Member of the Leibniz Association

The Leibniz Center of Tropical Marine Ecology (ZMT)

presents the

1st ZMT Workshop on Science for Sustainability - the Contribution of Transdisciplinary Knowledge Exchange

Bremen, 18.01. - 21.01.2015

Workshop Summary

supported by

Freie Hansestadt Bremen
Die Senatorin für Bildung und Wissenschaft

KELLNER & STOLL STIFTUNG FÜR KLIMA UND UMWELT
TREUHANDSTIFTUNG DER STIFTUNG DER UNIVERSITÄT BREMEN

DFG Deutsche Forschungsgemeinschaft

Targeted and reciprocal knowledge exchange (KE) between science and non-scientific stakeholders from policy, practice, industry and commerce, and civil society can essentially contribute to successfully tackling concrete environmental issues in developing countries. Although there is an urgent need for orientation on how to conduct KE and evaluate its societal and political impacts, there exists little available guidance to date to support research communities in this endeavour, and the international demand for guidelines is substantial. In response, several institutions and experts around the world have already started to integrate aspects of KE into their projects and have thus collected first valuable experiences.

Against this background the Leibniz Center for Tropical Marine Ecology (ZMT) hosted the "1st ZMT Workshop on Science for Sustainability - the Contribution of Transdisciplinary Knowledge Exchange" from the 18th to the 21st of January 2015 in Bremen (Haus der Wissenschaft). It was the general aim of the workshop to assemble the relevant global expertise on KE at one location to discuss challenges and opportunites of KE and to develop approaches and guidance on how to successfully incorporate KE into natural and social science research projects. For this purpose, the objective of the workshop was to shed light on good practice approaches on international, regional, and national levels, which created an essential basis for subsequent workshop sessions to develop a comprehensive view on the challenges, solutions, and approaches to KE. **A summary of the central recommendations (points mentioned and emphasised throughout the workshop) can be found below. A detailed summary of the results of each workshop session can be found in the annex to this document.**

Figure 1: Prof. Dr. Hildegard Westphal directed kind words to the participants during the reception at the Bremen Town Hall with Mayoress Karoline Linnert.

Reflecting the topic's relevance, a total of 120 participants around the world used this opportunity to discuss their experiences on KE and to form or strengthen networks. Amongst them were representatives and experts from a variety of research institutions; non-scientific institutions, such as the Bremen Government, EU Directorate-General Development and Cooperation, German Association for International Cooperation (GIZ), United Nations Conference on Trade and Development (UNCTAD), United Nations Food and Agriculture Organization (FAO), West Africa Sub Regional Fisheries Commission, Western Indian Ocean Marine Science Association (WIOMSA), the World Bank, WWF; and from tropical countries, including Brazil, the Fiji Islands, Indonesia, Kenya, Senegal, and Tanzania.

Over the course of three days (Monday-Wednesday), participants could take part three presentation sessions (15 different presentations on good practice approaches), four interactive workshop sessions, an open panel discussion, and a public talk. All of the sessions were complementing each other, were professionally facilitated and have led to productive discussions and results. To ensure that all participants can gain access to photos, presentations, transcripts and the results of the workshop, a password-secured Cloud has been set up.[1]

After forming a common basis of what KE means and being informed about strategic approaches by delegates of well-connected international institutions on **day one**, the different consecutive sessions of **day two and three** focused more on "common" problems when dealing with KE derived from local examples and specific ideas on how to overcome possible challenges. Being almost inseparably interconnected, some challenges like communication and resources were also mentioned as possible answers to problems when dealing with KE. This again emphasised the complexity of the approach, but also underlined once more the importance of flexibility and creativity.

On the first day, following the welcoming opening words of Prof. Dr. HILDEGARD WESTPHAL, Director of the ZMT, Prof. Dr. EVA QUANTE-BRANDT, Bremen Senator for Research and Education, Prof. Dr. MATTHIAS KLEINER, President of the Leibniz Association, as well as Dr. BEVIS FEDDER, ZMT Officer for Knowledge Exchange and Organiser, Prof. Dr. JÖRG HACKER (Sustainable Development through Knowledge and Exchange: The Role of Science) and THOMAS KORBUN (Sustainable Development - A Challenge for the Scientific System), Institute for Ecological Economy Research, opened up the workshop with two contributions to "Transformation of the scientific process". They emphasised, for example, how civil society organisations entering into the science policy arena and forming a joint network can give impulses for a transformation of parts of the science system to allow for more transdisciplinary and sustainability research.

Figure 2: Prof. Dr. Jörg Hacker on the challenges for scientists in sustainable development.

Subsequently, Dr. KLAUS BIRK, German Academic Exchange Service (Higher Education and Research for Sustainable Development: Success Factors and Lessons Learned from International Cooperation Programmes), PHILIP KARP, World Bank (The Art of Knowledge Exchange - Lessons form World Bank Experience and Applications for Marine Conservation), SABINE BECKER, Gesellschaft für Internationale Zusammenarbeit - GIZ (Science and International Cooperation - GIZ Experiences), Dr. VALERIA BERS, GIZ (The Blue Solutions Initiative - A Global Knowledge Network) and Dr. KWAME KORANTENG, Food and Agriculture Organization of the UN (Capacity Development for Ecosystem Approach to Fisheries Management in Africa - Experiences from the EAF-Nansen Project) elaborated on international approaches to knowledge exchange providing extensive know-how on existing KE initiatives from well-connected regional and global institutions. Some of the main messages of this sessions were to embrace learning from inspiring experiences from world-wide solutions on sharing, replicating and up-scaling KE as well as promoting impact-oriented monitoring and joint knowledge management.

[1] https://zmtcloud.zmt-bremen.de/owncloud/public.php?service=files&t=9fac6f6106b5302a4a8f79c89d84d4ea.
Please contact **bevis.fedder@zmt-bremen.de** for the „Cloud's" password.

Organized within small groups, the participants of the **first workshop session** individually developed 12 systemic conceptual models to specific case studies, which had strong KE elements, in order to create an in-depth understanding of KE. In general, capacity development, cultural exchange, empowerment, communication, and the achievement of environmental goals were amongst the most often mentioned positive outcomes of these case studies. Common difficulties were the integration of all stakeholders, the different political systems, communication, unclear priorities as well as insufficient resources (time and/ or money constraints). Corruption, expectation management, resources (time capacity, sustainable finances), communication (language and between disciplines), and intercultural competencies were identified as the main challenges to researchers in this session. Please see the annex for detailed results and workshop session summaries.

Figure 3: Workshop outputs.

On day two, Dr. HUGH GOVAN, Locally-Managed Marine Areas (Promoting Community Resource Management in Small Island Developing States - Lessons from the Locally Managed Marine Area Network), MASOUMEH SAHAMI, UNCTAD and UNITAR (From Economic Diplomacy to Knowledge Exchange - the Case of Tropical Least Developed Countries (LDCs) and Globalisation), DR. WERNER EKAU, ZMT (From Science to Practice – The Benguela Current Ecosystem as an example for joint research and management efforts), Prof. Dr. HORACIO SCHNEIDER, University of Para in Brazil (The Impact of an International Bilateral Cooperation Project in a Small Region of the Northeast of Para), JUDY MANN, South African Association for Marine Biological Research (Building Bridges - Communication for Marine Conservation in Southern Africa), Dr. JULIUS FRANCIS, Western Indian Ocean Marine Science Association (Bridging the Gap Between Science and Policy: WIO Region Experiences) and Dr. PATRICIA SHANLEY, Center for International Forestry Research (Redirecting the Flow of Knowledge: Obstacles to and Benefits of Knowledge Exchange in Amazonia) shared their experiences with KE giving practical examples and framing lessons learned from both what worked well and what didn't.

The afternoon session "Bake the cake everybody's talking about: an open **panel discussion** about salient issues on knowledge exchange" provided an adequate floor to critically discuss specific problems from philosophical, ethical, political, economical and other perspectives.

Figure 4: Prof. Dr. Klaus Töpfer, Alfred Schumm and Dr. Hamady Diop in an animated discussion on KE.

