

**Stellungnahme zum  
Leibniz-Zentrum für Marine Tropenökologie (ZMT)  
Bremen**

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## Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.<sup>1</sup>

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Für die Bewertung einer Einrichtung setzt der Senatsausschuss Evaluierung (SAE) Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein. In diesem Fall konnten die Fachressorts nicht wie üblich bei den Beratungen im SAE angehört werden. Ein Fachressortvertreter war verhindert. Die Vertreterin des anderen zuständigen Ressorts sagte aufgrund von Anreiseproblemen kurzfristig ab.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 2. und 3. Mai 2013 das Leibniz-Zentrum für Marine Tropenökologie (ZMT) in Bremen. Ihr stand eine vom Institut erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das ZMT nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 20. März 2014 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

## 1. Beurteilung und Empfehlungen

Der Senat schließt sich den Beurteilungen und den Empfehlungen der Bewertungsgruppe an.

Das Leibniz-Zentrum für Marine Tropenökologie (ZMT) erforscht die Ökologie tropischer und subtropischer mariner Küstensysteme sowie deren Ressourcen, Funktionen und Resilienz gegenüber natürlichen und anthropogen verursachten Umweltveränderungen. Die dabei vom ZMT übergreifend bearbeiteten Themenfelder sind von hoher Relevanz für die globale Meeres- und Umweltforschung. Insbesondere zeichnet sich das Institut durch die Verbindung natur- und sozialwissenschaftlicher Ansätze zur Beantwortung drängender ökologischer Fragen in tropischen marinen Ökosystemen aus. Mit diesem Ansatz verfügt das ZMT, sowohl innerhalb der deutschen Meeresforschung als auch im internationalen Vergleich, über ein deutliches Alleinstellungsmerkmal.

Das ZMT wurde 1991 als An-Institut der Universität Bremen gegründet. In den ersten Jahren konzentrierte sich das Institut überwiegend auf die Bearbeitung langfristiger, durch das Bundesministerium für Bildung und Forschung finanzierter Projekte. Diese trugen wesentlich zum Aufbau wissenschaftlicher Infrastrukturen in den Tropen bei, von denen das Institut heute maßgeblich profitiert.

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<sup>1</sup> Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e.V.

Die Aufnahme in die gemeinsame Bund-Länder-Förderung 2009 entfaltete eine beeindruckende Dynamik am ZMT. Entsprechend der Empfehlung des Wissenschaftsrats, die erfolgreiche Entwicklung zu sichern und auszubauen, konnten bereits 2010 vier Leitungspositionen, darunter die der Direktorin, in gemeinsamen Berufungsverfahren besetzt werden, so dass nunmehr sechs der vorgesehenen acht leitenden wissenschaftlichen Positionen am Institut besetzt sind. Die Projekte wurden in vier wissenschaftlichen Abteilungen sowie einer Service- und Infrastrukturabteilung organisiert. Parallel dazu baute das ZMT sein Forschungsprogramm thematisch aus. Dieser Aufbau des Instituts ging mit einer deutlichen Steigerung der Beschäftigtenanzahl einher.

Derzeit schließt das ZMT den mit Aufnahme in die Leibniz-Gemeinschaft vorgesehenen Ausbau mit der gemeinsamen Berufung der beiden noch nicht besetzten Arbeitsgruppenleitungen sowie einer unmittelbar anstehenden Nachfolgeberufung ab. Darüber hinausgehend möchte das ZMT in den nächsten Jahren drei bis vier drittmittelfinanzierte Nachwuchsgruppen einrichten. Das damit verbundene Wachstum muss jedoch auch mit einer weiteren Ausgestaltung und Präzisierung abteilungsübergreifender Fragestellungen einhergehen. Ziel des ZMT muss es sein, zukünftig noch stärker innerhalb der Umweltwissenschaften international hervorzutreten.

Die **Arbeitsleistungen** der Abteilungen „Biogeochemie / Geologie“, „Ökologische Modellierung“ und „Sozialwissenschaften“ werden als „sehr gut“ bewertet. In der Abteilung „Ökologie“ werden zwei Arbeitsgruppen als „sehr gut“ und drei Arbeitsgruppen als „gut“ eingeschätzt. Hinweise für Verbesserungen enthält der Bewertungsbericht. Übergreifend erbringt das ZMT herausragende Beratungsleistungen in den tropischen Zielländern. Der Transfer von Forschungsergebnissen in lokale Anwendungskontexte gelingt beeindruckend gut und sollte, wie vom ZMT vorgesehen, durch die Etablierung einer eigenständigen, für den Wissenstransfer zuständigen Arbeitsgruppe gestärkt werden. Zur qualitativen und quantitativen Steigerung der Publikationsleistungen sollte das ZMT seine Strategie unter Beachtung der im Bewertungsbericht näher ausgeführten Hinweise fortentwickeln.

Die Mittel der institutionellen Förderung sind auskömmlich. Das ZMT sollte den Anteil der **Drittmittel** am Gesamthaushalt weiter steigern und wie geplant die Drittmittelquellen noch stärker diversifizieren. Der Senat unterstützt die Überlegungen der Geldgeber, die räumliche Ausstattung des ZMT entsprechend dem weiteren Wachstum des Instituts dauerhaft durch eine Baumaßnahme zu verbessern.

Das ZMT verfügt über enge Kontakte zu **Partnerinstitutionen** der deutschen Meeresforschung. Auch kooperiert es erfolgreich mit den beiden Bremer Universitäten in Forschung und Lehre sowie in der Betreuung der am Institut Promovierenden. Innerhalb der Leibniz-Gemeinschaft ist das Institut ebenfalls sehr engagiert. Die Zusammenarbeit mit wissenschaftlichen und nichtwissenschaftlichen Partnern in den Ländern der tropischen Untersuchungsregion ist dauerhaft und für beide Seiten ertragreich. An der Ausbildung ausländischer Wissenschaftlerinnen und Wissenschaftler beteiligt sich das Institut mit großem Engagement.

Das Institut hat auf der Ebene unterhalb des wissenschaftlichen Leitungspersonals ein ausgeglichenes **Geschlechterverhältnis** erreicht. Seit 2010 wird es von einer Direktorin geleitet. Entsprechend den verbindlichen Vorgaben führte das ZMT das Kaskadenmodell ein. Zukünftig muss es seine Anstrengungen zur Anwerbung von leitenden Wissenschaftlerinnen jedoch weiter steigern.

Der **Wissenschaftliche Beirat** begleitet das ZMT engagiert. Zukünftig sollte er aber das Institut insbesondere bei der Präzisierung übergreifender Forschungsfragen noch stärker unterstützen.

Das ZMT widmet sich mit seinen übergreifend und langfristig angelegten Forschungen hochrelevanten Fragen der globalen Umweltwissenschaften und hat sich durch die Verbindung von natur- und sozialwissenschaftlichen Ansätzen ein wichtiges Alleinstellungsmerkmal erarbeitet. Durch den in der Vergangenheit mit großem Erfolg betriebenen Aufbau wissenschaftlicher, struktureller und technischer Kapazitäten in den Ländern der tropischen Untersuchungsregion verfügt das ZMT zudem vor Ort über wichtige dauerhafte Kontakte. Das ZMT wird sehr überzeugend einem breiten Aufgabenspektrum gerecht, das von der Verbesserung des Verständnisses drängender globaler Umweltfragen im Rahmen des globalen Wandels bis hin zum Wissenstransfer in lokale Anwendungskontexte reicht. In dieser Form können die Aufgaben des Instituts nicht an einer Hochschule wahrgenommen werden. Eine Eingliederung des ZMT in eine Hochschule wird daher nicht empfohlen. Das ZMT erfüllt die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu stellen sind.

## 2. Zur Stellungnahme des ZMT

Der Senat begrüßt, dass das ZMT beabsichtigt, die Empfehlungen und Hinweise aus dem Bewertungsbericht bei seiner weiteren Arbeit zu berücksichtigen.

## 3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das ZMT als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

## Annex A: Status Report

### Leibniz Center for Tropical Marine Ecology (ZMT) Bremen

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## 1. Structure and tasks

### Development and funding

The Center for Tropical Marine Ecology (ZMT) was founded in 1991 as an institute at the University of Bremen under the guidance of the “*Verein zur Förderung der wissenschaftlichen Forschung der Freien Hansestadt Bremen e. V. (VFwF)*”<sup>1</sup>.

In 2005/2006, the ZMT was evaluated by the German Council of Science and Humanities (*Wissenschaftsrat*) in order to assess whether it met the criteria for the joint funding by the Federal and *Länder* Governments. As a result of the positive report, the ZMT became an associate member of the Leibniz Association in November 2006. Joint funding and full membership were accorded in 2009.

Responsible department in the *Land* hosting the ZMT: Senator for Education and Science of the Free Hanseatic City of Bremen

Responsible department at federal level: Federal Ministry of Education and Research (BMBF)

### Legal form and boards

In 2009, the ZMT was transformed into a limited liability company (GmbH) under German corporate law, and the institute's name was changed to *Leibniz-Zentrum für Marine Tropenökologie GmbH* (Leibniz Center for Tropical Marine Ecology).

Shareholder of the ZMT is the VFwF. Among other things, the shareholder meeting is responsible for amending the articles of association, regulating company share and parts thereof, granting discharge from liability to ZMT's Management and Supervisory Board, assessing the annual financial statement, including profit and loss, and appointing the annual auditor. The shareholder meeting takes place annually.

The Supervisory Board meets at least once, but usually twice per year. Its duties include the appointments of the International Scientific Advisory Board, the Managing Director, the Head of Administration, and the heads of department. Representatives of the State Government of Bremen (Senator for Education and Science) and of the Federal Ministry for Education and Research (BMBF) are appointed members of the Supervisory Board, taking the chair and vice-chair, resp.. Additional members are recruited from the directorates of the local universities, relevant research institutions, and economy.

The International Scientific Advisory Board consists of up to nine internationally recognised scientists from Germany and abroad. The Board critically reviews ZMT's research agenda and the Leibniz specific programme budget. Meetings take place at least once per year and are flanked by scientific talks, poster presentations and reports. The Board also holds audits between two regular external evaluations.

ZMT's Management (Managing Director and Head of Administration) meets on a weekly basis to decide jointly on institute matters, employment contracts, finances etc.

To advise ZMT's Management and Supervisory Board on major research-related questions, an internal Scientific Council was established in 2012. The heads of the

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<sup>1</sup> Association for the promotion of scientific research in the Free Hanseatic City of Bremen.

research departments (excluding the Managing Director) are ex officio members. The institute's research staff elected three additional members for a term of three years.

ZMT's Ombudsman is in charge of overseeing the institute's compliance with the Rules of Good Scientific Practice.

In 2010, a Works Council (*Betriebsrat*) was elected by ZMT's staff for a term of four years in order to represent the interests of the employees. The Works Council consists of seven members.

### **Mission**

ZMT's mission is the integrated scientific analysis of tropical marine coastal systems, their resources, sensitivity and reaction to natural changes and human interactions. Research focuses on the drivers of and the adaptations to environmental change in the social-ecological and socio-economical context including social-ecological feedback cycles as well as the impact of societal use and environmental changes on ecosystems. The ZMT emphasises that it is an inter- and trans-disciplinary institute with the goal of developing research-based knowledge as a basis for sustainable action plans.

The ZMT uses an integrated approach combining natural and social sciences to address its research topics. Moreover, the ZMT places great value on working with its tropical counterparts in partnerships of equals. This is achieved through joint projects and joint education of scientists.

### **Organisational structure**

A new organisational structure was put in place in 2011. It designates four scientific departments (Biogeochemistry and Geology, Ecological Modelling, Ecology, and Social Sciences) headed by professors. The heads of department are appointed by the Supervisory Board for a period of five years. A fifth department comprising infrastructure and service is led by the head of administration (see appendix 1: Organisational Chart).

