



MISSION POSSIBLE

Towards blue carbon solutions

ON EXPEDITION

Time is running out: the increase in carbon dioxide in the Earth's atmosphere is already making itself felt. Temperatures are rising, the climate is changing. Limiting CO₂ emissions is part of the answer to solving climate change – but could we also reduce the amount of CO₂ in the atmosphere by extracting carbon dioxide and storing it in the oceans? And, if so, how?

In 2021, the German Marine Research Alliance (DAM) sent six big teams to find answers to these questions within the overall research mission, "Marine carbon sinks in decarbonisation pathways" (CDR_{mare}). One of the research alliances is known as "sea4soCieTy". It is coordinated by ZMT's Martin Zimmer and investigates the potential for storing carbon in coastal vegetated ecosystems like mangrove forests, seagrass meadows, salt marshes and kelp forests. Every year, mangrove forests in tropical regions alone absorb up to 180 million tonnes of blue carbon – up to 10 times more than terrestrial forests. The contribution of coastal vegetated ecosystems in this domain has admittedly been weakened by human influence – but could they be re-established? Could natural repositories of this kind be newly established, for example by mangrove afforestation?

From analysis to advice

"We're currently in the first phase of the project," says Mirco Wölfelschneider, project manager of sea4soCieTy, "which means the sea4soCieTy consortium has started to quantify the blue carbon storage capacity in coastal vegetated ecosystems, in comparison with unvegetated areas, and to analyse the stability of the organic matter in which carbon is fixed." This initially involves a lot of fundamental research in coastal vegetated ecosystems in the Caribbean, on the East and West coasts of the Malay Peninsula as well as on the German North Sea and Baltic Sea coasts. Social science studies are also part of the sea4soCieTy project, adds Véronique Helfer, mangrove ecologist involved in the project. "We would like to investigate whether or not local people are willing to accept the establishment of coastal vegetated ecosystems as a way of mitigating climate change." One good argument in its favour is that mangrove forests also provide additional ecosystem services such as maintaining high biodiversity and protecting coastlines from storms. "Phase 2 of the project will follow with concrete actions to re-establish or expand natural blue carbon sinks and scientific monitoring thereof," Mirco Wölfelschneider explains, and in Phase 3, the findings from the social science studies will translate into recommendations for policy-makers, business and society – "a kind of roadmap for investments in coastal vegetated ecosystems as sustainable carbon sinks." [>MORE](#) [>MORE](#)

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TOGETHER FOR CONSERVATION

Supplementary approaches to preserving the world's marine biodiversity

30 by 30 – is the short form for a global initiative to conserve biodiversity in at least 30 percent of the Earth's land and sea areas by 2030. With regard to ocean biodiversity, Marine Protected Areas (MPAs) are the most common tool of choice. By definition, their primary goal is to maintain biological diversity – as a form of protection against harmful human intervention. “On the other hand, local communities in coastal areas initiate and implement various area-based management practices outside the officially protected areas, which can have a positive impact on biodiversity,” explains ZMT marine ecologist Estradivari. “The primary management objective may not explicitly be to conserve biodiversity but perhaps a holy place or important food resources.”

There is now a term for management practices of this kind: Other Effective Area-based Conservation Measures or OECMs, for short. The criteria for identifying OECMs were laid down back in 2018 by the signatories of the Convention on Biological Diversity (CBD) at their 14th conference. Since then, governmental and private entities, indigenous peoples and local communities have been called upon to identify, recognize and support the OECMs so that the protected area system is meaningfully supplemented by this category.

Involving coastal communities for improved conservation

Some 400 Indonesian areas, in which the communities living there potentially contribute to conserving biodiversity outside of existing MPAs, were identified in the context of ZMT research into protecting and managing marine resources. “In our studies we discovered 14 different area-based management types that have the potential to be classified as marine

OECMs,” says Estradivari. They could prove crucial for Indonesia: even if its own national goal of significantly extending its MPAs and managing existing ones better is achieved by 2030, this would only cover ten percent of the waters surrounding the country's 17,000 plus islands, Estradivari emphasizes – not enough protection for the more than 600 species of coral and 3,000 different species of fish in this region. “For OECMs to make a meaningful contribution to nature conservation in Indonesia, we have identified strategies that could be helpful in recognising and supporting OECMs.” Last but not least, this includes adjusting the legal framework to ensure that OECM implementation is formally and legally recognised and effective on the ground.

Call for recognising OECMs in the global biodiversity agreement

Indonesia is not the only place that is well advised to get the local population on board and recognise OECMs as a valuable political tool in the global fight against the loss of species diversity. In a commentary in the journal *Nature* in 2021, more than 25 experts from 14 countries working or conducting research in marine management and species conservation expressed their support for recognising OECMs in the global biodiversity agreement – one of the authors was ZMT's Estradivari.

In the case of Indonesia, this recognition would have other, quite different advantages, too, she says. Within the framework of co-management, traditional communities could channel their knowledge into actively managing and conserving the oceans. “That promotes the regard in which these communities are held and also reinforces their resilience to social, cultural and economic change.”

Estradivari is a Doctoral Candidate in the ZMT Working Group Fish Ecology and Evolution focussing on the ecology and management of coral reefs to support biodiversity conservation. [>MORE](#) [>MORE](#)



“KNOWLEDGE CURRENCY IN THE 21ST CENTURY”

Birte Hemmelskamp-Pfeiffer and Arjun Chennu on effective data handling in tropical marine research

What are the challenges we face in handling data today?