Amongst the distinguished guests were Prof. Dr. KLAUS TÖPFER, Executive Director of the Institute for Advanced Sustainability Studies, ALFRED SCHUMM, Director of the WWF's Global Fisheries Programme, and Dr. HAMADY DIOP, Director of Research and Information Systems for the West Africa Sub Regional Fisheries Commission, who shared their extensive knowledge on KE within a Samoan Circle. The fruitful discussion focused on metrics of transdisciplinary KE and on ways to measure research impact as well as to achieve up-scaling. It was concluded that in order to

make science increase its empowerment, different perspectives need to meet, which stimulate each other in an enriching process and exchange on a long-term basis.

On the basis of the results of the first workshop session, the panel discussion, and the foregoing presentations, **the second workshop session** on day two laid focus on finding answers to the prior elaborated challenges. The synthesis of all posters showed that six main problem fields exist: “Interface of external/ local partners, Integration of stakeholders”, “Different priorities, Relevance of KE, Practice what you preach”, “Systemic issues, External pressure”, “Methods, Tools, Capacity development”, “Quality and Quantity”, and “Communication”. With regard to the challenges across all problem fields, the lack of motivation, incentives, and resources as well as capacity building were rated the most significant. Regarding possible answers to the challenges, communication, new narratives, and diversification of results, adaptive learning and co-generation, project planning (include KE), as well as transparency were deemed the most important.

Figure 5: Workshop Sessions encouraged participants to interact and exchange ideas.

More specifically, in order to encourage and motivate researchers to engage in KE, it was advised to include different perspectives of all stakeholders involved and giving them an equal value, to learn the language, and to organize long-term stays for engaging in networking and communicating with local partners. Communication once again was the unanimous answer to both building capacities and to translating knowledge and research results into meaningful measures for the stakeholders (bridging the gap). Additionally, there was agreement that sometimes “too much” knowledge can also be a challenge and that results need to be simplified, synthesized and shared through a more creative process using different types of channels (social media, arts, music, story-telling) according to the target audience.

The official part of day two closed with an animated **public talk** given by Prof. DOUGLAS MACMILLAN, University of Kent, on “Beyond conflict - creating common ground for nature conservation in the 21st century” which focused on the interconnection between values, choices and sustainability - concluding in stating that understanding and quantifying values provides the basis for achieving sustainability.

In the evening, a reception at the Bremen Town Hall with Mayoress KAROLINE LINNERT rounded off an eventful second part of the workshop and allowed for some sight-seeing as well as for socializing.

Finally, the **third workshop session** on **day three** took the outcomes of the preceding sessions even further, and participants were invited to develop solutions to barriers that might prevent researchers to succeed in integrating KE, as previously elaborated (derived from challenges and answers). The aim was to be as specific as possible in terms of tools and approaches that could be used e.g. supporting and contributing to the implementation of KE-initiatives. In combination with the **fourth workshop session**, during which participants were to endorse recommendations and guidelines, ***important key points emerged***. These are summarised into into ten points on systemic issues (points 1-3) and for individual projects from the design stage to the dissemination stage (points 4 – 10):

1. KE has to be **included in project planning from the beginning** and both the funding and project application processes and criteria have to be revised - changing **evaluation standards to focus more on KE**. Funding schemes need to be adapted to allow **longer funding cycles** as well as to include **money for communication and dissemination;** barriers should be removed by **simplifying application processes** and **applications need to be checked for KE criteria**.

2. Research institutions should **hire for balanced and expanded non-academic partnerships and should encourage and challenge innovative outputs** and **assess KE as criteria for proposal reviews**. In addition to the number of publications, a **social impact rating** for all researchers could indicate research success.

3. Indicators that help to **trace the societal impact** of a project need to be developed. **Sufficient resources** (time and funding, flexibility) have to be available. It might need multiple actors from different spheres to evaluate impact: Ask beneficiaries how they would evaluate the impact (**target groups are co-evaluators**).

4. To make the research more relevant to local needs, **identify and integrate all stakeholders from the beginning** and also consider to integrate "**citizen scientists**", e.g. in data collection. Engage in **joint project planning** and organise **regular meetings** and/or **participative workshops for capacity building** during the whole research process including local and international experts or facilitators, mediators, interpreters or even professional PRs, if needed.

"Make partners on the ground that are experienced in engaging stakeholders."

5. Case studies help to learn from practical examples of what worked well and what didn't.

6. Transparent, honest and respectful communication, **capacity building** as well as a **thorough preparation** are key to laying a solid basis for successful KE-initiatives. Researchers need to develop **competencies in mediation** and different **communications means**, work on their **language skills,** and **cross-cultural** as well as **transdisciplinary competencies** (workshops, KE modules).

7. Researchers are challenged to complement traditional paper writing by **simplifying** their results and to use different **(social) media** more creatively, also including **emotions, story-telling,** and **arts** depending on their target audiences. They should provide **open access information** and could, for example, contribute to **solution networks**.

8. Scientists have to be aware that the basis to reciprocal KE is formed by common values like **respect** and **openness** for different understandings as well as by **empowerment** and **ownership**.

"Be aware that knowledge exchange is also power transfer."

"We can't have a "one size fits all" approach!"

9. In different areas, there might exist different realities and thus overcoming transboundary issues and encouraging **co-management** (global analysis of approaches for regional level implementation) are important.

10. A mix of different scientific approaches (pure, applied, and on-demand) should be provided. In some cases, **science on demand** - using only little capacity - can lead to "big" results.

The ZMT is in the process of using the results of the Workshop as a basis for the ZMT Strategy for Knowledge Exchange (an orientation for values and a "tool box" for scientific projects), an adaptation of the Bremen Criteria (document reflecting the ZMT's standards for sustainable research practise), and a scientific publication addressing the central hypothesis of KE relevant to international research on sustainable use of resources.

Figure 6: Professionally facilitated open panel discussion.

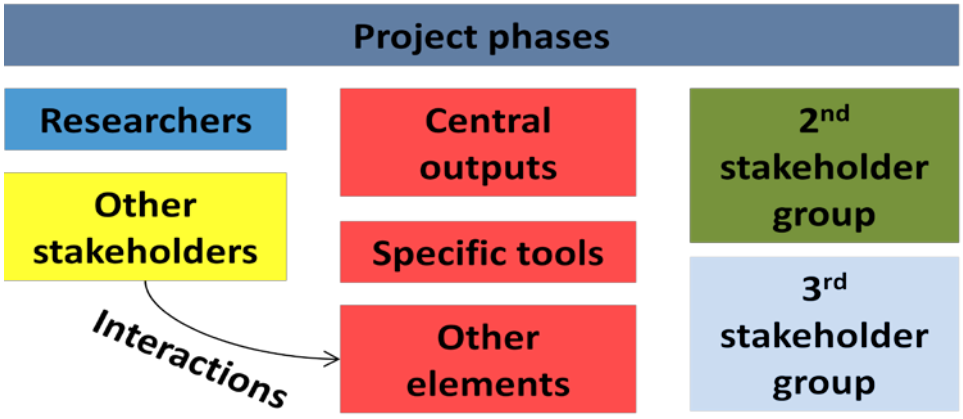
Annex: Summary of Workshop Results

Workshop Session 1 - Modelling knowledge exchange (Case Studies)

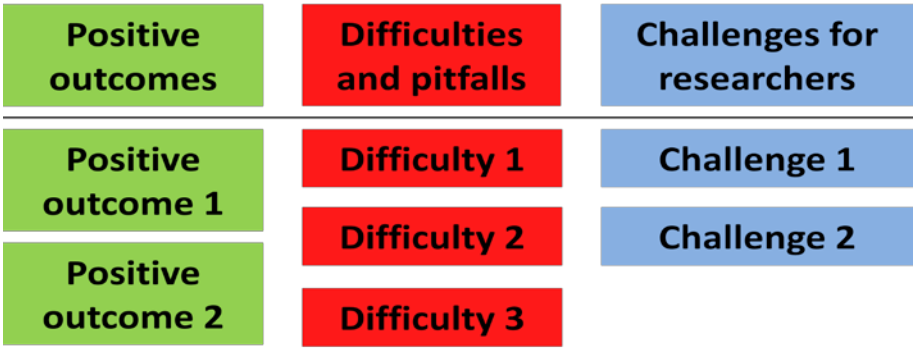
During this Workshop Session (19.01.2015, 15:55 - 17:55 h), the participants gathered information and experiences on knowledge exchange in existing projects, identified the involved stakeholders, and elaborated on the basis of these case studies both the positive outcomes (What worked well?) and the challenges and pitfalls (What didn't work well? What were the lessons learned?).

