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## Newsletter 2/2015

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## COMPASS FOR CROSSROADS

In a fishing village in Senegal ZMT analyses harvesting behaviour

Excitement on the beach: after days at sea in the simplest of wooden boats, the fishermen return. A colourful crowd awaits the haggard men and hopes they are bringing a good catch. When they land, the fish are immediately thrown onto the sand and sold. The sight at Mbour beach, 80 kilometres south of Dakar on the Atlantic coast of Senegal, is gripping, says ZMT's Agostino Merico. "The struggle of these fishermen reminds me of Hemingway's story of the old man and his battle with the sea." How much are the Senegalese fisherman prepared to invest in harvesting their most important resource? The decision-making situation that interests Agostino Merico and the team of ZMT researchers in this location constitutes a typical human dilemma: how many boats and how much manpower are they going to commit, how many days are they going to stay at sea – and how much fish are they going to catch in the end to make it worth their while? "We are here to try and understand fundamental human behaviour in dealing with natural resources," says Merico.

### A harvesting game

HARVEST is the name of the project that is taking ZMT to Senegal in autumn 2015. Ultimately, the question the researchers want to answer is, what are the conditions under which people deal with natural resources in a sustainable manner? In cooperation with the African Institute for Mathematical Sciences (AIMS) Senegal, the ZMT team is planning a number of economic experiments. Using a simple videogame-like computer programme in the form of a mobile app, the Senegalese fishermen will "play" their daily harvesting decisions on the spot. "If they invest a lot, the catch must be good to strike a balance – but it could be that the resource does not recover quickly enough and the system may collapse," the ZMT scientist explains. By analysing the data collected in these experiments, the researchers will discover the conditions under which a resource collapse can be avoided.

### Fishing sustainably

The long-term objective is to create a solid scientific basis for sustainable fisheries management. The virtual harvesting game is supposed to be used in other tropical regions of Asia or South America as well to collect information on the decision-making behaviour of fishermen. "The data will help us to understand the harvesting mechanism and then to regulate it by determining the maximum extraction possible to ensure that an ecosystem can be exploited sustainably," says Merico – so that at the crossroads neither the ocean nor the fishermen lose out. [> READ MORE](#)



## WILLING TO CHANGE

Environmental economist Douglas MacMillan awarded the second ZMT-Leibniz Chair

Forests were his first passion. When the young Douglas MacMillan went to the University of Aberdeen he chose to study forestry management. “I have always been passionate about the environment and sustainable management of natural resources,” the Scot explains. “Now that I have the opportunity to work together with scientists at ZMT, I’m basically returning to my roots.”

Because in the course of his career, Douglas MacMillan veered away from forestry and did a doctorate in economics. “I soon realised what an enormous impact economics has on conserving the natural environment,” says MacMillan, explaining his decision – one that he has never regretted. Only by taking economics on board can you really bring about changes in the way we handle our natural resources. And the environmental economist wants to use his research to bring about these changes. “We are at a stage now, where science has a wider role to play in protecting the planet.”

### Price tags for ecosystems

He would not have wanted to become a financial or labour economist; that would have been too boring, says Douglas MacMillan with a grin. As an environmental economist he now concentrates on the economic value of ecosystems. He has published more than 100 articles including 70 in peer reviewed journals on valuing ecosystems services and biodiversity, human-wildlife conflict, the illegal trade in wildlife and spatial conservation planning. He wants to make people aware that biodiversity and the natural environment are worth their weight in gold to a country’s economy. “Figuratively speaking, we put price tags on the services of ecosystems in order to create a basis for decision making in environmental protection and resource management.” This lays the foundations for conservation.

The British economist is thrilled about the ZMT-Leibniz Chair. “After all this time, it’ll be a real pleasure to immerse myself in environmental research like ocean acidification.” He also emphasizes that research should have an impact and

drive capacity building. This is precisely what he will find in Bremen where he will cooperate with people who are just as determined to work for a better future. “What really excites me is that ZMT is also engaged in research designed to ensure that humankind can respond to the major environmental problems of our times – population growth, migration and resource consumption – with sustainable management.”

*“ Science has a wider role to play in protecting the planet ”*

ZMT and its new professor have already embarked on their common cause: Douglas MacMillan is involved in an internal ZMT initiative to identify new challenges and research themes for the globally-active institute.

### ZMT-Leibniz Chair II

**Douglas MacMillan** is Professor of Conservation and Applied Resource Economics at the University of Kent, UK. In January 2015, the Leibniz Center for Tropical Marine Ecology awarded him the second ZMT-Leibniz Chair. For three years, MacMillan will be able to cooperate closely with scientists at ZMT. The



Douglas MacMillan

Leibniz Chair is paving the way for further contacts and future collaboration between ZMT and the School of Anthropology & Conservation at the University of Kent where MacMillan holds a professorship.

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## TIME FOR THE FUTURE

Sound data are the precondition for meaningful models on the extraction of resources – a conversation with Gunnar Brandt on the value of time series, as demonstrated by Easter Island

*What is it that makes Easter Island an interesting subject for ecological modelling?*

**Brandt:** Easter Island is very remote and the historical population of Rapa Nui experienced centuries of complete isolation. This makes it the perfect example of how a community exploits a restricted amount of resources. Archaeologists and palaeoecologists have conducted many studies on the island, including radiocarbon investigations. Thus a reasonable amount of data is available that can be used in combination with a mathematical model for reconstructing the long-term temporal dynamics of humans and their resources.

*Activity on Easter Island took place centuries ago – why look back?*

**Brandt:** The past is a valuable archive that can teach us a great deal about how socio-ecological systems function. At ZMT we develop mathematical models that describe the temporal dynamics of such systems. Data that tells us about changes over long periods of time are extremely important to this endeavour. Observational research projects usually span only a few years and do not generate enough information for developing really sound temporal dynamic models.