### **National and international scientific environment**

According to the ZMT, with its exclusive focus on tropical coasts and the interdisciplinary nature of its research, it is unique among German research institutions. Discipline-specific topics of tropical coastal research are also investigated at the Alfred Wegener Institute for Polar and Marine Research Bremerhaven (AWI), the Helmholtz Centre for Ocean Research Kiel (GEOMAR), Senckenberg am Meer (Wilhelmshaven), the Leibniz Institute for Baltic Sea Research Warnemünde (IOW), the Potsdam Institute for Climate Impact Change (PIK), the Leibniz Institute for Global and Area Studies (GIGA, Hamburg), the Center for Development Research (ZEF, University of Bonn), the Freie Universität Berlin, the University of Göttingen, the University of Hamburg, and at the collaborating universities in Bremen. These institutes and universities, however, only seldom conduct research on tropical coasts and ecosystems and usually with a narrow disciplinary focus on individual aspects.

A number of institutes outside of Germany share some of ZMT's topical and geographic research foci, e.g. the Australian Institute of Marine Sciences (AIMS), the Australian Centre of Excellence for Coral Reef Studies, the Department of Environmental Affairs in

Cape Town, South Africa, the Labomar at Universidade Federal do Ceará (Fortaleza, Brazil) and the Centro de Investigación en Ciencias del Mar y Limnología (CIMAR, at Universidad de Costa Rica).

Some international institutes, such as the Global Change Institute (gciQ at University of Queensland, Australia), the French Institut de Recherche pour le Développement (IRD, Marseille) or the Smithsonian Institution (Washington, DC, USA), pursue a global research strategy, but are not solely focussed on marine sciences.

Other institutes concentrate on distinct ecosystems or natural science disciplines, whereas in some institutes the main research subject is largely social science-related, e.g. the Stockholm Resilience Centre or the Asia Research Centre at Murdoch University (Perth, Australia).

### **National interest and justification for funding as a non-university institution**

According to the ZMT, the tropics are characterised by the largest biodiversity of all climate zones, and at the same time are characterised by high rates of human population growth and rapid societal dynamics. Therefore, the tropics are at the focus of discussions on the global impact of environmental change for ecosystems and human welfare.

The ZMT seeks to enhance the understanding of tropical marine ecosystems and the interplay between their different components in order to develop strategies to overcome and mitigate negative developments. The objective is to identify feedback mechanisms between natural and anthropogenic drivers to enable predictions to be made on how ecosystem goods and services are affected in these social-ecological systems. Therefore local knowledge has to be integrated into scientific system models. This approach is in agreement with the recommendations made at the last United Nations Conference on Sustainable Development (Rio+20) and thus corresponds to a commitment also concerning Germany.

In accordance with the Leibniz' credo *theoria cum praxi*, ZMT's activities range from basic research to problem-oriented applied research with the objective of achieving the sustainable use of coastal systems and the transfer of knowledge. ZMT's overall agenda is fixed on a long-term basis in order to facilitate long-term partnership research. By fulfilling its tasks and services it is linking research to policy making including responses to political developments. According to the institute, ZMT's truly interdisciplinary approach and flexible, supporting infrastructure could not be executed at a university.

## **2. General concept and profile**

### **Development of the institution since the last evaluation**

Since the last evaluation (2005/2006), the ZMT has undergone a phase of rapid expansion and reorganisation including the appointment of four additional professors in 2010, two in conjunction with the University of Bremen and two with Jacobs University Bremen. As a consequence, four scientific departments were established in 2011: (1) Biogeochemistry and Geology, (2) Ecological Modelling, (3) Ecology, and (4) Social Sciences.



The ZMT has developed a research concept focusing on the effects of environmental changes (e.g. ocean acidification, warming, exploitation, and eutrophication) on the functioning of coastal and marine social-ecological systems in the tropics. More specifically, the loss of habitats and biodiversity and the consequent loss of ecosystem services is a major subject of research.

As the pressure on marine and coastal resources in the tropics is continuously increasing, the ZMT sees a need to improve the scientific basis for decision-making. Fisheries and aquaculture, tourism development, population growth and urbanisation, land reclamation and construction work, habitat destruction and biodiversity loss, as well as climate change with all its consequences in terms of sea level rise, storms and acidification etc., create a demand for new strategies for integrated coastal management and resource governance.

ZMT's research programme was initially formulated in 2009. Three refined programme areas will be fully implemented in 2013. All new research projects are designated to contribute to and advance these themes. The programme areas span the four scientific departments to build a research matrix.

#### Programme Area I: Ecosystem functioning and services

- Ia Tropical upwelling systems as resource providers and analogues for global change
- Ib Impact of stressors on engineering organisms – consequences for ecosystem services

#### Programme Area II: Ecosystem management and stakeholders

- Ila Terrestrial impact on coastal social-ecological systems
- Ilb Drivers of coastal and marine area management and protection

#### Programme Area III: Coordination

- IIIa Capacity building
- IIIb Research infrastructure
- IIIc Science management

## **Results**

### Research

Over the past three years, research projects at the ZMT resulted in 268 published articles in peer-reviewed journals, edited books and series, and other journals (2010: 80; 2011: 88; 2012: 100). Moreover, eight ZMT-edited or co-edited books and special issues were published (see appendix 2: Publications).

As a rule, ZMT's researchers publish their results in established, disciplinary journals. In addition, results from interdisciplinary projects are communicated in journals with a broader focus. The ZMT also aims to address its target groups in tropical countries and considers which journals are read by the local research communities. This translates into ZMT's strategy to publish in high-ranking journals in combination with spin-off products in local journals. Publishing in open-access journals is also becoming an important tool for reaching relevant target groups. As a service to the wider research community, some of ZMT's staff also serve on the editorial boards of several international scientific journals or books.

### Scientific service and infrastructure tasks

ZMT's infrastructure includes chemistry and biology laboratories, a marine experimental ecology facility (MAREE), a thin section laboratory, a scanning electron microscope laboratory, comprehensive IT-services, a scientific data archive, a library, and a data management system. Furthermore, the ZMT is involved in setting up field stations with local partners (e. g. in Brazil and Indonesia).

Technical staff also participates in method development, field campaigns, and research expeditions. Portable instruments are maintained to support fieldwork. Moreover, the technical staff supports the planning of field sampling to ensure the optimum quality of the data.

### Knowledge transfer and coordination

The ZMT provides scientific knowledge for management contexts and also engages in knowledge transfer to stakeholders. In the framework of several projects, the institute has communicated research outcomes to regional management representatives, agencies, state departments, and policy makers. Furthermore, ministries in Indonesia, for example, serve as research and coordination counterparts, ensuring that research questions address the needs of Indonesian research and policy and that the results are directly available for government institutions.

The ZMT intends to continue developing the institute's transfer activities with the support of a team dedicated to this task. A concept for the establishment of a transfer unit is currently being developed in order to adopt a strategic approach to the organisation of consultancy and transfer activities. The ZMT also serves as a point of reference for expert opinions. Since 2010, four reports have been produced for the private sector, governmental agencies and other organisations.

### **Academic events and public relations**

The ZMT actively organises, hosts and supports international scientific meetings, prepares work meetings, has a tradition of in-house seminars, and encourages its young researchers to participate in scientific conferences. Its scientists regularly present their results at conferences, symposia and workshops. In the years 2010–2012, a total of 249 talks were given by ZMT's staff.

The ZMT communicates its research to the general public to raise awareness for the challenges confronting tropical coastal ecosystems. Relevant activities include the institute's website, press releases on research highlights, contributions to journalism fora expert statements on current issues etc. In 2012, the ZMT started to issue a semi-annual newsletter which is prepared with an external journalist. ZMT's scientists also give public talks on their activities. Furthermore, the institute opens the doors of MAREE to interested groups and co-operates with regional science museums. It has participated in various exhibitions. Science is also transported into schools: the ZMT offers workshops, lectures and project days for pupils.

## **Strategic work planning for the next few years**

According to the ZMT, its long-term vision is to strengthen its position as a leading institution for the investigation of social-ecological systems in marine and coastal tropical environments. It intends to intensify its global research and education network and to act as the national contact point for scientists and politicians. In the future, it also sees itself as a science diplomacy institution for German research policy in general and the Leibniz Association in particular.

One of ZMT's main goals is to strengthen and further develop its interdisciplinary research approach in order to address research questions that require long-term data series and large-scale comparative approaches. ZMT's mid-term strategy (5-10 years) for research will address scientifically challenging and socially relevant, current developments in tropical regions with a focus on the following themes:

- Effects of global and local environmental change on tropical coastal ecosystems
- Effects of ecosystem changes on ecosystem services
- Usage patterns of ecosystems and their services, as well as the dynamics of and incentives for behavioural change influencing the sustainability of ecosystem usage and functioning
- Influence of governance structures and protection schemes on the sustainability of ecosystems

These topics will be addressed on different scales from organism to ecosystem level, thereby generating a stepwise increase in complexity.

In addition to the transfer unit already mentioned, the ZMT also intends to establish a dive unit. In response to the need for scientific diving, the ZMT is becoming an official and government-approved training facility accredited by the German Commission for Research Diving (KFT, *Kommission Forschungstauchen Deutschland*) in collaboration with the Alfred Wegener Institute for Polar and Marine Research (AWI). The first annual training course will be conducted in 2013 with a capacity of 12 divers.

## **Appropriateness of facilities, equipment and staffing**

The total revenue of the ZMT in 2012 was approx. 8.4 m€. Revenue from project funding and grants amounted to approx. 1.2 m€ (see appendix 2 for details). The ZMT considers its core budget to be sufficient at the moment, but anticipates that its future space development (see below), the basic cost for rent, infrastructure and equipment will increase such that it will require adjustment.

According to the ZMT, the increase in the number of staff in the last few years (from 79 staff members in 2009 to 163 in 2012) will continue in the future. The institute expects to have approx. 250 members of staff in 2015. In 2013, the institute plans to establish two more workgroups in the departments Biogeochemistry and Geology, and Social Sciences, namely those of the professors in ecotoxicology and social sciences. Further growth is expected when three junior research groups are established, two of which will be funded by BMBF grants (applied for) and one in collaboration with the University of Bremen under the Excellence Initiative (already granted).

The ZMT attempts to match the growth in scientific staff by an accompanying growth of technical and administrative personnel. Consequently, it envisages three to four

additional full time technicians for the laboratories, three additional staff for IT, and four more staff in core administration. Furthermore, the ZMT plans to employ a dive officer and four staff members for the new transfer unit. In ZMT's opinion, it will not be possible to cover the additional staff requirements from the core budget, even if the expected 5% growth continues after 2015. Therefore, the ZMT considers an increase in its core budget to be inevitable.

According to the ZMT, its technical equipment has continuously been updated over the last few years and is largely considered adequate. The planning and implementation of an ecotoxicological laboratory will start immediately after the arrival of the new professor. Following the appointment of a new professor for mangrove ecology (successor to the current mangrove workgroup leader), the biology laboratory will be extended according to the specific requirements.

With regard to space, the ZMT is currently spread out over three rented buildings. However, in the institute's view, the increase in personnel and equipment described above will necessitate expansion in terms of office and laboratory space. Latest analyses show that the overall development will require a doubling of the space presently used (i.e. an additional 4,100 m<sup>2</sup>). After having considered various alternatives, the ideal solution for the ZMT would be to move into a single coherent building on the campus of the "Technologiepark" where new building plots will become available in the next two years. As renting and moving would require additional funds, the ZMT intends to apply for two "extraordinary items of expenditure" (*Sondertatbestände*): one to cover the rise in overall running costs (permanent increase in the core budget) and a second, temporary one to cover the costs of the move and initial equipment.

### 3. Scientific departments at ZMT

#### **Biogeochemistry and Geology (15.5 FTE<sup>2</sup>)**

The Department of Biogeochemistry and Geology focuses on the investigation of the physico-chemical environment, the interaction of biota with this environment, material cycles, and biomineralisation. It investigates the effects of environmental change and anthropogenic disturbances on tropical coastal ecosystems on various temporal and spatial scales.