In total, there were twelve case studies prepared and discussed in different groups. The results - a mix between systemic conceptual models and input/output models - are presented on the following pages (diagrams as well as short summaries).

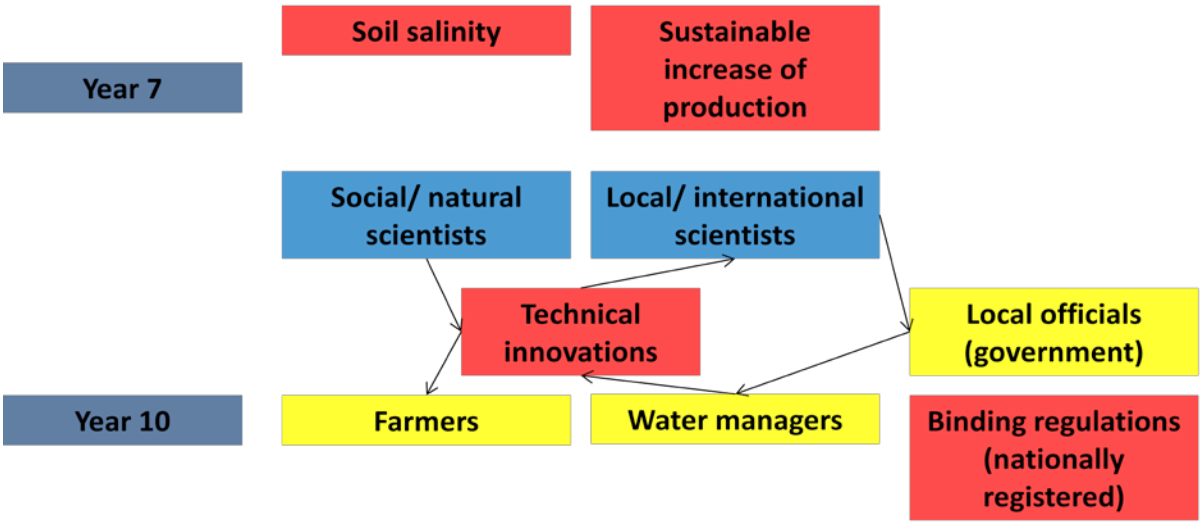
Even though every group had the freedom to creatively develop their own diagrams, generally, the different project phases were represented in dark blue; any scientific stakeholder in blue; non-scientific stakeholders in yellow, secondary stakeholder groups in green, and tertiary groups in white; and central outputs, measurements, and approaches or specific tools in red (see below). Interactions were indicated by arrows with the direction of the arrow showing "who does/did what to whom".



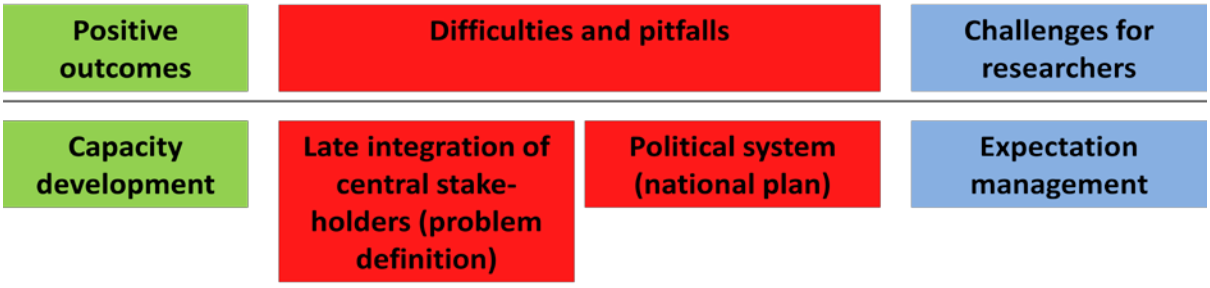
To take this one step further, case study summaries were made in the second part of the session. Participants elaborated positive outcomes of the case study (green), but also its difficulties and pitfalls (red) and the challenges the case study raised for the researchers (blue). Some groups additionally mentioned the answers they found to the challenges.



Case Study 1: Follow the innovation - Uzbekistan

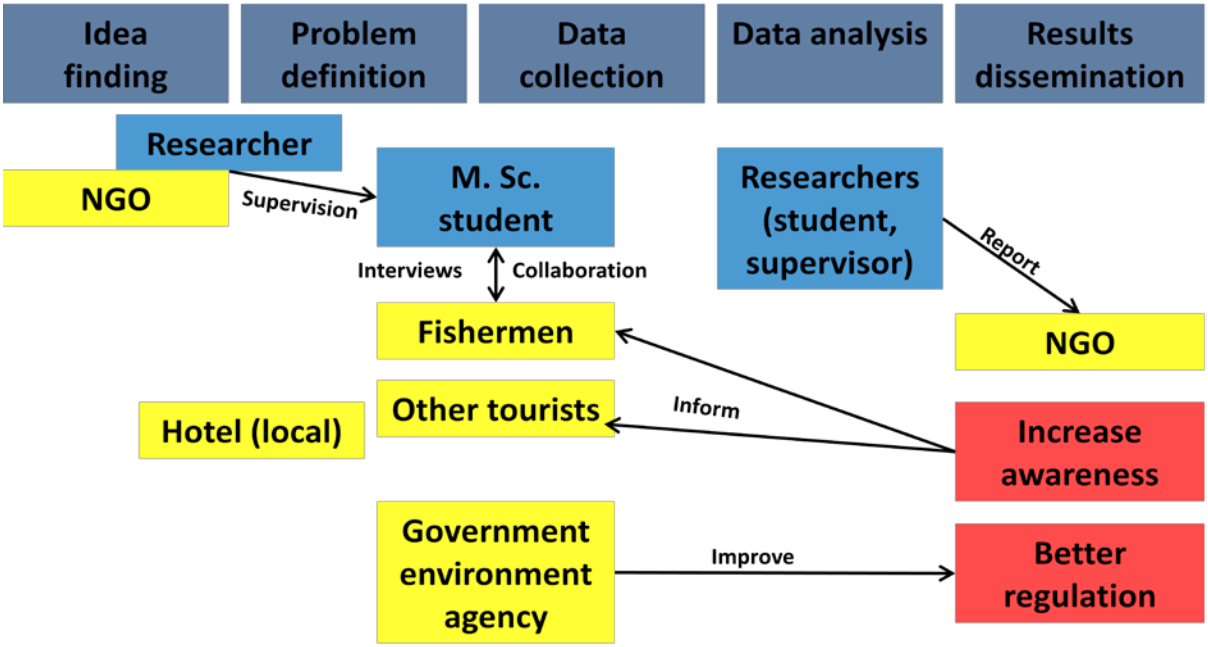


Soil salinity on the one hand and a sustainable increase of production on the other were the drivers to this project where local and international natural as well as social scientists worked together to impart knowledge on technical innovations to farmers, water managers, and local government officials. Within ten years, nationally registered binding regulations were drawn up.



The project enabled capacity development amongst all stakeholders, but both the late integration of the central stakeholders and the political system posed a problem. Managing expectations from an early project stage was suggested as a solution to some of the issues encountered.

