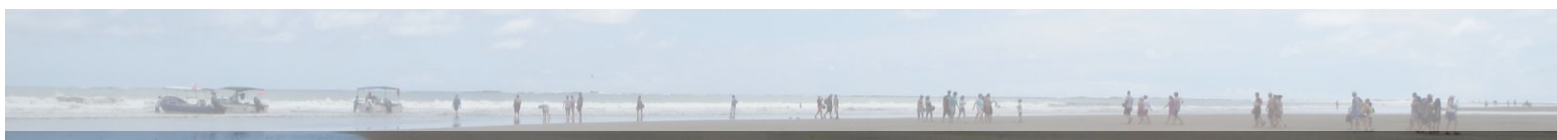
protocols and policies. This includes the harmonisation of data and metadata standards as well as best practices for the integration and analysis of biodiversity data. Data portals should also develop common protocols and interfaces to exchange data and streamline accessibility and interoperability of data. There are a range of initiatives already working on those topics, such as the FAIR (Findable, Accessible, Interoperable and Reusable) data principles and the CODATA research alliance. On a personal level incentives for sharing data should be developed, as well as strategies to create a culture more favorable to sharing biodiversity data. Specific policies can also regulate how sharing data can be linked to fundings of research grants or activities, or work on preventing data piracy and research being conducted by foreign collaboration partners without sharing the gathered data. A supplementary point that was often repeated is 3.) that we need to work on **developing the necessary technical capacity and personal skills** to deal with the new challenges deriving from technological opportunities and analytical demands to predict future scenarios from species to ecosystem level. This can include regional alliances to share the load on infrastructure as well as standardized training courses on biodiversity data handling.

The road ahead

The field of biodiversity conservation and management is rapidly developing at the moment. New technologies and tools are at hand to increase our understanding of why species or ecosystems thrive under certain conditions and don't do well under others. Available computing power enables scientists and policy makers to get enhanced analytics and insight of the ever-increasing volume of data. Specialized professions and training are being developed to prepare biologists for the new bioinformatics analyses. Since reliable, high resolution quality biodiversity and environmental data readily available and understandable are one of the cornerstones of educated conservation and sustainable use of marine ecosystems and resources. What is currently missing is a common roadmap to connect the available dots and create a larger and more refined picture of the state of ecosystems, habitats and species worldwide. In our view the following (ambitious) key aspects need to be addressed to transform the way we conserve and sustainably manage marine ecosystems and resources. 1.) **Define shared key biodiversity parameters and essential environmental variables** to be included in standardized long-term monitoring efforts. Based on the feedback from key stakeholders (question 1) a set of parameters can be developed to be included in future monitoring efforts. Those harmonized efforts will assist in comparing different regions and create a large global and interoperable dataset. On top of that agreed set of variables additional parameters could be included for different regions based on specific needs in those areas. 2.) **Standardise monitoring efforts itself across regions**. Harmonised biodiversity monitoring will facilitate integration into larger datasets and interoperability of data. It will also assist with the exchange of best practice or mitigation strategies if those are measured against the same parameters. 3.) **Implement policies that encourage both horizontal and vertical transfer of relevant data.** Tearing down barriers which hinder or prevent the sharing of data will likely be the most difficult task. On the other hand does it contain large potential to be of profound impact to biodiversity conservation and resource management. Fostering a culture of open exchange of data, backed by supporting policies and incentives to data producers can decrease the timespan between sets of data being collected and shared with a wider audience. If data piracy and "parachute science" are discouraged, or capacity and data exchanges become mandatory, new strategic cooperations will be established. 4.) **Form strategic alliances and tap existing resources**. Too often scientists and policy makers work on similar topics while not being aware of other efforts in the same field. An exchange on the individual data needs as early as possible can open new avenues in science to policy interactions. Data being generated by scientist could be geared or adapted to the needs of policy makers from the very beginning. Therefore we encourage shared conferences and inclusion of policy making needs already in the development of projects with relevance to conservation or sustainable management of marine resources. Initiatives on FAIR and open data exchange, best practices or data management already exist, those are great resources, which can easily be tapped. We assume that many institutions working on marine conservation and marine resource management will have similar goals and have an inherent interest in a sustainable management of their coastal species, habitats or ecosystems. Therefore, by harmonizing and standardizing their individual activities we can create synergies to make biodiversity data collection, analysis, management and uptake in

policy making initiatives more streamlined and affordable.

IMPRINT

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