#### Work programme development

In the course of the re-structuring of the ZMT in 2011, the Department of Biogeochemistry and Geology was established with workgroups on Carbon and Nutrient Cycling, Ecological Biogeochemistry, Geoecology and Carbonate Sedimentology, and Wetland Dynamics. A more recent addition is the junior research group on Tropical Marine Microbiology. In 2013, a further workgroup on Ecotoxicology will be established. Starting late in 2013, a joint junior research group on Sea Level Change in the tropics will tighten the department's links to the University of Bremen via MARUM (Center for Marine Environmental Sciences). This group is jointly financed by the university under the third funding line of the Excellence Initiative, as well as by the ZMT.

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<sup>2</sup> Full time equivalents as of 31.12.2012

### Results

In the years 2010, 2011, and 2012, a total of 41 articles in peer-reviewed journals were published, and six more articles were accepted for publication. Moreover, four Ph.D. theses and ten Master's and diploma theses were completed. The department was involved in the organisation of several interdisciplinary workshops on an international level.

Research highlights include findings in the framework of several projects funded by the Federal Ministry of Education and Research (BMBF) such as LANCET (Land-sea interactions along coastal ecosystems of tropical China, Hainan), SPICE (Science for the protection of Indonesian Coastal Marine Ecosystem), GENUS (Geochemistry and ecology of the Namibia upwelling system), and MADURA (Water quality management in tropical coastal regions, Java, Indonesia). Further research projects generated insights into the carbonate chemistry along the Costa Rican Pacific coast, in Galápagos waters, and in the natural eutrophication of the shallow waters off Mauritania.

### Work planning

While the current themes studied in the Biogeochemistry and Geology Department will remain of great importance, new themes are being developed including eutrophication, ocean acidification, sea level change and ecotoxicology (new professorship).

In the future, interdisciplinary work with the other departments will be intensified by shifting from expedition-oriented projects to a combined approach involving observational, experimental, and modelling studies. A novelty will be the development of biogeochemical models of element fluxes in coastal aquatic systems under stress in cooperation with the Ecological Modelling Department. Within the ZMT, the ongoing collaboration with the Social Sciences Department will be strengthened in order to contribute to the understanding of (1) the societal drivers behind human activities impairing the performance and resource potential of aquatic ecosystems, (2) the feedbacks of these changes on the livelihoods of the local population and the governance of coastal regions, and (3) the role of the perception of change.

### Appropriateness of facilities

According to the ZMT, the new workgroups (Ecotoxicology and Sea Level Changes) necessitate the implementation of various analytical methods. Mass spectrometry and fieldwork will be expanded by including instruments for measuring greenhouse gases. A network of autonomously operating carbonate water chemistry observation stations in reefs will be built in Costa Rica. Furthermore, an FTIR spectrometer for the analysis of greenhouse gases will be purchased in 2013 financed as an "extraordinary item of expenditure" (*Sondertatbestand*).

The recently installed thin section and SEM laboratories are state-of-the-art. The workgroups increasingly use the MAREE for biomineralisation and geochemical studies. The chemical and biological equipment is appropriate; however, the basic laboratory infrastructure is reaching the end of its lifespan and new equipment requires additional space. Currently, the biological laboratory is expanding to include molecular ecology and microbiology techniques.

## **Ecological Modelling (12.5 FTE<sup>3</sup>)**

Mathematical modelling has been an important aspect at the ZMT since its foundation in 1991, with trophic modelling being the first tool used for ecosystem analysis and resource management. The department develops and uses mathematical models for different levels of biological and ecological organisation and on different spatial and temporal scales. Exchange of energy and materials, species interactions and disturbances create complex patterns in the spatial and temporal distribution of organisms and drive the cycling of carbon and other major nutrients. The investigation of such patterns, their relationships to ecological and biogeochemical processes and to changing environmental and social conditions are central to the research activities.

### Work programme development

In 2010, a joint professorship with the Jacobs University Bremen was established to broaden the activities to include biogeochemical modelling and the adaptive dynamics of ecological traits. As part of the reorganisation of the institute in 2011, three modelling workgroups were designated to form the Ecological Modelling Department: (1) Resource Management, (2) Spatial Ecology and Interaction, and (3) Systems Ecology.

### Results

In the years 2010, 2011, and 2012, a total of 30 articles in peer-reviewed journals were published, one more article was accepted for publication. Moreover, three Ph.D. theses and 17 Bachelor's, Master's and diploma theses were completed. The department was involved in the organisation of several interdisciplinary workshops as well as in capacity building and teaching.

Research highlights include the development of various models, e.g. a new model on benthic competition in coral reef ecosystems, a coral polyp model, and an adaptive model to investigate the co-evolution of human harvesting behaviour and common pool resource systems. Moreover, a trophic modelling approach, which was combined with fisheries and environmental time-series, has yielded interesting results with regard to the structure and functioning of Galápagos ecosystems.

### Work planning

In the future, the department wants to investigate a number of new scientific issues on the organism, community, and ecosystem levels. On the organism level, the plan is to continue developing the coral polyp model to include key metabolic processes within the coral-zooxanthellae symbiosis. In particular, the aim is to identify tipping-points for multiple environmental parameters (including light, temperature, nutrients, and pCO<sub>2</sub>) at which nutrient and/or polysaccharide fluxes between host and symbionts become inefficient or energetically too expensive. A crucial question for ecological sustainability is whether the use of resources will be able to shift continually as needed, or whether all resources will eventually be exhausted. This will be tackled by constructing models that link population dynamics and renewable resource dynamics. Moreover, the analyses of time series on fisheries, climate and oceanographic data will help to understand the drivers of ecosystem changes.

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<sup>3</sup> Full time equivalents as of 31.12.2012

### Appropriateness of facilities

In the Ecological Modelling department, additional Ph.D. students were recently acquired through third-party funded projects. While sufficient for the time being, the computational infrastructure will have to be adapted to the requirements of the growing department. The applied modelling approaches can, however, be used without involving data processing centres. Taking into account the current office situation and conceivable growth, office space needs to be adjusted.

### **Ecology (21.5 FTE<sup>4</sup>)**

The Department of Ecology investigates the function of and the threats to tropical coastal marine ecosystems including coral reefs, mangrove forests, and seagrass meadows. Particular focus is put on the influence of upwelling events, seasonality, and natural acidification. The research topics range from organisms' response to and recovery from multiple disturbances, via population dynamics, to the understanding of ecosystem functioning and services.

### Work programme development

In 2010, the department's profile was strengthened by the appointment of a new professor for coral reef ecology. Based on the recommendations made at ZMT's last evaluation a structure with four workgroups was introduced in 2011: Reef Ecology, Ecophysiology, Fisheries Biology, and Mangrove Ecology. In June 2012, a junior research group on Algae and Seagrass Ecology was added to the department.

### Results

In the years 2010, 2011, and 2012, a total of 78 articles in peer-reviewed journals were published, six articles were accepted for publication. Moreover, 16 Ph.D. theses and 48 Bachelor's, Master's and diploma theses were completed. In October 2011, the department, in cooperation with MARUM and the University of Hamburg, organised a BMBF-funded training cruise for South African students aboard the *Maria S. Merian* in Namibian waters. This approach of combining science-driven fieldwork on a research vessel with intensive training activities will be continued in the future.

The department participates in the large-scale projects SPICE and GENUS. Research highlights include findings relating to organic carbon release by scleractinian corals, the composition of coral reef-associated, biofilm-forming bacterial communities and their active responses to experimental ocean acidification in the Australian Great Barrier Reef, distribution, growth and physiological performance of early stages of key species of an upwelling system, spatio-temporal patterns of biodiversity and community composition in an Indonesian mangrove forest, and mangrove crab behaviour.

### Work planning

In the future, the main research focus will lie on the ecology of ecosystem engineers such as corals, macroalgae, seagrasses, crustaceans and fish, as well as mangroves. It will be investigated how multiple stressors affect the physiology, behaviour and life performance (growth, reproduction) of these organisms, and how this can affect

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<sup>4</sup> Full time equivalents as of 31.12.2012

ecosystem functioning and services. The goal is to reveal the complexity of the ecological and social interactions. Furthermore, the department will continue to analyse stress-related physiological adaptation to environmental changes in key species and their ecosystems.

As anthropogenic activities on land, like deforestation, aquaculture, and urban development, will increase sediment and nutrient input into coastal waters, the department will strengthen the links between land-based activities and community dynamics in coastal ecosystems.

#### Appropriateness of facilities

Over the last few years, the department has continued to develop its capacity for *in situ* measurements in the field. In 2011 and 2012, additional PAM (pulse-amplitude modulated) devices, *in situ* loggers for key environmental parameters along with a portable gas chromatograph to measure nitrogen fixation rates were purchased and now supplement ZMT's *in situ* measuring capacities.

The MAREE facility is becoming an ever more valuable instrument. The installation of a new mesocosm setup will be completed by March 2013, so that long-term experiments on the biogeochemical role of ecosystem engineering organisms like hard corals, seagrasses, and macroalgae can start. Apart from this opportunity, MAREE has all the technical prerequisites for conducting controlled experiments to distinguish between the effects of different relevant factors that occur in the field simultaneously.

As for all departments, the workgroup leaders are expected to acquire third-party funding in order to expand staffing and obtain funding to address new research developments. Therefore, there is a need for additional laboratory space, additional and renewal of tools, field equipment and infrastructure with increasing staff.

#### **Social Sciences (12.5 FTE<sup>5</sup>)**

This department contributes to the objective of providing scientific advice on sustainable management. The intention is to improve the understanding of the role of humans in ecosystems and the importance of the ecosystem to society. It also aims to enhance understanding of how the human impact on the ecosystem can be altered by governance mechanisms.

#### Work programme development

Social science expertise at the ZMT has greatly expanded over the past few years. Since 2010, the number of the members of department has doubled, and several new projects have been started. In addition to the existing workgroup on Social-Ecological Systems Analysis, a workgroup on Institutional and Behavioural Economics was established in 2010. The Social-Ecological Systems Analysis group has a theoretical background in resilience alliance and human ecology. The Institutional and Behavioural Economics group, which mainly analyses collective dilemmas related to coastal and marine resources, largely follows a common pool resource approach. Since November 2011, the department has also hosted a temporary Leibniz Chair in social anthropology.

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<sup>5</sup> Full time equivalents as of 31.12.2012



In 2011, a meeting was organised to identify the strengths of the department and the best field for a third permanent workgroup. This resulted in the announcement of a second social sciences professorship position which is currently in the appointment procedure.

### Results

In the years 2010, 2011, and 2012, a total of 34 articles in peer-reviewed journals were published, and two more articles were accepted for publication. Moreover, two Ph.D. theses and 16 Bachelor's, Master's and diploma theses were completed. The department was also involved in organising conferences at national and international level, in teaching and capacity building, and in contributing to ZMT's public relations activities.

Research highlights include the development of an environmental history approach in which archival and empirically collected data are utilised to analyse changes in coastal social-ecological systems over time, as well as findings relating to sustainable and unsustainable behaviour of the local population in the handling of natural resources. The research within the SPICE programme has focussed on the potentials of locally self-organised marine management in reaction to technical, economic and climate change. In order to find a solution to reducing the use of plastic bags – an important factor in coastal pollution – a natural experiment using various incentives was conducted in Indonesia. Furthermore, questions of environmental and institutional economics are addressed applying the tools of dynamic modelling. Those projects are in collaboration with various different workgroups of the ZMT and the Jacobs University.

### Work planning

In the future, the ZMT expects the contribution made by the social science to interdisciplinary research endeavours to increase. The multi- and interdisciplinary projects involving the natural and social sciences will be problem-oriented and theory-guided.

A junior research group with a focus on the resilience of Pacific island coral reef social-ecological systems, which was recently applied for through BMBF, could develop existing expertise and strengthen the cooperation between the Social Sciences and Ecology Departments yet further. In addition, efforts are underway to establish a junior research group on resource economics.

### Appropriateness of facilities

The workgroups already in existence aim for continued growth subject to the success of applications for third-party funding. The particular emphasis will be on funding for postdoctoral staff. As the department is expected to expand substantially in the near future, in particular by establishing the new workgroup, the space constraints affecting the entire institute also apply to the Department of Social Sciences.