Case Study 2: Impact of beach fisheries on plastic pollution in South Africa

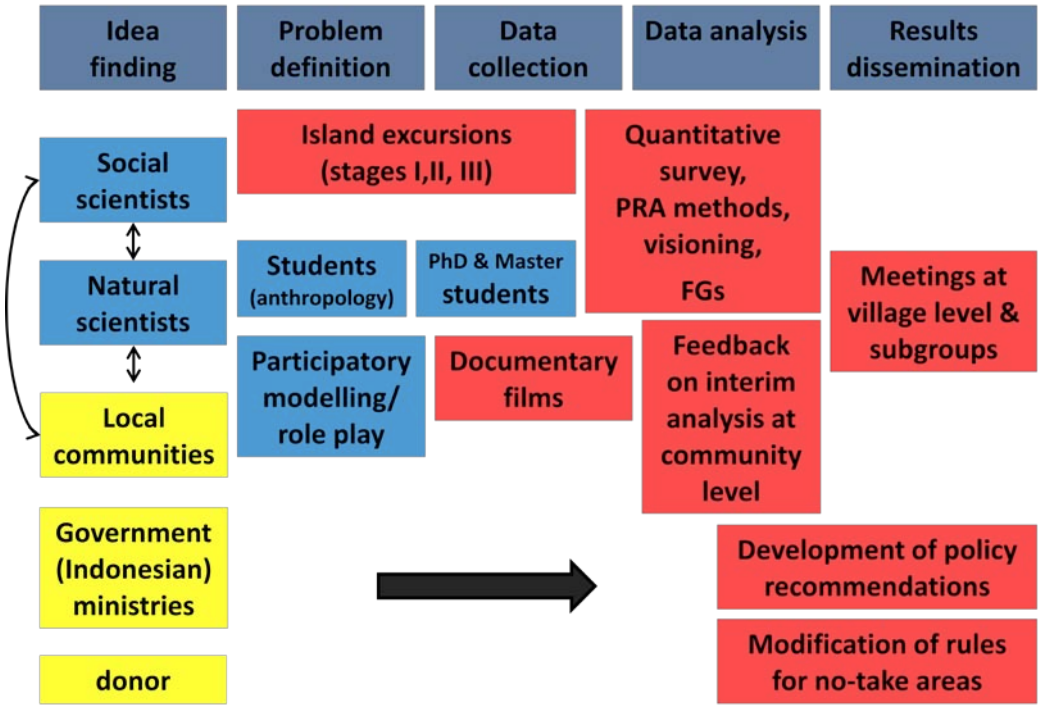


A cooperation between an NGO and researchers was involved in idea finding and problem definition. Supervised master students collected data on the ground and interviewed and collaborated with fishermen, other tourists, a local hotel, and the government's environment agency. After data collection and data analysis the researchers reported their results to the NGO, which then started a campaign to increase awareness and to inform the fishermen, tourists, and hotel staff. Additionally, the environment agency revised and improved their regulations with regard to plastic pollution caused by beach fisheries.

Positive outcomes	Difficulties and pitfalls	
Increased tourism	Resistant fishermen	Long-term perspective
Healthier ecosystem	Seasonality	Quality of information
Clean beach		

Positive outcomes were clean(er) beaches, increased tourism, and healthier ecosystems. The challenges and pitfalls were both resistant fishermen, the seasonality of the problem (beach fisheries), the quality of the information, as well as the long-term perspective.

Case Study 3: Indonesian coral reef management



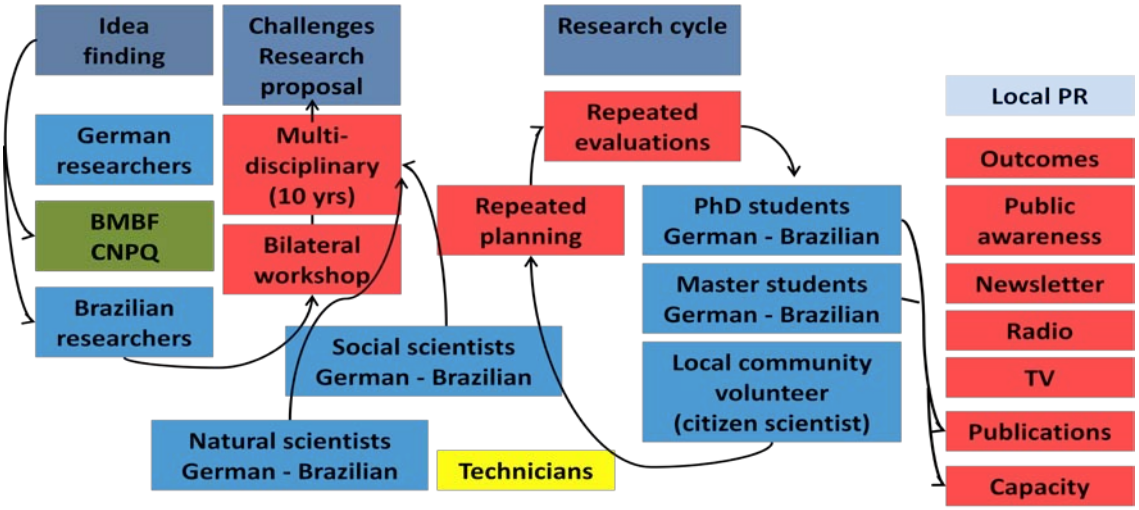
In the process of idea finding, several "parties" were involved and collaborated with each other: Social scientists and natural scientist worked closely together as well as both the natural and social scientists and the local communities. Furthermore, Indonesian government ministries and a donor were part of this step of the process.

The problem was defined by anthropology students and Island Excursions organised in three stages (I, II, III). PhD and master students collected data through a quantitative survey (PRA methods, visioning, FGs), analysed it, and gave feedback on the interim analysis at community level. The results were disseminated using documentary films as well as through meetings at village level and subgroups. Additionally, policy recommendations were developed.

Difficulties and pitfalls	Challenges for researchers
Communication from islands to national level	Corruption
Getting relevant public policy authorities together	Priority setting: academic vs. social relevance

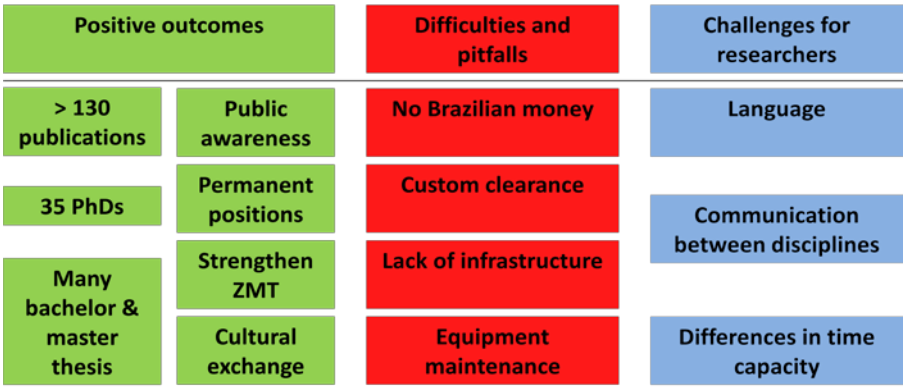
The project helped to modify the rules for no-take areas even though it was difficult to get relevant public policy authorities together and to communicate from the different islands to a national level. Other challenges were corruption and the question of priority: academic vs. societal relevance.

Case Study 4: MADAM - Mangroves in Brazil



The idea to this project was developed by German researchers, the BMBF (Federal Ministry of Education and Research), and the CNPQ (Conselho Nacional de Desenvolvimento Científico e Tecnológico - National Counsel of Technological and Scientific Development, Brazil) in cooperation with Brazilian researchers. A bilateral workshop and the input of both German and Brazilian natural scientists as well as social scientists (supported by technicians) eventually led to the proposal of Project MADAM, a multi-disciplinary, 10 year project.