*What are the implications for models of natural resource use?*

**Brandt:** If one wants to know how people manage ecological resources such as fisheries, forests, or fossil fuels, the relevant time scale is decades or, even better, centuries. It is not possible to develop an understanding of human behaviour on a timescale of a few years.

*What are the consequences for research at ZMT?*

**Brandt:** Modelling the use of resources is a very ambitious goal in today's complex societies. ZMT is committed to this goal, and projects that collect data over long periods

of time take preference. There are places where ZMT has kept up with research for up to 20 years. This approach is essential for developing a proper understanding of an ecological system and for being able to hopefully predict something about the future.

*People like to refer to Easter Island as a model for the world – how representative is it really?*

**Brandt:** Responsibility is the issue that is always under debate: did the Rapa Nui destroy themselves or were they the victims of external forces? These questions have been applied elsewhere: is humankind bound to destroy itself or can we prevent a global collapse by innovation? None of these questions can be answered easily. The case of Easter Island clearly demonstrates that there is still a great deal of uncertainty about the ultimate consequences of resource overexploitation. Using a mathematical model one can figure out a plausible scenario, but other possibilities cannot be completely ruled out. One really needs to have a very intimate understanding of a system in order to make sound predictions about its fate.

### The latest from Easter Island

**Gunnar Brandt and Agostino Merico** from the Systems Ecology group at ZMT have compiled existing data on the history of Easter Island and have used them in combination with a mathematical model to scrutinise plausible scenarios about the end of the ancient Rapa Nui society. Their results show that the people of Easter Island did not exploit their resources to an extent that would have caused an abrupt collapse, nor was the arrival of the Europeans the main reason for the collapse. Instead, the gradual overuse of natural resources combined with the arrival of Europeans caused a slow but inexorable demise. (See publications p. 4)

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## Successful

### International knowledge-sharing workshop

With a focus on the theme of “Science for Sustainability –The Contribution of Transdisciplinary Knowledge Exchange”, ZMT and numerous prominent participants sent a clear signal about the growing social responsibility of science for the sustainable use of resources. 120 researchers from all over the world as well as representatives of governments, international organisations like the World Bank, the World Wildlife Fund (WWF) and the United Nations debated the issues at ZMT in Bremen and elaborated valuable recommendations for good practice in the exchange of knowledge. With great dedication and collaborative teamwork, ZMT bundles energies from across the globe for this purpose. [> READ MORE](#)

## Highly promising

### Indonesia plans extensive cooperation with ZMT

ZMT has been working together with Indonesian partners for decades. But cooperation in marine research is now set to become much closer. The Indonesian Coordinating Minister of Maritime Affairs and member of ZMT’s Scientific Advisory Board, Indroyono Soesilo, is planning a pilot project on sustainable coastal fishery and integrated aquaculture. Collaboration is also due to include a coral reef observation station, and the cultivation and industrial exploitation of marine algae. [> READ MORE](#)

## Statement

### Policy paper on the importance of river catchments for coastal zones drawn up at ZMT

Rivers are a continent’s life blood – all the carbon, nutrients and contaminants they pick up along the way eventually flow into the oceans. Riverine input has implications for the functioning and structure of the ecology, economics and governance of coastal zones. However, the importance of rivers and their input in coastal zone habitats has been underestimated in the past and should be the focus of much greater attention and research – this was the conclusion drawn by many members of the German Marine Research Consortium (KDM) at a joint workshop held at ZMT in March 2015. With a view to MARE:N, a programme for coastal, marine and polar research to be funded by the Federal Ministry of Education and Research (BMBF), the specialists in German coastal and river research drew up a policy paper emphasising that sustainable coastal management worldwide needs to be based on a comprehensive understanding of the processes in river catchment areas. The policy paper was presented at the Hamburg Symposium “Küste 2025” in April 2015. [> READ MORE](#)

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## NEW FACES

ZMT welcomes **Anna-Katharina Hornidge**. In May 2015, the sociologist took on the new professorship in social sciences, a joint appointment with the University of Bremen. Hornidge has come from the Center for Development Research at the University of Bonn and will now build up and lead the new working group on Development and Knowledge Sociology in the Department of Social Sciences. [> READ MORE](#)



Funded by a fellowship from the Alexander von Humboldt Foundation, **Nesar Ahmed** has been working in the Social-Ecological Systems Analysis group at ZMT since the beginning of 2015. An aquaculture specialist, he holds a professorship at Bangladesh Agricultural University and will focus on the impact of climate change on coastal aquaculture, approaching the issue from an ecological and socio-economic perspective. [> READ MORE](#)



Furnished with a scholarship from the Japanese Nippon Foundation (NF) and POGO (Partnership for Observation of the Global Oceans), the young marine scientist **Sri Nandini** from Fiji will join the international team at ZMT for part of her training – thanks to ZMT’s collaboration with the NF- POGO Centre of Excellence at the Alfred Wegener Institute in Bremerhaven. [> READ MORE](#)



## PUBLICATIONS

### Articles

#### Can institutional change theories contribute to the understanding of marine protected areas?

G. W. de Morais et. al., March 2015, Global Environmental Change 31, 154-162. DOI: 10.1016/j.gloenvcha.2015.01.008

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#### Spatial variations in wave transformation and sediment entrainment on a coral reef sand apron.

D. L. Harris et. al., May 2015, Marine Geology 363, 220-229. DOI: 10.1016/j.margeo.2015.02.010

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#### The slow demise of Easter Island: insights from a modeling investigation.

G. Brandt & A. Merico, 2015, Frontiers in Ecology and Evolution 3:13. DOI: 10.3389/fevo.2015.00013

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