## 4. Collaboration and networking

### Collaboration with universities

The ZMT is a contractual collaborative partner of the University of Bremen (four joint appointments of professors including the current director and three further joint professorships under preparation) as well as of Jacobs University Bremen (two joint appointments of professors). In addition, several of ZMT's workgroup leaders hold a *venia legendi* from the University of Bremen granting them the right to teach and supervise Ph.D. students.

Within the framework of the German Excellence Initiative, a joint junior research group with MARUM, mutually financed by the ZMT and the University of Bremen, will further strengthen existing ties. Additional research collaborations with the University of Bremen currently exist in the context of the research projects SPICE, GENUS, LANCET, and CARIMA.

In Germany, there are partnerships with the University of Oldenburg's Institute for Chemistry and Biology of the Marine Environment (ICBM), participating in the new graduate school SUTAS (Sustainable use of tropical aquatic systems), with three departments at the University of Hamburg (Institute for Biogeochemistry and Marine Chemistry, Institute for Hydrobiology and Fisheries Science, Institute of Oceanography) and with the Institute for Geosciences at Kiel University. In addition, collaborations exist with the universities of Vechta, Giessen, Göttingen, Munich (LMU), Hanover, Rostock, and Aachen (RWTH).

The ZMT also fosters research collaborations with many university partners abroad. It maintains about 40 Memoranda of Understanding with research institutions and universities worldwide. These collaborations are of special importance to ZMT's fieldwork because they provide a formal framework for local access to study areas, export of material, and the exchange of scientists. Partner universities are located, among others, in Jordan, the USA, Ecuador, Tanzania (Zanzibar), China, and Switzerland.

### Collaboration with other institutions in Germany and abroad

Within Germany, the ZMT is part of several networks including, among others, the Max Planck Institute for Marine Microbiology (Bremen), the Alfred Wegener Institute for Polar and Marine Research (Bremerhaven), the Leibniz Institute for Prevention Research (BIPS, Bremen), the Helmholtz Centre for Ocean Research (GEOMAR, Kiel), the Helmholtz Centre for Materials and Coastal Research (HZG, Geesthacht), the Leibniz Institute for Baltic Research (IOW, Warnemünde), and *Senckenberg am Meer* (a subdivision of the Senckenberg Society at Wilhelmshaven).

Under the umbrella of the German Marine Research Consortium (KDM), Germany's marine research institutions work together closely to find common ground and provide support in direct dialogue with political interest groups. ZMT is a partner in the consortium.

Abroad, the ZMT fosters close linkages its research partners in the tropics by cooperation agreements in the framework of joint projects and / or by signing Memoranda of Understanding that facilitate research activities in the host countries. Two members of ZMT's staff served as director of marine sciences at the Charles Darwin

Foundation in Galápagos (2007-2010 and 2011-2012). Another strong partner is the Department of Environmental Affairs (DEA, Cape Town, South Africa). As a rule, ZMT's projects are almost exclusively planned and implemented in conjunction with foreign partners.

The ZMT actively supports extended visits by scientists from abroad to develop research synergies. Presently, more than one third of the institute's staff originates from abroad; amongst Ph.D. candidates, the share is over half. Between 2010 and 2012, the ZMT hosted 150 scientific guests principally from tropical partner countries (including 85 guests who stayed for more than one week). In the same period, ZMT's researchers went on 100 research visits (lasting more than one week) to other scientific institutions in Germany and abroad. Eleven research cruises involving 37 ZMT staff were organised during this period.

## 5. Staff development and promotion of junior researchers

### **Staff development and personnel structure**

As a consequence of the last evaluation (2005/2006), the ZMT has significantly increased its staff. Besides the four professors appointed in 2010 (one per department), two junior research groups and a Leibniz Chair have extended the institute's profile. The total number of personnel increased from 79 in 2009 to 163 in 2012 (for details see appendix 4).

In 2010, the ZMT appointed a new director, who is also head of the Department of Biogeochemistry and Geology, and three new heads of department (Ecological Modelling, Ecology, and Social Sciences) to professorial positions that were created in response to the evaluation in 2005/2006. As this evaluation also recommended broadening the disciplinary spectrum, the ZMT will hire another two professors (for Ecotoxicology and Social Anthropology) in 2013. In the run-up to the retirement of the leader of the workgroup on Mangrove Ecology (Ecology Department), a third professor is currently being recruited.

### **Promotion of gender equality**

Currently, about 50% of all employees at the ZMT are female. Among the scientific employees, 30 out of 68 are women. Presently, the institute is adopting a flexible quota-system for scientists in order to establish a discipline-specific level of representation of women in the various status groups. When hiring the three new professors, the ZMT will give preference to female scientists provided that they have the right qualifications.

At present, two out of 14 scientists on permanent contracts are female. In 2012, the ZMT introduced a new funding scheme for the establishment of junior research groups providing financial support for four years. The ZMT managed to recruit two female scientists at this level. Further measures to promote women include the lecture series "Women in Science", a special mentoring programme, and a family-friendly working environment. ZMT's first women's representative is to be elected in spring 2013.

### Promotion of junior researchers

In the reporting period (2010-2012), no *habilitations* were completed at the ZMT and no junior professorships were established with cooperating universities. Nevertheless, in order to promote postdocs, the ZMT has implemented various measures: two junior research group leaders were appointed, and three additional junior research group leaders are expected to join the ZMT in 2013. Young group leaders have the opportunity to take part in special leadership training. Also, the ZMT will promote junior research group leaders by allowing them to participate in the Helmholtz Academy.

The ZMT supervises 60 Ph.D. students<sup>6</sup> on regular contracts or scholarships. In the years 2010, 2011, and 2012, 22 doctoral degrees were completed by candidates who were either employed at the institute, or in receipt of a scholarship, and/or were supervised by ZMT's researchers.

The ZMT offers a structured doctoral programme and provides support and supervision for completing a dissertation within three years. This includes regular support from a panel of supervisors who meet with the candidate at least once every six months to discuss the progress of the thesis. Since 2011, ZMT's scientists have cooperated on drawing up a supervision agreement which is signed by every scientist supervising Ph.D. students at the ZMT to ensure the quality of objectives and supervision standards. In addition, during the course of their doctoral project, every student is expected to participate at least once in an international conference by presenting a talk or poster. The Ph.D. students at the ZMT have elected a representative body to provide a forum for their interests and to communicate them to ZMT Management.

In the framework of the Excellence Cluster MARUM, the ZMT is one of the organisers of the Graduate School GLOMAR (for Marine Sciences), initiated in the first round of the "Excellence Initiative". Currently, 15 of ZMT's Ph.D. students are affiliated with GLOMAR. Furthermore, the ZMT is involved in the Bremen International Graduate School in the Social Sciences (BIGSSS).

Starting in January 2013 with initial funding from the Leibniz competitive procedure (SAW), the graduate school SUTAS (Sustainable use of tropical aquatic systems) combines ZMT's expertise with that of other Leibniz institutions and partner universities to promote a structured, interdisciplinary graduate training with a focus on the societal context.

Moreover, the ZMT is a partner in the Colombian-German Ph.D. graduate programme CEMarin (at the University of Santa Marta, Colombia) run by the German Academic Exchange Service (DAAD). Currently, four Ph.D. students are affiliated with CEMarin, while two ZMT professors give lectures in the programme.

In line with its new Ph.D. programme, the ZMT offers exceptionally fast Ph.D. students extended contracts in order to give them the opportunity to complete publications and write their first proposals for a third-party funded project: if Ph.D. students complete their thesis within 33 months, the ZMT will extend their employment contracts for an additional three months.

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<sup>6</sup> as of 31.12.2012

In 1999, the ZMT launched the first Master's programme to be taught in English at the University of Bremen, ISATEC (International Studies in Aquatic Tropical Ecology), and still contributes significantly to the lecture programme. 34 out of 73 Master's and Diploma theses completed at the ZMT in the years 2010, 2011, and 2012 were undertaken in the framework of the ISATEC programme.

### **Vocational training for non-academic staff**

As of summer 2011, the ZMT is an authorised training employer and is currently hosting four trainees, two of whom are supervised in the IT Department. The ZMT library is training a specialist in media and information services, and one trainee will become an office communication specialist. One further trainee position in the field of electronics is scheduled for autumn 2013.

The non-academic staff at the ZMT is regularly given the opportunity to participate in training courses, e.g. on laboratory equipment or techniques, or on special software.

## **6. Quality assurance**

### **Internal quality management**

According to the ZMT, various measures to ensure high quality research standards have been introduced: In 2011, the ZMT appointed an ombudsperson, who acts as the point of contact in cases of suspected scientific misconduct. As part of ZMT's Ph.D. programme, young researchers are called upon to observe the rules of good scientific practice as formulated by DFG.

The ZMT contributes to the Leibniz Association's annual *Pakt-Monitoring*<sup>7</sup>. Since 2012, the data on performance indicators have been entered into a central database system. In the coming years, this tool will be expanded to support ZMT's performance evaluation and provide data for benchmarking.

The ZMT has also introduced performance-related funding as an incentive for scientists. This includes projects funded from the core-budget that are granted – in addition to strategic considerations – on the basis of the applicants' performance.

### **Quality management by the Scientific Advisory Board**

The International Scientific Advisory Board regularly assesses the scientific development of the institute. It evaluates the performance indicators, discusses strategies, and provides constructive advice with respect to the institute's long-term objectives. It meets annually for two days. After the meeting, the chair of the board provides detailed feedback to the heads of department, followed by a briefing for the assembled ZMT staff. The chair of the International Scientific Advisory Board reports to the Supervisory Board. The outcome of performance indicators is regularly reviewed by both the International Scientific Advisory Board and the Supervisory Board.

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<sup>7</sup> Control and analysis of the Leibniz institutes' development supported by a five percent increase of the core budget in the years 2011 to 2015.

## **Implementation of recommendations from the last external evaluation**

The recommendations from ZMT's last evaluation conducted by the German Council of Science and Humanities (*Wissenschaftsrat*) in 2005/2006 (in italics), were addressed by the ZMT as follows:

1. *The International Scientific Advisory Board is expected to accompany ZMT's development process and to advise with particular respect to the conversion of its research concept into a medium-term research programme.*

The International Scientific Advisory Board was established in 2005 and has since adopted the council's recommendations. The board critically evaluates ZMT's scientific output and its overall progress, and is actively involved in discussions on its future strategic orientation. It also advises developing the structure of the institute. In line with the rules and procedures of the Leibniz Association, the board held a mid-term audit in 2010.

2. *The ZMT needs to build stable structures and organisational solutions to manage the upcoming expansion.*

In 2011, the ZMT introduced a departmental structure. Each department consists of several workgroups led by senior scientists. In addition, junior research groups were established. Each department is headed by a senior workgroup leader who attends the department leader meetings.

Strategic discussions and decision-making processes are implemented in a transparent way to allow for participation. In order to facilitate communication, a range of meetings regularly takes place. In addition, a written communication scheme was developed by a team of workgroup leaders in cooperation with the director to clarify and optimise the flow of information within the ZMT.

Further developments include a structured doctoral programme, implemented in 2011, reliable storage of scientific data and information, and the Leibniz-specific Programme Budget allowing for better structuring of research themes and interdisciplinary cooperation.

3. *It is recommended to continue the interdisciplinary work across individual workgroups.*

At present, ZMT's research structure forms a matrix in which disciplinary departmental columns form the basis of interdisciplinary research lines.

4. *The smaller workgroups and departments need to be enlarged by adding new personnel.*

In 2010, four additional professors were appointed jointly with the University of Bremen (geology of the tropics, reef ecology) and Jacobs University Bremen (ecological modelling, social systems and ecological economics). The newly formed departments increased their personnel by acquiring third-party funding, as reflected by the number of Ph.D. students which increased by a factor of 3 compared to 2006 (2006: 21; 2012: 60). The overall number of scientific staff grew by a factor of 2.5 (2006: 37; 2012: 95). In 2012, two junior research groups were established. At least one additional junior research group will be established by the end of 2013. In 2011/2012, three professorial positions were advertised jointly with the University of Bremen.