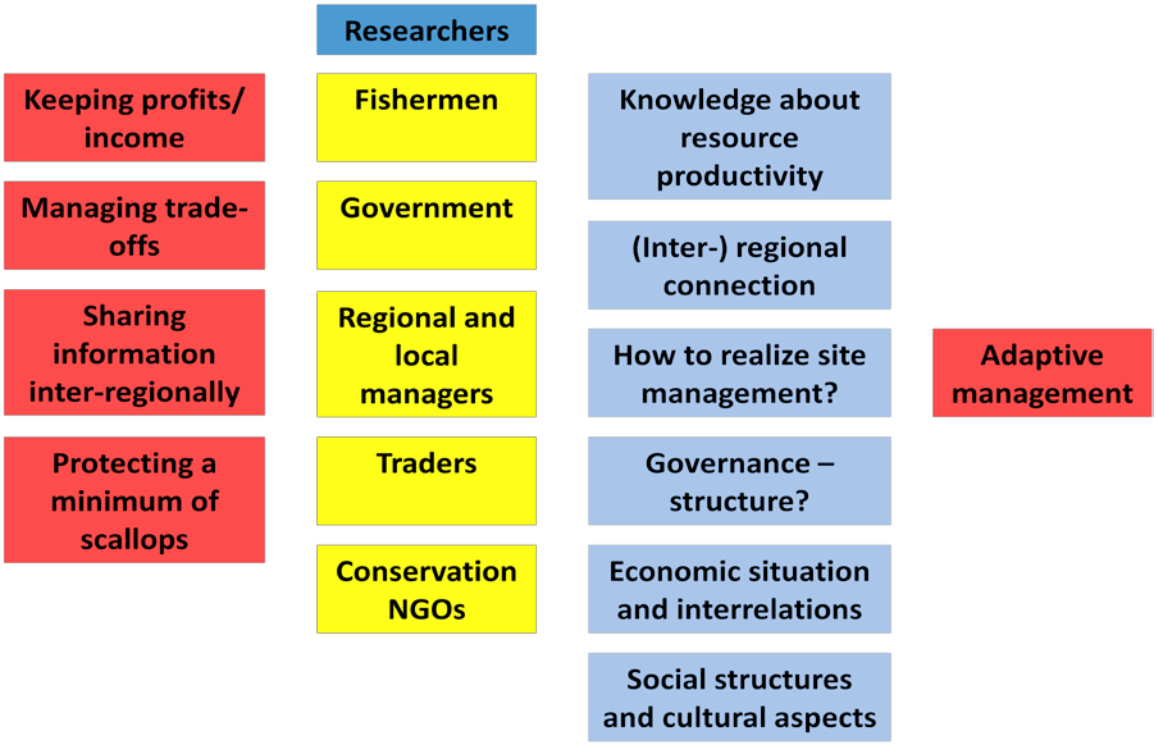
The project then went through several research cycles of repeated planning, data collection, analysis and evaluation done by Brazilian and German PhD and master students as well as by local community volunteers (citizen scientists). Local PRs managed to raise public awareness publishing newsletters, broadcasting radio and TV clips and the students added publications and general capacity to the outcomes of the project.



As a whole, the project produced more than 130 publications, 35 PhD thesis, several master and bachelor thesis, raised public awareness, created about ten permanent positions for scientists and technicians, led to cultural exchange and strengthened the ZMT - Brazilian relationship.

Challenging were not only custom clearances for equipment, its maintenance, the lack of infrastructure, and the lack of Brazilian money to support the project, but also the language, the communication between disciplines, and the differences in time capacity.

Case Study 5: Marine Protected Area Network creation for sustainable management of scallop populations in Chile

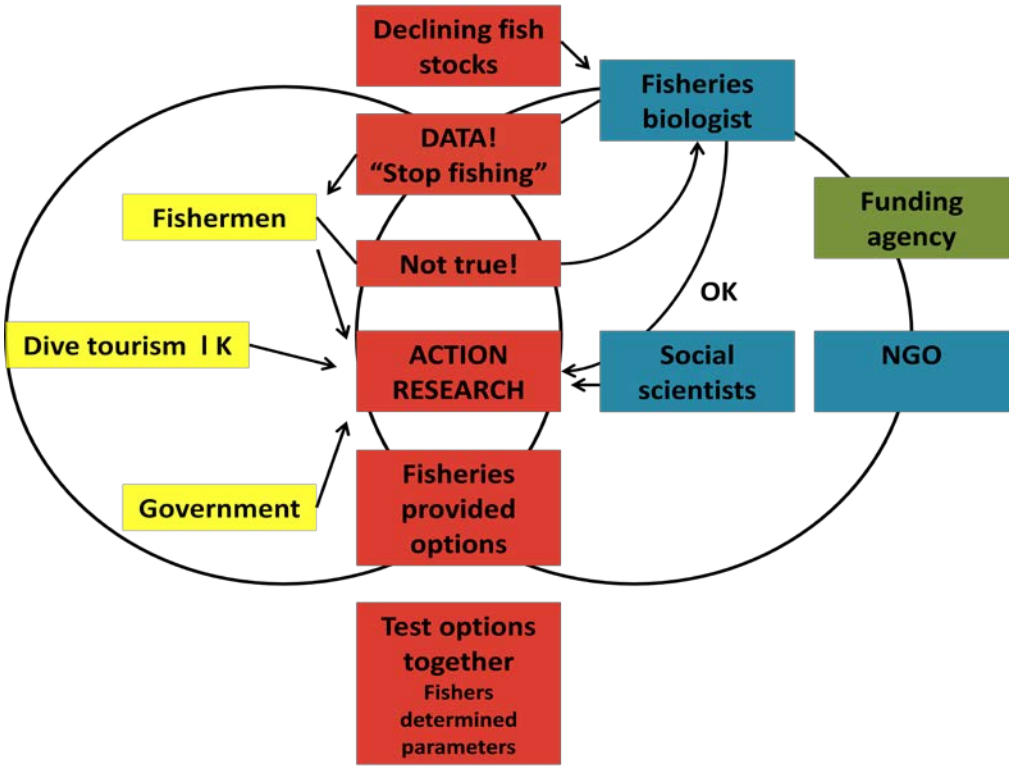


Researchers, fishermen, the government, regional and local managers, traders, and local conservation NGOs worked together in this project to find ways to keep the profits/ incomes, to manage the trade-offs, to share the information inter-regionally, and to protect a minimum of scallops.

The partners were faced with several questions and challenges, such as how to realise site management, the knowledge about resource productivity, regional and interregional connection, the governance structure, the economic situation and interrelations, as well as both social structures and cultural aspects.

The aim was to create and implement an adaptive management suitable to all stakeholders ensuring sustainable us of the scallops.

Case Study 6: “No more fish” - CB Marine Managed Areas



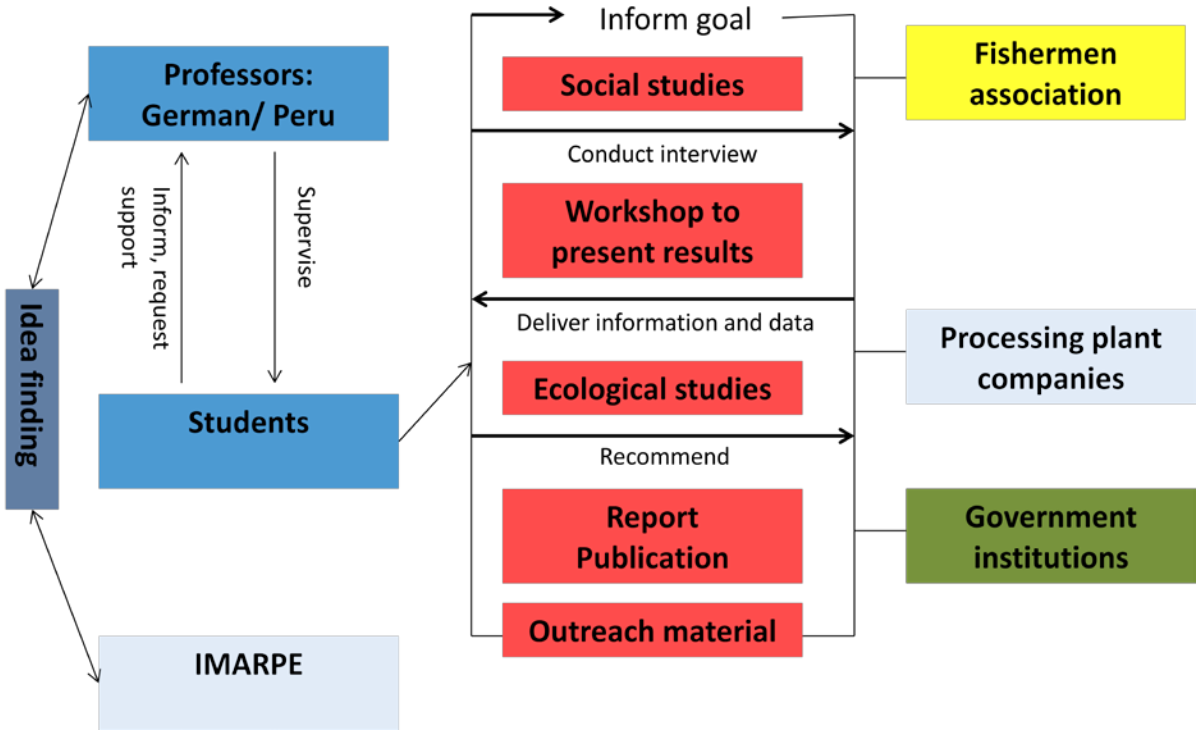
Declining fish stocks motivated biologists of the fisheries to collect data, present the data to the fishers, and demand a decrease in fishing. The fishers, worried about their livelihoods, questioned the results and demanded “action and more research” to clarify and better assess the situation. The fisheries biologists agreed and - together with the fishers, the government, the dive tourism, social scientists, and an NGO - the necessary research was conducted in cooperation, which was supported by a funding agency.