BIRTE: The volume of data in science increases every year, which raises many questions regarding management. For example, we have to estimate the amount of data we will be collecting and how much storage space we'll require, and we need to think about the storage structure and how to handle historical data sets. The background to all this is that we now have to publish research data and ensure it is re-usable. Making data publicly available is not always trivial. It has to be done according to the [FAIR AND CARE](#) principles using [TRUSTworthy](#) repositories. Moreover, when it comes to interview data, for instance, publishing research data demands a differentiated approach.

ARJUN: That's the point: We live in a society today where decisions are increasingly based on knowledge. And the foundations of this knowledge are scientifically collected data. If you want to share knowledge and have it assessed, you have to openly exchange these data with others. So, you might say, data are the currency of knowledge in the 21st century. But the question is: How to share the analytical environment along with the data? Moving huge terabyte datasets is not feasible, so the alternative approach is to let collaborators into your data warehouse and work together. This is where our [ZMT DataLab](#) comes in.

How does ZMT deal with its own data?

ARJUN: The value of a currency is determined by context. Data without context are worthless in terms of re-use. That's why ZMT's Data Science and Technology working group also addresses the issue of how to maintain the data context. In order to make knowledge based on data collection usable and derive new results from it, the entire

data context must be available as well – that is, the data about the data and the analytical decisions. A concrete example would be mapping the biodiversity of coral reefs. This involves data from diverse disciplines – from coral reef ecology, machine learning, information processing and many others. At the end of the day, it's about providing a completely re-usable project, including software codes. This is the only way this research and the decisions it has generated can remain traceable and reproducible for decades and can be utilised for new research.

BIRTE: In the meantime, we at ZMT's Research Data Service start helping our scientific staff to prepare data management plans when they are still in the development stage of a project idea or submitting a project proposal. This is where the foundations for the publication and re-usability of research data are laid. We also provide assistance during the research process. Currently, we are testing, amongst others, a data app to support electronic data collection. Our goal is for data to be transferred automatically to the ZMT Data Cloud.

What opportunities does this engagement open up?

BIRTE: Good research data management means more exchange between the individual projects and more cross-disciplinary research. For ZMT this is particularly relevant. If the data are clearly visible, findable and documented, new research ideas are triggered, new data analysis is facilitated, and new research results emerge.

ARJUN: Seen from the point of view of society as a whole, the reproducibility of research means that we have trust in our science and can credibly proceed with tackling the next challenge.

Dr Birte Hemmelskamp-Pfeiffer is the head of Research Data Infrastructure at ZMT [>MORE](#); Dr Arjun Chennu is the head of the Data Science and Technology working group [>MORE](#). In the context of ZMT's strategic expansion "Digital ZMT (DigiZ)", they pool resources to reinforce and develop the Open Science, Open Data Policy. [>MORE](#)

E-waste management strategies in Agbogbloshie (Ghana)



Dr Paul K. Botwe, a Senior Lecturer from the School of Public Health at the University of Ghana in Legon (Ghana), has been awarded a fellowship for early career scientists by the Alexander von Humboldt Foundation (AvH) which allows him to spend two years at ZMT. Paul's research focuses on Agbogbloshie, a suburb in Ghana's capital Accra, that over the last 20 years has become the biggest dumping ground for electronic waste (e-waste) worldwide. He will study the impact of unregulated e-waste management strategies on the environment – particularly, aquatic ecosystems – and how they ultimately impact on human health outcomes in Agbogbloshie. [>MORE](#)

Photo exhibition "Contested Coastal Worlds"



A photo exhibition at Bremen's Haus der Wissenschaft invites visitors into the worlds of people dealing with progressive coastal change. They report on everyday struggles, hopes and aspirations with stories about coastal care and environmental change from Ecuador, the Dutch Caribbean, Germany, India, Indonesia, and the Lakshadweep Islands.

Together, the storytellers form a chorus of voices – grass-roots activists, fishers, gleaners, coastal volunteers, dyke protectors, artists and scientists among others – who all embody very different kinds of experience and knowledge. The exhibition "Contested Coastal Worlds – Care and Conviviality in Coastal Life" ends on 4 February 2023. [>MORE](#)

"Integrated Earth System Research" at Leibniz

The manifold interrelations between humans and the Earth system were at the centre of a conference on 'Integrated Earth System Research'. Nationally and internationally recognised researchers from the natural sciences, engineering, social sciences and humanities were involved in the event dedicated to scientific advances towards a coherent understanding of the increasing human impacts on the Earth system, their societal consequences, and respective governance challenges. The conference was organised by the Leibniz Research Network 'Integrated Earth System Research'. [>MORE](#)

Keynote speaker at WIOMSA conference



At this year's 12th Scientific Symposium of the Western Indian Ocean Marine Science Association (WIOMSA), ZMT director Raimund Bleischwitz, an expert in environmental and resource economy, held one of the four keynote addresses. During his talk he focused on emerging blue economy activities and their contribution to achieving Sustainable Development Goals (SDGs) and elaborated on ocean accounting perspectives, including metrics on natural capital and ecosystem services. [>MORE](#)

Passing the baton at IOI Germany

Professor Raimund Bleischwitz, Scientific Director of ZMT, has taken over as head of the International Ocean Institute (IOI) Germany. He succeeds Dr Werner Ekau, who had presided over IOI Germany since the opening of the German branch in 2002 and is now retired. In his new role, Raimund Bleischwitz sees Blue Economy and climate strategies as important items on the agenda of IOI Germany. [>MORE](#)

Waving the flag for Marine Social Sciences

Human behaviour and people's relationships with the sea need to move further towards sustainability. Here, marine social sciences, a constantly evolving field within social and marine research, has a vital role to play – as ZMT director Raimund Bleischwitz and colleagues (including scientists from ZMT) argue in their new comment for Springer Nature Sustainability Community. Their op-ed piece serves to "push and strengthen the recognition and integration of the marine social sciences and thus transformative research in general". [>MORE](#)