5. *In order to compensate for expiring joint-projects like MADAM, the institute needs to make an effort at maintaining a high level of third-party funding.*

Traditionally, ZMT's research was conducted within the framework of a few large BMBF projects such as MADAM (Mangrove dynamics and management) and RSP (Red Sea Program). While large-scale BMBF projects still play an important role and have grown in number (currently: SPICE III and GENUS II), applications are now submitted to a broader range of funding agencies.

6. *The publication record is good, but is expected to increase in quality and quantity as projects reach maturity.*

The number of publications by ZMT's staff is rising steadily, not just in absolute numbers, but also in relative numbers. A comparison of this relative figure shows that ZMT's output per scientist is in the same range as that of other international marine institutes.

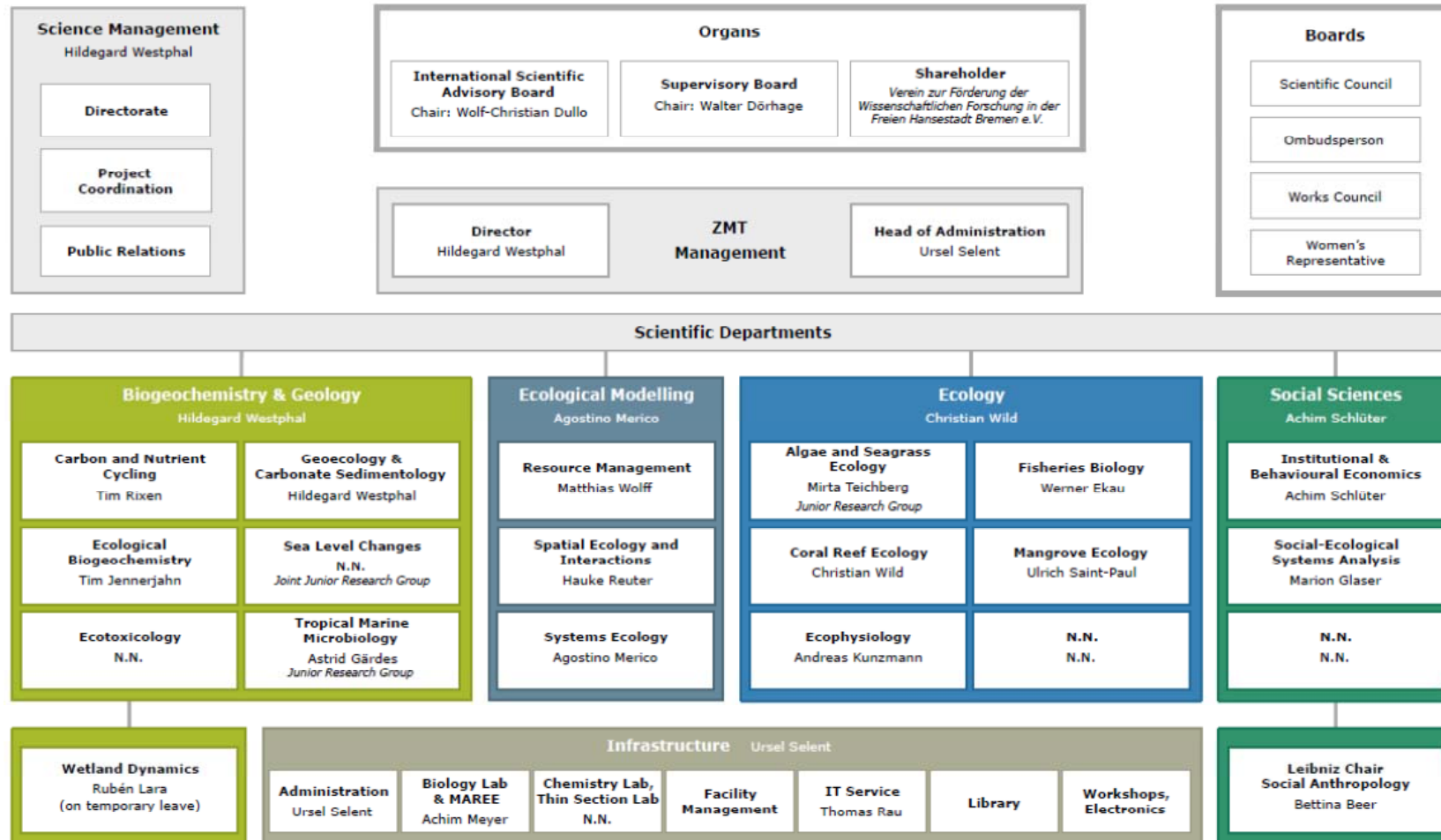
7. *Office space and laboratory facilities must grow in concert with the planned expansion of personnel. In the long run, a new building is needed.*

The increase in funding prepared the ground for the recommended growth in ZMT's scientific expertise and its rising number of staff. Since 2005, different measures have been undertaken sequentially to expand laboratory and office space. While these measures increased the space by about 50% compared to the levels of 2005, they remained largely inadequate because at the same time, the number of staff grew by almost 100%. An expansion is considered crucial to complete the path the institute has embarked upon.

Appendix 1  
Organisational Chart



Leibniz Center for Tropical Marine Ecology (ZMT)





## Appendix 2

## Publications and patents

	2010	2011 <sup>1</sup>	2012 <sup>1</sup>	<i>accepted</i> <sub>2</sub>
Publications in total	82	91+1	86+16	16
<i>thereof</i>				
Articles in peer-reviewed journals	47	52+1	55+16	13
Editorships	2	4	2	2
Articles in books and series	24	24	22	1
Articles in other journals	9	11	7	-
Monographs	-	-	-	-
<i>thereof number of cross-departmental publications</i>	4	5	5	2

## Publications per scientist

Number of scientists holding a Ph.D.	27	29	29
Number of publications per scientist holding a Ph.D.	3.0	3.2	3.5
Number of peer-reviewed journal articles per scientist holding a Ph.D.	1.7	1.8	2.5

<sup>1</sup> Publications available online ahead of print are indicated as +X.

<sup>2</sup> Contributions accepted, but not yet published.

Industrial property rights (2010-2012)	Granted	Registered
Patents	0	0
Other industrial property rights	0	0
Exploitation rights / licences (number)	0	

## Appendix 3

## Revenue and Expenditure

Revenue	2010			2011			2012 <sup>1</sup>		
	T€	% <sup>2</sup>	% <sup>3</sup>	T€	% <sup>2</sup>	% <sup>3</sup>	T€	% <sup>2</sup>	% <sup>3</sup>
<b>Total revenue (amount I., II. and III.; excluding DFG fee)</b>	<b>6545.1</b>			<b>7564.9</b>			<b>8357.0</b>		
<b>I. Revenue (amount I.1., I.2. and I.3)</b>	<b>6539.1</b>	<b>100.0</b>		<b>7494.8</b>	<b>100.0</b>		<b>8285.8</b>	<b>100.0</b>	
1. <i>Institutional funding</i>	5116.3	78.2		6487.2	86.6		7094.4	85.6	
1.1 Institutional funding (excluding construction operations and acquisition of property) by the federal government and states according to AV-WGL	5116.3			6487.2			7094.4		
1.1.1 <i>thereof received on the basis of the Leibniz Competition Scheme (SAW Scheme)<sup>4</sup></i>	0.0			0.0			0.0		
1.2 Institutional funding (excluding construction operations and acquisition of property) provided that it is not according to AV-WGL	0.0			0.0			0.0		
2. <i>Revenue from project funding grants</i>	1410.5	21.6	100.0	969.2	12.9	100.0	1150.2	13.9	100.0
2.1 DFG	40.6		2.9	145.1		15.0	153.7		13.4
2.2 Leibniz Association (competition scheme) <sup>4</sup>	0.0		0.0	0.0		0.0	0.0		0.0
2.3 Federal government (BMBF)	1147.6		81.4	603.5		62.3	847.6		73.7
2.3.1 - <i>thereof International Office IB BMBF</i>	133.3		9.5	61.9		6.4	86.0		7.5
2.4 EU	57.1		4.0	88.1		9.1	89.6		7.8
2.5 Private sector	66.9		4.7	56.4		5.8	48.0		4.2
2.6 Foundations	0.0		0.0	0.3		0.0	0.3		0.0
2.7 Other funding agencies	98.4		7.0	75.9		7.8	10.9		0.9
3. <i>Revenue from services</i>	12.3	0.2		38.4	0.5		41.2	0.5	
3.1 Revenue from contract work	2.1			2.3			0.0		
3.2 Revenue from publications	0.0			0.0			0.0		
3.3 Revenue from intellectual property rights with or without commercial protection rights by the ZMT	0.0			0.0			0.0		
3.4 Revenue for additional services	10.2			36.1			41.2		
II. <i>Miscellaneous revenue (e.g. membership fees, rent, reserve fund withdrawal)</i>	6.0			70.1			71.2		
III. <i>Revenue for construction operations</i>	0.0			0.0			0.0		

Expenditure	T€	T€	T€
<b>Expenditure (excluding DFG fee)</b>	<b>6402.8</b>	<b>7407.8</b>	<b>8196.3</b>
1. Personnel	3197.0	3742.8	4323.3
2. Equipment	2059.8	2410.1	2483.8
2.1 <i>thereof registration of commercial protection rights</i>	0.0	0.0	0.0
3. Equipment investments and acquisitions	634.1	623.4	1153.6
4. Construction operations, acquisition of property	227.7	89.5	14.9
5. "Reserves" (e.g. cash assets, expense carryovers)	251.8	538.6	220.7
6. Miscellaneous	32.4	3.4	0.0
<i>DFG fees (to the extent that they were paid by the institute: 2.5% of the revenue from institutional funding)</i>	142.3	157.1	160.7

<sup>1</sup> Preliminary values as of 30 December 2012.

<sup>2</sup> Percentage relationship between I.1 (institutional funding), I.2 (revenue from contributions for project funding) and I.3 (revenue from services).

<sup>3</sup> Percentage relationship between the various origins of revenue from project funding grants (I.2.1-I.2.7).

<sup>4</sup> Resources from the competitive scheme were awarded until 31.12.2010 within the framework of institutional funding. Since 1<sup>st</sup> of January 2011, resources have been awarded by the Leibniz Association as contributions to project funding.

## Appendix 4

**Staff**  
(as of: 31.12.2012)

	Full-time equivalents		Employees		Female employees	
	<i>total</i>	<i>on third-party funding</i>	<i>total</i>	<i>on temporary contracts</i>	<i>total</i>	<i>on temporary contracts</i>
	Total	%	Total	%	Total	%
<b>Research</b>	<b>45.46</b>	<b>25.30</b>	<b>68</b>	<b>80.88</b>	<b>30</b>	<b>93.33</b>
Director (W3) <sup>1</sup>	1.00	0.00	1	0.00	1	0.00
Department heads (W2 or equivalent) <sup>2</sup>	3.00	0.00	3	0.00	0	0.00
Workgroup leaders (C3, C2, E14, E13Ü)	7.20	0.00	9 <sup>3</sup>	0.00	1	0.00
Junior research group leaders (E14)	2.00	0.00	2	100.00	2	100.00
Scientists in non-executive positions (E13)	12.51	29.99	14	100.00	5	100.00
Ph.D. students (E13)	19.75	39.24	39 <sup>4</sup>	100.00	21	100.00

<b>Infrastructure</b>	<b>25.40</b>	<b>0.00</b>	<b>28</b>		
Head of Administration	1.00	0.00	1		
Heads of infrastructural groups	2.00	0.00	2		
Technicians (Biology Laboratory)	2.00	0.00	2		
Technicians (Chemistry Laboratory)	5.00	0.00	5		
Technicians (MAREE)	1.00	0.00	1		
Technicians (Thin Section and SEM)	1.00	0.00	1		
Administration	5.90	0.00	8 <sup>5</sup>		
Facility Management	1.00	0.00	1		
Information Technology (IT) service	4.00	0.00	4		
Library	1.50	0.00	2 <sup>6</sup>		
Workshops, Electronics	1.00	0.00	1		

<b>Science Management (Directorate)</b>	<b>8.75</b>	<b>28.57</b>	<b>9</b>		
Assistants	3.00	0.00	3		
Project coordination	3.75	66.67	4		
Public relations	1.00	0.00	1		
Secretariat	1.00	0.00	1		

<b>Student assistants</b>	<b>12.61</b>	<b>34.13</b>	<b>27</b>		
Apprentices	4.00	0.00	4		

<b>Sub-total</b>	<b>96.22</b>	<b>19.02</b>	<b>136</b>		
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<b>Staff with external funding</b>	<b>16.00</b>	<b>100.00</b>	<b>27</b>		<b>17</b>
Guest scientists with external funding	6.00	100.00	6		4
Ph.D. students with scholarships	6.50	100.00	13 <sup>4</sup>		9
Ph.D. students with other external funding	3.50	100.00	8 <sup>4,5</sup>		4 <sup>5</sup>

<b>Total</b>	<b>112.22</b>	<b>30.57</b>	<b>163</b>		
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<sup>1</sup> The Director is also a head of department.