In the end, the fishers provided the options defining the parameters, which were tested together.

	Positive outcomes	Difficulties and pitfalls	Challenges for researchers
Participation	Respect	Communication	
Restored fish stocks	Increased knowledge	Trust	Give up power control
	Empowerment	Responsibility distribution	Long-term data
	Innovation	TIME	Replicability
	Ownership	Resources	People

Even though there were challenges like communication, trust (give up power control), responsibility distribution (long-term data), time (replicability), and resources (people), the project encouraged participation, respect for each other, increased knowledge, empowerment, innovation, ownership, and finally helped to restore the fish stocks.

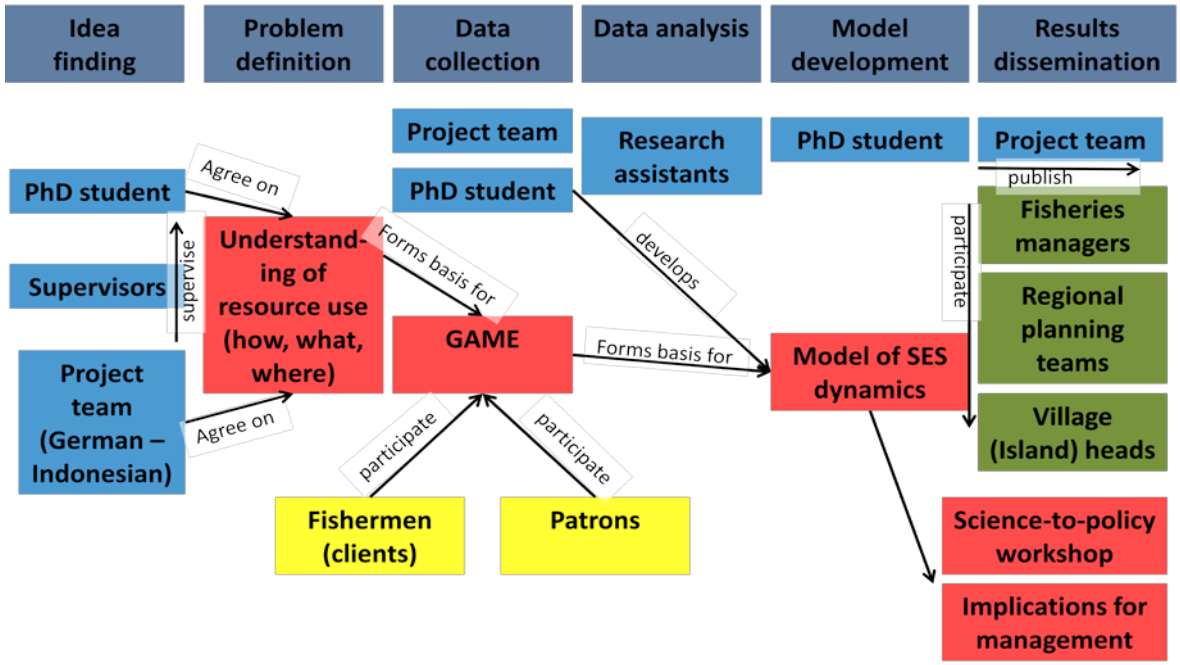
Case Study 7: Peru scallop aquaculture



A cooperation between German and Peruvian professors as well as members of the Instituto del Mar del Perú (IMARPE) developed the idea to the project, which was to be organised and carried out by students. The latter were to inform the fishermen association about the project goals and then conduct interviews with fishermen and processing plant companies as part of the social studies. Furthermore, ecological studies were done and the results presented to all stakeholders in a workshop.

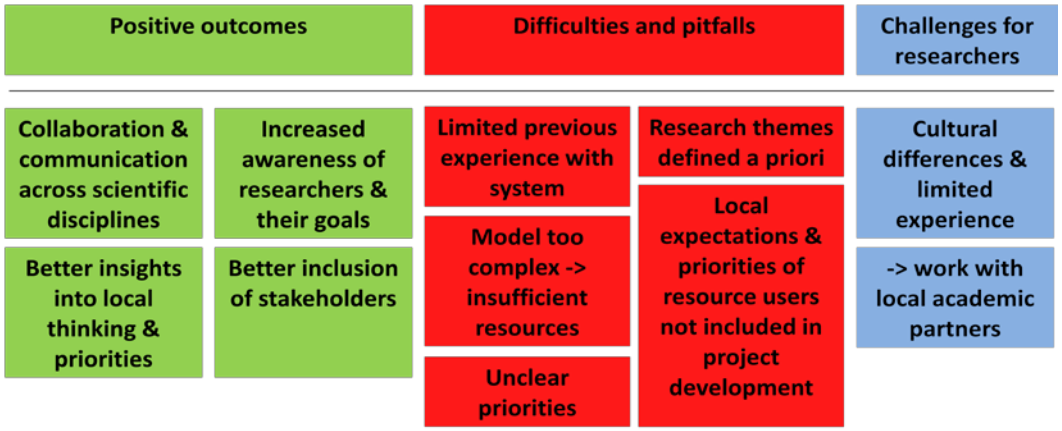
Finally, both a report with recommendations and a publication were forwarded to the corresponding government institutions and outreach material created.

Case Study 8: Reef game



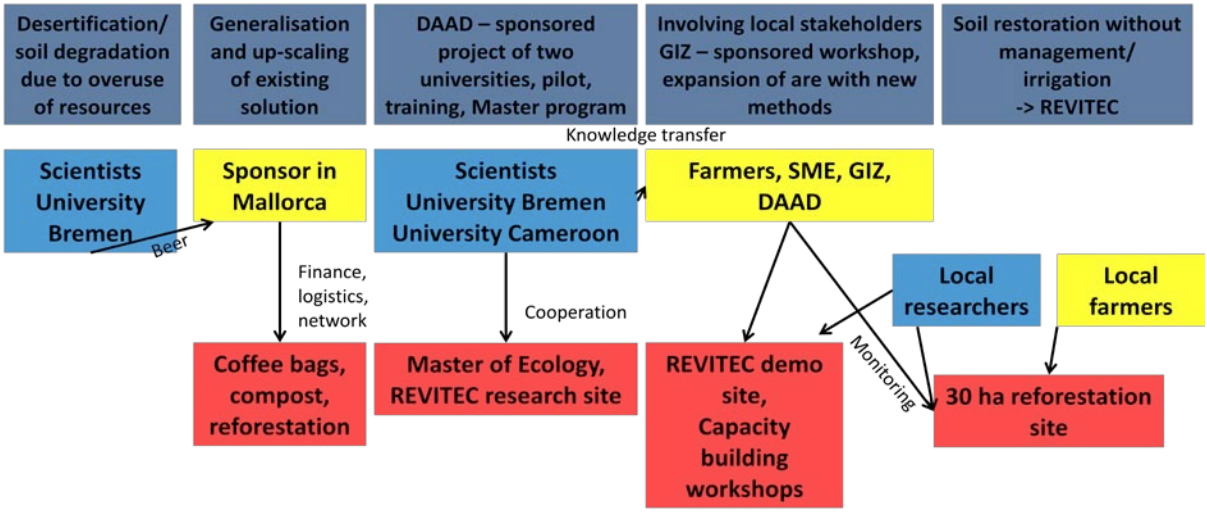
A German - Indonesian project team (including supervisors and PhD students) agreed on a common understanding of resource use, which then formed the basis for the “Reef Game”. Both fishermen and patrons were encouraged to participate in the game which was to form the basis for a model of SES (Socio-Ecological Systems) dynamics developed by the PhD students.