<sup>2</sup> The heads of department are also workgroup leaders.

<sup>3</sup> Thereof one on temporary leave and one on part-time leave.

<sup>4</sup> In total, 60 Ph.D. students with either core budget, third-party, or external funding.

<sup>5</sup> Thereof one on parental leave.

<sup>6</sup> Thereof one in partial retirement.

## Annex B: Evaluation Report

### Leibniz Center for Tropical Marine Ecology (ZMT) Bremen

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#### Appendix:

Members of review board and guests; representatives of collaborative partners

## 1. Summary and main recommendations

Founded in 1991, the Leibniz Center for Tropical Marine Ecology (ZMT) studies the ecology of tropical and subtropical marine coastal systems, their resources, functions, sensitivity and resilience to natural and anthropologically-induced environmental changes. The institute very successfully combines approaches used in the natural and social sciences. This special integrated approach is one of ZMT's unique features.

In the initial years, the institute largely conducted major BMBF-funded research projects focussing on Brazil, the Red Sea and Indonesia. However, in 2005/6, ZMT was evaluated by the Science Council and subsequently granted joint funding by the Federal Government and the *Länder* in 2009. Since then, it has very successfully continued to develop its research projects both thematically and geographically. Overall, the average performance of the four scientific departments is rated as "very good." In addition, ZMT provides outstanding advisory services. The transfer of research results to local applications in tropical countries is impressive. In the field of peer-reviewed primary publications and third-party fundraising the institute should, however, continue to improve its performance.

The promotion of junior researchers has been noticeably expanded in the last few years, both in terms of numbers and structure. ZMT has also been successful in improving gender equality and in instituting family-friendly policies. In addition, since 2010, the head of the institute has been a woman providing a role model for women and those with families.

ZMT maintains good contacts with the universities and, in the broadest sense, marine research institutions in the region. It is connected very well and fosters lasting, productive collaborations, particularly with partners in the tropical target countries. In the past, the institute managed to build impressive capacity in these countries from which it still reaps significant benefits.

Including ZMT in joint institutional funding of the Federation and the *Länder* generated considerable growth in structures, human resources and financing. The institute mastered the concomitant adjustment processes well. In the future, it would like to continue growing in order to be better prepared to meet the challenges ensuing from its interdisciplinary approach to ecological/social issues in tropical marine ecology in the context of global change. Three joint appointments of junior professors (with the University of Bremen) and the introduction of three junior research groups are imminent. On this basis, it should be possible in the mid-term to achieve the well-prepared increase in third-party income and concomitant growth in human resources that ZMT desires. Personnel and structural development going beyond this would require more detailed elucidation.

Special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

1. The continued growth ZMT is planning must be based on more concrete department-spanning objectives and be defined, above all, in terms of quality and a clearly defined research focus. To achieve this, the departments must draw up further joint research hypotheses that will drive the work of the institute as a whole and generate a long-term research perspective for ZMT. At the level of in-

dividual working groups the themes must be more clearly interrelated for this purpose and embedded in the department-spanning objectives.

2. ZMT must also continue to sharpen its profile if it is to become even more visible as a significant partner in tropical marine ecology at the international level. To achieve this, both the discipline-based work in the departments and the interdisciplinary interaction must be systematically advanced and even more effectively coordinated. The social sciences have a particular role to play in this as it is their input that is helping the institute to acquire a unique tropical marine context-specific interdisciplinary character.
3. Building on its current research strategy, ZMT should improve its publication performance both in terms of quality and quantity.
4. As planned, it is wise for the institute to try to achieve greater diversity in its third-party funding. The proportion of DFG and EU funding, in particular, should be increased significantly. The ambitious plans to increase the proportion of third-party funding for research from currently approx. 14% to at least a third of the overall budget are meaningful and necessary in order to implement the institute's strategic goals. In this context, ZMT should try to convince funders of the major interdisciplinary added value of its social science approach for the natural science objectives addressed at the institute.
5. It is welcomed that the *Land* Bremen envisages the construction of a new building, which should be completed as soon as possible, as a lasting solution.
6. The institute should make its data collections available to the scientific community via open access.
7. ZMT should continue increasing the number of trainees in order to fulfil the expectations of the Federal and *Länder* Governments vis-à-vis the Leibniz Association

## 2. General concept and profile

The Leibniz Center for Tropical Marine Ecology (ZMT) studies the ecology of tropical and subtropical marine coastal systems, their resources, functions, sensitivity and resilience to natural and anthropologically-induced environmental changes. With the aim of achieving a sustainable use of resources on tropical coasts, investigations focus on the interactions between social and ecological systems. By addressing cross-cutting thematic focus areas, the institute has been highly successful in combining approaches deriving from natural science and social science. With its holistic approach to the study of tropical coastal systems ZMT has earned a special position for itself within German marine research and is internationally visible.

ZMT was originally founded in 1991 as an adjunct institute at the University of Bremen. In the first few years, it concentrated on long-term research projects focussing on Brazil, the Red Sea and Indonesia, which were funded by the Federal Ministry of Education and Research. Amongst other things, this resulted in sustained capacity building in the tropical target areas that is still an important basis for collaborations today. In 2009, ZMT became an independent institute and was granted joint funding by the Federation and the *Länder*.

## Development of ZMT since the last evaluation

Since being admitted to joint funding by the Federation and the *Länder* in 2009 the institute has seen exceptional growth in structures, financing and human resources: in 2010, the four departmental leadership positions, including the directorship, were filled as joint appointments with the University of Bremen and Jacobs University Bremen. Subsequently, ZMT re-structured the institute, transforming the sectors that were formerly organised according to working themes into departments. A fifth department was created, amalgamating infrastructure and service. The institute has also introduced three overarching programme areas in which scientists from each of the four academic departments are actively involved. In 2012, ZMT established two junior research groups. This structural re-organisation was accompanied by a doubling of staff numbers and a significant increase in ZMT's institutional funding. At the time of the evaluation, 60 doctoral candidates were being supervised at ZMT.

Originally, ZMT's major focus was on investigating mangrove and coral reef ecology in Brazil and Western Asia. Thus, in the past, it only dealt with selected, region-related issues in the context of long-term projects. By extending its themes as well as its geographical reach with research projects in Southeast Asia and Africa ZMT has now developed its research programme significantly. It is welcomed that the working groups are now increasingly adopting approaches that primarily derive from overarching priorities.

## Results

ZMT has mastered the transition to joint funding by the Federation and the *Länder* and the concomitant growth well. Under the prudent, dedicated leadership of the director, who was appointed in 2010, the institute has developed impressively. The thematic areas addressed are highly relevant to global marine and environmental research. ZMT has been particularly successful in highlighting the importance of social science approaches in addressing pressing ecological issues in tropical marine coastal systems and using them to the overall benefit of the institute. It has thus managed to create a significant unique feature for itself, even by international standards. The Review board rates the institute's average performance during the last few years as "very good." ZMT is also very active in the tropical target countries in an advisory capacity; the transfer of the relevant research results to local applications is impressive.

In the last few years, ZMT has improved its publication record. It is now moving in the right direction but has not yet reached a level commensurate with its human resources and professional potential. **Building on its current research strategy, ZMT should improve its publication performance both in terms of quality and quantity** and identify concrete measures that will lead to a sustainable increase in the number of papers appearing in carefully selected, very high-profile journals. The institute is also recommended to increase the volume of synthesis papers produced. ZMT scientists should be more involved on the editorial boards of prestigious scientific journals. The strategy ZMT has adopted of publishing research results in international scientific journals before they appear in local journals in the tropical target countries has proven very successful and should be continued.

Normally, ZMT researchers study tropical coastal systems in a limited geographical area. Occasionally, comparative studies of different tropical systems are carried out. In the future, the institute is encouraged to consider using multi-institutional collaborations to

conduct comparative studies and analyses of tropical systems with extra-tropical systems – for which there is a major need. In this context, ZMT should seek to enhance awareness of the significance of tropical research within the area of research on global change.

In the past, many ZMT scientists have taken part in national and international specialist conferences. In the future, they should increasingly lead independent sessions and panels. ZMT should also consider hosting its own specialised conferences and workshops on topics relevant to its mission to increase its visibility in the international research community.

### **Strategic work planning for the next few years**

ZMT wishes to continue growing: in addition to the six professorships already held, two further joint professorships with the University of Bremen (Ecotoxicology, Social Sciences) are available under institutional funding. An additional joint appointment with the University of Bremen, the successor to the professorship in Mangrove Ecology, is also open. As it was not possible to fill these three positions, ZMT took the reasonable decision of advertising them as junior professorships and of trying to fill them in 2013.

On top of this, three junior research groups (“Sea Level Changes”, “Submarine Groundwater Discharge” and “Resilience of Pacific Island Social-Ecological Systems”) are scheduled to start work within a short time. ZMT was able to raise the funding for the “Sea Level Changes” group under the Excellence Initiative, financed by the Federal Government and the *Länder*, together with MARUM, the Center for Marine Environmental Sciences at the University of Bremen. Funding for the other two groups was sought from the BMBF. A fourth junior research group on “Resource Economics” is currently in the planning stage.

ZMT correctly assumes that, in the mid-term, the appointment of the professors and junior research group leaders will lead to a significant increase in the number of third-party projects and consequently to additional staff. This process has been well planned and is being purposefully managed. In the mid-term, ZMT expects staff numbers to reach about 250. This would make it into a medium-sized research institute, the dimensions which would be appropriate for carrying out the tasks stated in its statutes. The Review Board was also of the opinion that a critical mass of this order would be required in order to sustain competitiveness at international level in tropical marine ecology. ZMT’s strategic planning is thus coherent and meaningful.

**The continued growth ZMT is planning must be based on more concrete department-spanning objectives and be defined, above all, in terms of quality and a clearly refined research focus. To achieve this, the departments must draw up further joint research hypotheses that will drive the work of the institute as a whole and generate a long-term research perspective for ZMT. At the level of individual working groups the themes must be more clearly interrelated for this purpose and embedded in the department-spanning objectives.** The programme areas, formulated in 2009, provide a good basis for development and should be elaborated. Now that the restructuring process has been successfully completed, this has become possible.



**ZMT must also continue to sharpen its profile if it is to become even more visible as a significant partner in tropical marine ecology at the international level. To achieve this, both the discipline-based work in the departments and the interdisciplinary interaction must be systematically advanced and even more effectively coordinated. The social sciences have a particular role to play in this as it is their input that is helping the institute to acquire a unique tropical marine context-specific interdisciplinary character.**

### **Appropriateness of funding**

In order to fulfil its current tasks the institutional funding at ZMT's disposal is adequate. As a consequence of being granted joint funding by the Federation and the *Länder* and thanks to annual growth in the context of the Joint Initiative for Research and Innovation, in the past, the institute was able to increase its core budget very significantly.

### **Third-party funding**

Since it was founded in 1991, ZMT has successfully participated in large-scale, long-term projects in tropical marine research funded by the Federal Ministry for Education and Research (BMBF). As a result, at the time it was granted joint funding by the Federation and the *Länder*, more than 90 per cent of its third-party income derived from the Federal Government. This proportion has dropped since 2009. However, against the backdrop of ongoing long-term projects that have now entered their second and final third phases, BMBF funding still accounts for a significant proportion of ZMT's third-party income. **As planned, it is wise for the institute to try to achieve greater diversity in its third-party funding. The proportion of DFG and EU funding, in particular, should be increased significantly.** In 2010, 2011 and 2012, the sum of funding raised from the DFG was less than the respective fees paid; this should change in the coming years. **The ambitious plans to increase the proportion of third-party funding for research from currently approx. 14% (2012, cf. Status Report, A-21, Appendix 3) to at least a third of the overall budget are meaningful and necessary in order to implement the institute's strategic goals. In this context, it should try to convince funders of the major interdisciplinary added value of its social science approach for the natural science objectives addressed at the institute.** Moreover, ZMT management should also proactively encourage staff to submit proposals to external funding bodies.

### **Facilities**

The number of additional staff employed by ZMT in the last few years has led to a constantly increasing need for office and laboratory space. So far, it has been possible to accommodate this by renting additional space in the immediate vicinity. In the opinion of the Review Board, the facilities are not generous but still just cover immediate needs.

In view of the appointment of three new junior professors, the establishment of a junior research group and other junior research groups that have already been applied for, or are at the planning stage, there will very soon be a need for additional space. **It is welcomed that the *Land* Bremen envisages the construction of a new building, which should be completed as soon as possible, as a lasting solution.** The interim solutions

proposed by the *Land Bremen* will, in particular, have to cover the deficits that are already being felt now with regard to experimental and laboratory space.

### 3. Subdivisions of ZMT

#### **Biogeochemistry and Geology**

The five working groups in this department conduct innovative studies of biogeochemical processes in tropical coastal ecosystems. Thematically, they fit very well with ZMT's overarching objectives. During the reporting period, they presented convincing results, which radiated out into the wider specialist community. Amongst other things, they produced important fundamental insights into the impact of wetlands on human health. The work on carbon dynamics in mangroves is outstanding. Overall, the department's performance is rated "very good" by the Review Board.

Plans for future projects convincingly link up with current research issues. The review board recommends extending this work to investigate the interaction between catchment areas and tropical coastal landscapes as well as carbon sequestration. Furthermore, the strong emphasis on carbon in microbiological investigations should be complemented by aspects of the nutrient regime. The very good cooperation within the department should be extended in future to embrace other departments at ZMT even more closely. Cooperation with Social Sciences, in particular, should be intensified. In this context, inter- and transdisciplinary approaches should be advanced further.

During the reporting period, the working groups were successful in raising substantial third-party funding; their work produced very good results that, however, were not published at quite such a high-level as they might have been. In view of this, but also based on the highly-relevant issues under consideration, the Review Board sees potential for enhancement, especially with regard to publications in very high-profile international journals as well as discipline-specific journals (cf. Chapter 2). Furthermore, the international visibility of the group could be augmented by publishing a larger number of synthesis papers in journals widely read by workers in the biogeochemical and sedimentary geology fields.

The department is headed by the director of ZMT who was appointed in 2010. Her highly-relevant and innovative research approaches have a strong impact. In 2012, a junior research group was set up with a focus on tropical marine microbiology. Before the end of 2013, a junior research group investigating sea-level change is scheduled to be established in cooperation with MARUM, the Center for Marine Environmental Sciences at the University of Bremen. In addition, ZMT is planning to appoint a junior professor in ecotoxicology in the very near future and establish a further junior research group focussing on aspects of submarine groundwater discharge. These plans are convincing and a meaningful extension of the spectrum of expertise already in existence.

#### **Ecological Modelling**

The scientists in this department develop mathematical models for various levels of biological and ecological organisation involving different spatial and temporal scales. In the past, the three working groups managed to combine natural and social science issues to a remarkable degree. Consequently, the department currently plays a central, connect-

ing role within ZMT. Its overall performance is rated as “very good” by the Review Board.

The working groups employ a remarkable variety of approaches and techniques. The methods chosen, such as applying agent-based models to biogeochemical issues or using dynamic trait models to model social action, are both innovative and ground-breaking. The models that facilitate the observation of changes in entire ecological communities are particularly interesting. Although the group has only been working together for a few years, it is active at the very forefront of research in the field. Following an intensive and very productive phase of model development, an outstanding base has now been created to enhance its publication performance in the coming years, both in terms of quantity and quality. Apart from this, the Review Board expects the working groups to raise significantly more third-party funding in future and recommends increasing the number of licences for appropriate software in order to improve their statistical resources.

In the past, one of the department’s main focuses was model development. The Review Board welcomes the fact that the working groups are now concentrating to a greater extent on applying the modelling approaches they have developed. In this context, the existing, very good collaboration with other groups at ZMT should be expanded. In future, the groups should continue to focus on providing tailored models for the use of partners in the tropical target countries. In order to address large-scale research issues on a global level, the Review Board recommends them to develop their expertise in GIS which is not yet adequate. ZMT should also insure that researchers in all groups have adequate training and resources to use this important tool.

## **Ecology**

This department investigates the functions of, as well as the disturbances and anthropogenic threats to, tropical marine ecosystems on different ecological levels. The five working groups deal with interesting, topical themes. The third-party funds raised in the evaluation period 2010 to 2012 are rated as good. Overall, however, the quality of performance is not consistent: two groups are rated as “very good”, three other groups as “good” by the Review Board.

With its investigations into issues affecting the ecology of coral reefs, some of which are unique, the working group surrounding the head of department is very visible internationally. Qualitatively, the group publishes at an impressively high level, but in the last few years the volume of publications has dropped. Due to its focus on individual key organisms, so far, the group has tended to publish too exclusively in journals with a taxonomic bias. Thus it should now seek to increase the number of publications in more broadly-based journals in the relevant scientific disciplines. The group is encouraged to continue the systematic development of its projects and to exploit its potential for innovative work to an even greater extent.

The research conducted by the junior research group on Algae and Seagrass Ecology, which was only established in 2012, is rated as highly interesting and very promising. The small group is pursuing various ambitious ideas that complement each other very well and form an excellent basis for future comparative work, for example, on marine ecosystems in tropical and temperate zones. Due to its short lifespan the group has only

been able to produce a few publications; the Review Board expects the volume to increase significantly in future.

By comparison, the other three groups have produced weaker results. They are recommended to align their research much more visibly to ZMT's overarching research objectives and to drive collaboration with the other departments.

The Mangrove Ecology and Fisheries Biology groups, for example, address a lot of interesting but not sufficiently innovative and coherent issues, the relevance of which to ZMT's overarching objectives is not always suitably clear. In the future, the Review Board expects activities to be more precisely focussed and priorities to be set; the publication record should also be increased. In order to exploit scientific potential to the full, these groups should, in particular, promote interdisciplinary approaches. It is welcomed that the successor to the professorship in Mangrove Ecology is scheduled to be appointed before the end of 2013, which will allow a transition period under two professors.

Comparatively innovative approaches are used in the Ecophysiology Group but the publication record should be enhanced considerably. Some very good publications that have appeared in 2013 suggest that improvement is already underway in this respect. The good contacts to industry benefit the entire institute and are greatly welcomed.

Three of the department's five working groups concern themselves with ecosystems (coral reefs, algae and seagrass beds, mangroves), whereas the other two are more discipline-based (Ecophysiology, Fisheries Biology). This distribution is not convincing and thus the institute is recommended to examine whether integrating the discipline-based groups in the habitat groups would lead to an improvement in the quality of results.

### **Social Sciences**

This department investigates the role of humans in tropical marine systems in order to gain a better understanding of the motives and behaviour of individuals and groups, particularly with regard to the handling of resources. The knowledge acquired should contribute to building expertise on sustainable management. Since the last evaluation, the department has developed very well and has become a unique feature at ZMT. It plays an integrating role for the entire institute and generally its performance is rated "very good" by the Review Board. On the basis of the work conducted so far, the working groups have the potential to produce excellent results.

The work and publications produced by both working groups are very good and attract great interest in the international community. The way in which empowerment skills are conveyed locally is impressive. With their first-class, methodologically innovative studies, the groups are at the forefront of their fields of research. Cooperation with other groups at the institute functions very well, as demonstrated by the comparative social-ecological analysis of Indonesia and Brazil. Given the central importance of the social sciences for ZMT as a whole, the very good collaboration that already exists with other departments should be systematically promoted.

The groups were successful in raising third-party research funding. Against the backdrop of the themes addressed, however, there would seem to be considerably more scope for approaching an ever greater variety of funding organisations. This strategy

should not only be used to increase ZMT's third-party income but also to put it on a broader basis.

At present, the department is composed of two working groups one of which was set up in 2010 under the current head of department. At the end of 2011, ZMT established a "Leibniz Chair". This is a title Leibniz institutions can bestow on outstanding research personalities who then cooperate intensively with the institute for a specific period of time. ZMT awarded this title to an Ethnology professor from the University of Lucerne for three years, together with financial provisions for a doctoral position and (field) research. The institute thus found a clever way of gaining additional important expertise for itself over a fixed period in order to promote and complement existing competence. However, ZMT should also take care to fully integrate the "Leibniz Chair" into the program of the department.

In the near future, ZMT also intends to fill a junior professorship in social sciences. In addition, plans are underway to establish two junior research groups in the fields of resilience research (an application for this group has already been submitted to the BMBF) and resource economics. Concrete plans to expand the department yet further are very convincing and of great interest to the strategic development of the institute as a whole. In implementing them, great attention should be paid to consistently maintaining the department's research priorities and closing specific gaps in areas such as governance research, behavioural science and evaluation studies.

### **Infrastructure**

ZMT has an impressive infrastructure. The laboratories are appropriately equipped and in excellent technical condition. The institute possesses the relevant equipment it needs for its work and field tests. In the shape of the seawater experimental facility MAREE, ZMT also has an outstanding infrastructure facility at its disposal for work in the field of marine experimental ecology. In order to maintain its extensive laboratory work, ZMT should prioritise the availability of adequate specialist technical staff and anchor this in the existing budget. ZMT's provision of IT equipment is appropriate.

In order to bundle and drive its advisory and transfer activities in the tropical target countries ZMT is planning to establish an independent information transfer unit which should, amongst other things, enhance the institute's communications with local interest groups. This is important for optimising the process of taking the views and needs of the local population into account when transferring knowledge. This two-way approach should be reflected in the name of the planned unit.

ZMT's plans for establishing a permanent, institutionalised scientific diving school are meaningful and are supported. An important argument in its favour is that students should receive training before they embark on their first field research activities.

The institute has comprehensive data collections on a large variety of ecological parameters from countries in the tropics. It is welcomed that ZMT is making efforts to digitise and complete existing databases. **The institute should make its data collections available to the scientific community via open access.** To achieve this, more extensive collaboration with PANGAEA, the world data centre located at the Center for Marine Environmental Sciences (MARUM) at the University of Bremen is suggested, as well as

driving cooperation with the relevant information infrastructure facilities in the Leibniz Association.

## 4. Collaboration and networking

### **Collaboration with universities**

Currently, there are four joint professorships with the University of Bremen, including two heads of department (Biogeochemistry and Geology; Ecology). The other two leading scientists (Ecological Modelling; Social Sciences) have appointments in collaboration with Jacobs University Bremen. The staff are actively involved in university teaching. Collaboration with the universities functions very well, whereby the involvement in MARUM, the Center for Marine Environmental Sciences, plays a special role. This is evidenced, for example, by the fact that funding for the new junior research group on “Sea Level Changes” in the Department of Biogeochemistry and Geology was raised through MARUM in the context of the Excellence Initiative run by the Federal and *Länder* Governments.