Eventually, participation in results dissemination was extended from the project team to fisheries managers, regional planning teams and the village (island) heads. Results were disseminated through a scientific publication and a science-to-policy workshop. Furthermore, the model of SES dynamics enabled the development of implications for management.



Stakeholders could benefit from the collaboration and communication across scientific disciplines, the better inclusion of all stakeholders, mainly balanced priority setting and attempted clear goal setting of this approach. Nevertheless, researchers were challenged by systematic issues as well as cultural differences and should have maybe considered working more closely with local academic partners.

Case Study 9: ReviTec



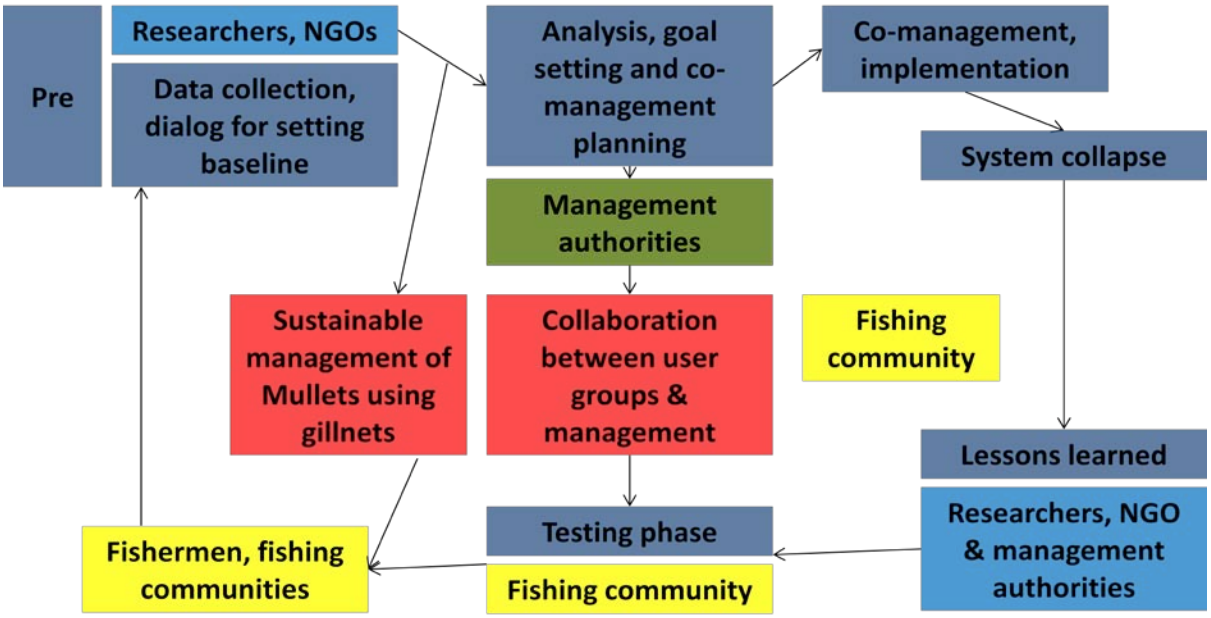
Desertification and soil degradation due to the overuse of resources in Cameroon threatened to increase without alternative approaches to the problem. Scientists of the University of Bremen had successfully launched a project in Mallorca and thought to generalise and upscale the existing solution to work at other locations. The sponsor in Mallorca provided finance and logistics and the necessary network to organise coffee bags and compost as a basis for reforestation.

Eventually, the DAAD got involved in what became a project of two universities, pilot study, training and master program.

Positive outcomes		Difficulties and pitfalls	Challenges for researchers
30 ha vital forest	New study program	Boko Haram	Intercultural competencies and misunderstandings
Awareness for sustainable land use	New businesses income	Lack of materials and resources	Northern approach
			Sustainable finances and structure

Even though the terror organisation Boko Haram and the lack of materials and resource were challenging the process of the project, the positive outcomes were not only an increased awareness for sustainable land use and new business income for local farmers, but also 30 ha of vital forest and a new study program (Master of Ecology) at the University of Ngaoundéré.

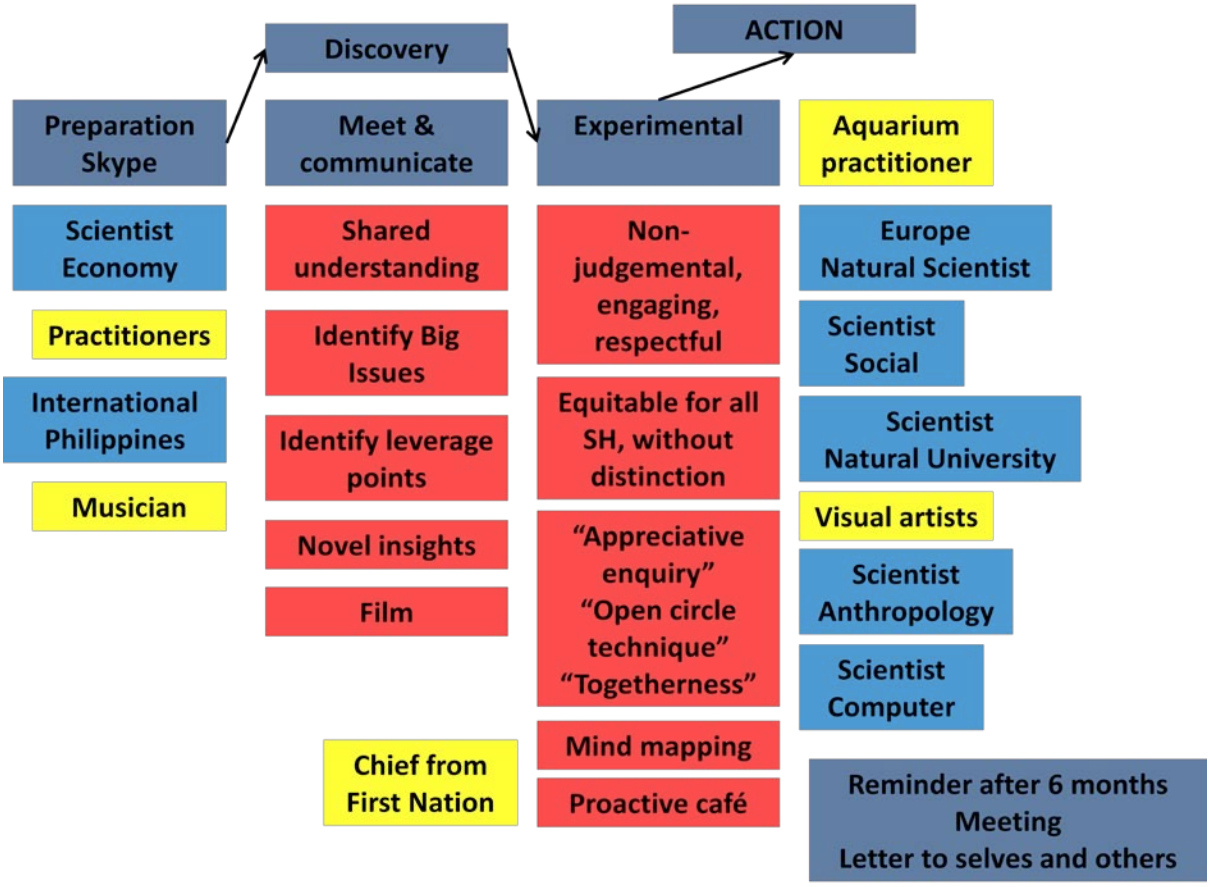
Case Study 10: South African gillnet fisheries



A “sustainable management South African gillnet fisheries targeting mullets” was the aim of researchers and NGOs that cooperated in data collection, setting of a baseline, data analysis, and co-management planning.