In 2012, ZMT was planning to appoint three professors together with the University of Bremen. However, these plans could not be implemented on the basis of the applications received. It is welcomed that ZMT and the University of Bremen are now intending to fill these positions with jointly appointed junior professors (cf. Chapter 2).

### **Collaboration with other domestic and international institutions**

Close contacts are maintained with German marine research institutions both in Bremen and further afield. With its focus on tropical coastal systems ZMT is very well integrated in this network of institutions. Cooperation with other institutions in the Leibniz Association is very productive and highly significant, especially in the field of biodiversity research. However, there should be more intensive collaboration with Leibniz institutions with regard to sharing primary research data.

Thanks to an extensive network built up over years, ZMT is connected with many scientific and non-scientific partners in the tropical regions that are the subject of study. The Review Board suggests that the institute might want to develop appropriate collaborations with North American institutions.

ZMT’s expertise plays an active role in European tropical research networks. The influence it thus exerts on the programming of EU funding measures is extremely important for increasing the institute’s chances of raising substantial EU funding for its own purposes in future (cf. Chapter 2).

It is highly welcomed that staff at ZMT are significantly involved in training foreign scientists and doctoral candidates. Exchange of doctoral candidates and staff functions well. The review board sees potential for yet more students from the tropical target countries to participate, for example in graduate programmes like SUTAS (cf. Chapter 5). Given its wealth of experience spanning many years ZMT should also aim to take on a leading role in teaching within the existing tropical research network.

## 5. Staff development and promotion of junior researchers

### Staff development and personnel structure

Due to the retirement of the previous director a change of leadership took place in 2010. Since then, ZMT has been headed by a female director who is also the head of one of the four departments. The heads of the other three departments were also appointed in 2010 in cooperation with the two Bremen universities. Following the initial evaluation by the Science Council, the number of scientific positions (full-time equivalents) increased from 30 in January 2006 to 45 in December 2012 (excluding guests and scholarship-holders). In particular, the number of doctoral candidates supervised at the institute rose significantly (from 14 to 60 including scholarship-holders).

As it was not possible to appoint professors for Ecotoxicology, Mangrove Ecology and Social Sciences in the first round, ZMT and the University of Bremen will jointly appoint junior professors to these positions (Bremen Model) during 2013 and 2014. This decision is endorsed. ZMT is thus able to achieve its goal of two professors per department. The plans for establishing additional junior research groups (financed by the BMBF) are convincing.

### Promotion of gender equality

At the level of scientific staff, as a whole, the institute has a gender balance. However, although ZMT has had a female director since 2010, the gender ratio is strongly male-biased at the more senior levels. On the reporting date, 31.12.2012, four of the 15 scientists in leadership positions were women, two of whom were junior research group leaders (as of 2012) on fixed-term contracts.

In accordance with the binding regulations set by the Joint Science Conference (GWK) on agreed target quotas for the proportion of women at the various qualification levels (cascade model), the institute is currently introducing a system to achieve these goals. In addition, it already employs a number of tools which make the institute more attractive to women, such as promoting gender equality and making it easier to combine family and career. In the immediate past, this led to good progress being made, but the institute must still increase its efforts to attract more female researchers. One strategy would be more active headhunting. The institute should also emphasise its equality measures in job descriptions and apply for a certificate confirming its efforts on behalf of equal opportunities and family-friendly staffing policies.

### Promotion of junior researchers

On the reporting date, 31.12.2012, ZMT employed 39 doctoral candidates. A further 21 doctoral researchers working at the institute were in receipt of scholarships or other funding. Thus, 15 senior scientists supervised a total of 60 doctoral candidates (cf. Status Report, A-22, Appendix 4). Thanks to ZMT's participation in two graduate schools located at the University of Bremen, since 2011, doctoral candidates have taken part in structured programmes. In addition to this, since January 2013, doctoral candidates have also been trained at the graduate school SUTAS (Sustainable use of tropical aquatic systems), which was awarded funding in the Leibniz Competition (SAW Procedure).

In view of the institute's plans to continue expanding it is recommended to define an appropriate ceiling for the number of doctoral candidates per supervisor in order to en-

sure the quality of supervision. In designing the doctoral curricula the institute should also ensure that candidates are able to meet all the demands made on them by the mandatory elements of the programme in the prescribed time. Currently, expectations are extremely high.

There should be better support for doctoral candidates from abroad: a Welcome Centre could be set up, for example, in collaboration with a neighbouring institution. ZMT should also plan to teach statistics at any early stage in the doctoral curriculum and examine how sufficient statistics courses could be on permanent offer at the institute.

It is explicitly welcomed that training, especially of foreign scientists, is a central element of ZMT's capacity building strategy in tropical countries. The institute holds data on the whereabouts and success of its alumni, which could provide insights that could be put to greater use in designing future training programmes. For this purpose, ZMT could also regularly conduct surveys of its scientific and non-scientific staff.

### **Vocational training for non-academic staff**

On the reporting date, 31.12.2012, ZMT hosted four trainees in IT, library services and office communications. In autumn 2013, a fifth trainee position in electronics will be introduced. **ZMT should continue increasing the number of trainees in order to fulfil the expectations of the Federal and *Länder* Governments vis-à-vis the Leibniz Association.** The members of the Supervisory Board, particularly the representatives of the Federation and the *Land* which hosts the institute, should work towards an appropriate proportion of vocational education activities at ZMT.

## **6. Quality Assurance**

### **Internal quality management**

ZMT conducts effective quality management but should set its sights on even more ambitious expectations with regard to the quality of scientific results. The system of performance-related funding has proven its worth. As recommended by the Scientific Advisory Board, the existing elements of quality assurance should continue to be developed and complemented by indicators for strategic benchmarking. In 2000, a cost and performance accounting was introduced.

Currently, ZMT does not have sufficiently clear guidelines on co-authorship in scientific publications involving technical staff. ZMT should draw them up. In addition, the Review Board recommends a greater emphasis to be placed on aspects of scientific ethics, particularly in training doctoral candidates.

Furthermore, the institute should improve the design of its website, emphasising accessibility and user-friendliness. This can be assessed on the basis of website use analysis (number of "hits" and other measures of use). ZMT should also examine whether social media should be used even more systematically to disseminate research and educational material.

### **Quality management by the Scientific Advisory Board and the Supervisory Board**

The Scientific Advisory Board has acted as a very committed mentor for ZMT. It should continue to support the institute in precisely defining overarching research objectives



(cf. Chapter 2) and be yet more demanding in its evaluation of performance indicators. The Supervisory Board conducts its tasks as laid down in the statutes very well.

According to the AV-WGL<sup>1</sup>, decisions made by the institutions' supervisory bodies on important research and science-policy matters, having significant financial implications, or referring to the institutions' managerial staff require the agreement of the representatives of the Federal Government and the *Land*. The wording of ZMT's statutes should now be brought into line with the relevant formulations in the AV-WGL.

Furthermore, it should be added to the statutes, that the head of the infrastructure department assumes the responsibility of budget management.

### **Implementation of recommendations from the last external evaluation**

ZMT successfully implemented the majority of the recommendations made by the Science Council in 2006 (cf. Status Report, A-17 ff.):

- (1) ZMT implemented the recommendations of the Science Council on structural development by introducing a departmental structure.
- (2) The institute acted on the suggestion to strengthen interdisciplinary work in the working groups. In 2009, it defined department-spanning programme areas. However, the contribution of the individual departments to the overarching research objectives must be yet more clearly defined (cf. Chapter 2: Strategic work planning for the next few years).
- (3) The recommended increase in human resources at ZMT was implemented by appointing four heads of department, establishing junior research groups and significantly increasing the number of scientific and technical staff (cf. Chapter 2: Development of ZMT since the last evaluation).
- (4) In view of the imminent end of joint projects financed by the BMBF, the Science Council urged ZMT to make greater efforts to raise third-party funding to finance research. This recommendation is still relevant. The working groups must drive their efforts to raise funding from the DFG and the EU in particular (cf. Chapter 2: Third-party funding).
- (5) The Science Council urged ZMT to improve its publication record. The institute acted on this suggestion but has not yet achieved a level commensurate with its enormous potential (cf. Chapter 2: Results).
- (6) The Science Council put on record that the institute's plan to increase human resources would have to be accompanied by a concomitant expansion of ZMT's office and laboratory space. In the long run, the Science Council noted, ZMT should be provided with a new building. This recommendation is still relevant (cf. Chapter 2: Facilities).
- (7) The institute acted on the recommendations regarding the work of the Scientific Advisory Board. In future, the Board should particularly support the institute in precisely defining overarching research objectives (cf. Chapter 6: Quality Management of the Scientific Advisory Board).

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<sup>1</sup> Administrative Agreement between the Federal and *Länder* Governments with regard to the joint funding of member institutions of the Leibniz Association.

## Appendix

### 1. Review Board

#### *Chair (Member of the Leibniz Senate Evaluation Committee)*

Ursula **Gaedke** Institute of Biochemistry and Biology, University of Potsdam, Germany

#### *Vice Chair (Member of the Leibniz Senate Evaluation Committee)*

Dagmar **Gerthsen** Laboratory for Electron Microscopy, Karlsruhe Institute of Technology, Germany

#### *Reviewers*

Steven **Bouillon** Department of Earth & Environmental Sciences, Katholieke Universiteit Leuven, Belgium

Isabelle **Côté** Department of Biological Sciences, Simon Fraser University, Burnaby, BC, Canada

Tracy D. **Frank** Department of Earth and Atmospheric Sciences, University of Nebraska-Lincoln, USA

Cornelius **Hammer** Institute of Baltic Sea Fisheries, Johann Heinrich von Thünen Institute – Federal Research Institute for Rural Areas, Forestry and Fisheries Rostock, Germany

Sybil P. **Seitzinger** International Geosphere-Biosphere Programme (IGBP), Royal Swedish Academy of Sciences Stockholm, Sweden

Selina **Stead** School of Marine Science & Technology, Newcastle University, United Kingdom

Dennis **Swaney** Department of Ecology and Evolutionary Biology, Cornell University, Ithaca, USA

Eric **Wolanski** School of Marine and Tropical Biology, James Cook University, Townsville, Australia

#### *Representative of the Federal Government*

Anke **Aretz** Federal Ministry of Education and Research, Bonn

#### *Representative of the Länder Governments (Member of the Leibniz Senate Evaluation Committee)*

Martin **Dube** Ministry for Education, Science and Culture of Mecklenburg-Vorpommern, Schwerin

## 2. Guests

### *Representative of the relevant Federal Ministry*

**Karl Wollin** Federal Ministry of Education and Research, Bonn

### *Representative of the relevant Land Ministry*

**Walter Dörhage** Bremen Senate Department for Education, Research and Health, Bremen

### *Representative of the Scientific Advisory Board*

**Wolf-Christian Dullo** Helmholtz Centre for Ocean Research Kiel (GEOMAR)

### *Representative of the Leibniz Association*

**Klement Tockner** Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin

### *Representative of the Joint Science Conference, Bonn*

**Rebekka Kötting**

## 3. Representatives of collaborative partners (one-hour interview)

**Hans-Otto Peitgen** Jacobs University, President

**Bernd Scholz-Reiter** University of Bremen, Rector

**Matern Mtolera** University of Dar es Salaam, Institute of Marine Sciences, Tanzania

**Riyad Manasrah** Associate Professor, Physical Oceanography, Marine Science Station, Jordan

1 October 2013

**Annex C: Statement of the Institution on the Evaluation Report**

**Leibniz Center for Tropical Marine Ecology (ZMT)  
Bremen**

The Leibniz Center for Tropical Marine Ecology is most grateful to the members of the evaluation group, the guests, and the coordination office of the Leibniz Association for the professional, thorough, and fair evaluation. We are exceedingly pleased about the very positive rating of the performance and strategic developments at our institute. In particular, we appreciate the acknowledgment by the evaluation group of the world-wide uniqueness of our social-ecological approach, its societal relevance and timeliness. We greatly welcome the recommendations which have provided valuable input for the continuous process of shaping the institute's future strategy.