In cooperation with the fishermen and fishing communities researchers went through different project stages via implementation to even system collapse but were able to finally learn from the process’ failures and succeeded to set up a collaboration between user groups and management, which at first formed the basis for a testing phase, but then led the achievement of the project’s aim.

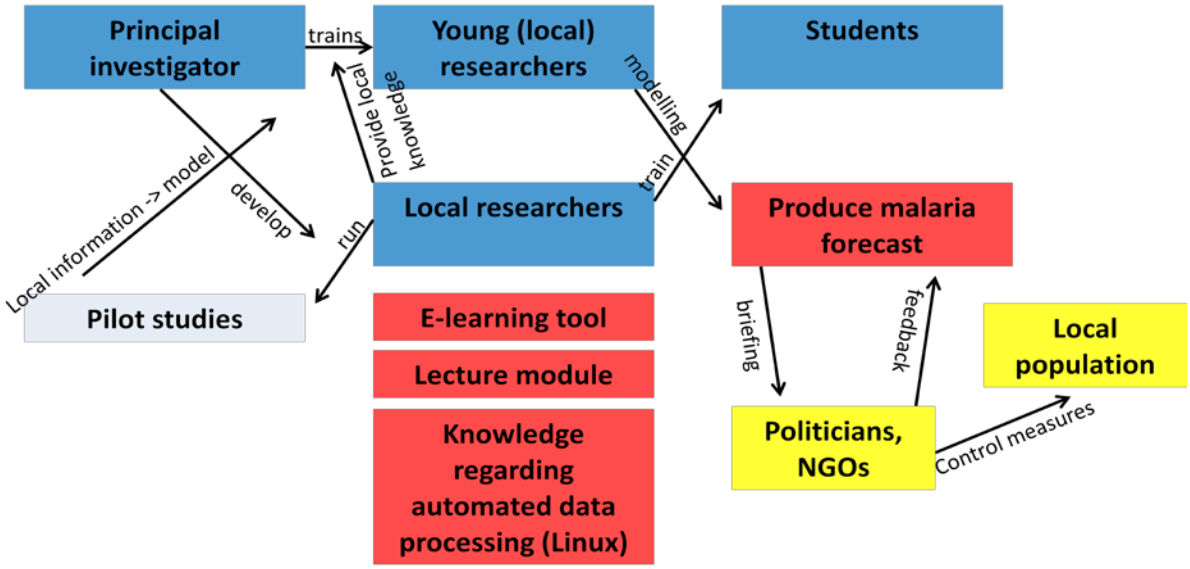
Case Study 11: Spaceship Earth



"Spaceship Earth" - a project that involves many stakeholders and tries to approach problems more creatively and holistically. Through a preparatory Skype session with scientists, practitioners, musicians etc. on an international level, first ideas lead to a "discovery". The latter is the basis for both a communicative and an experimental process eventually leading to "action".

This project tries to encourage and invite many different stakeholders to participate in the process and builds on shared understanding, non-judgemental as well as respectful communication. Furthermore, project partners make use of various means for idea finding, data collection and results dissemination.

Case Study 12: Transfer of complex weather-driven malaria models to Africa



Young (local) researchers were trained by a principal investigator to work more closely together with other local researchers and to help modelling a program to produce a malaria "forecast". To achieve this, local researchers provided local knowledge and ran pilot studies in order to collect more local information for the model. Politicians and NGOs were briefed on the results of the project and on how the model is run.

In return, politicians and members of the NGOs supported the final development of the model through their feedbacks and implemented control measures for the local population. In addition to that, an e-learning tool was programmed, a lecture module created, knowledge regarding automated data processing imparted, and further students were trained.

Positive outcomes	Difficulties and pitfalls		Challenges for researchers
Reduction of malaria cases	Unsuccessful training	Uncertainty about decision makers' reaction	Lack of "trainable" students
Capacity building	Useless forecasts	Lack of funding for counter measures	Construction of malaria models (neglected aspects)

Unfortunately, the model produced some useless forecasts and training was partly unsuccessful, or it was lacking "trainable" students. Researchers were additionally faced with an uncertainty of the decision makers' reactions as well as a lack of funding for counter measures. Nonetheless, the project show a reduction of malaria cases and capacity building had started.

Workshop Session 2 - Challenges for researchers in knowledge exchange during the research process

Tab. 1: Summary of the results of Workshop Session 2 - part 1 (20.01.2015, 15:10 - 17:10 h). For larger problem fields, different challenges and answers were developed in small working groups and were roughly ranked by relevance (people voting for the topic). KE - Knowledge exchange, SH - Stakeholder

Problem Field/ Issue					
Interface of external/ local partners, integration of SH		**Different priorities, relevance of KE, "Practise what you preach"**		**Systemic issues, external pressure**	
Challenges	**Answers**	**Challenges**	**Answers**	**Challenges**	**Answers**
- Motivation, incentives (3) - Develop researchable questions with SH (3)	- Frame problems from different perspectives (3) - Equal value of different roles (2)	- Translation of knowledge and solutions into meaningful measures for SH (5) - Bridging the gap (science - society) (5) - Environmental impact of mobility (3)	- Communication, collaborative scoping, different means (8) - Develop new narratives that resonate with many SH (5) - Adaptive learning and co-generation (4) - Better assessment of needs and context (2) - Self-reflection (2) subjectivity - objectivity - Transparency (1)	- Resources: Funding, time, staff (13) - Criteria of funding agencies (no resources for KE) (2)	- Project planning: time and money for KE, financial planning (6) - Reassuring funders, long-term funding (2) - Re-design research funding schemes
- Political and Economic reality (2) - Knowledge needs space and a voice (1)	- Networking (2) - Democratisation, connection (2) - Local partners and assistants (2) - Basic knowledge of law & management (1)	- Know yourself (1) - Researchers don't want to invest into KE (3) - Understand other fields of research		- Institutional disincentives "publish or perish" (11) - KE not important factor for career development - Evaluation (4)	- Include KE in project planning (7) - Restructure incentives and performance evaluation (4)
- Different backgrounds (3) - Many SH = many perceptions (2) - Not all SH included	- Involve other people - Well connected contacts	- Willingness of SH (2) - Linking knowledge to policy (2)		- German academic system, lack of mentors and creativity/ beauty (5) - Complexity of study systems (1)	- Platforms for KE (permanent, independent) (3) - KE modules (2) - Bilateral graduate programs (1)
- Local knowledge	- Stay in the country, learn the language (3) - Make use of experiences, long-stay research	- Lack of impact models, flexibility		- Capacity building (3)	- Knowledge networks - Develop skills apart from "paper writing"

Tab. 2: Summary of the results of Workshop Session 2 - part 2 (20.01.2015, 15:10 - 17:10 h). For larger problem fields, different challenges and answers were developed in small working groups and are roughly ranked by relevance (people voting for the topic). KE - Knowledge exchange, SH - Stakeholder

Problem Field/ Issue					
Methods/tools, capacity development		**Quality and Quantity**		**Communication**	
Challenges	**Answers**	**Challenges**	**Answers**	**Challenges**	**Answers**
- Capacity development (3)	- Develop and implement training program, include local knowledge (9) - Communication, collaborative scoping, different means (8)	- Quality of knowledge (3) - Too much knowledge (1)	- Practise restraint (1) "Knowledge on tap not on top" - Synthesis (experts, working groups, workshops, etc.) - Simplify	- Language, jargon, context (5)	- Transparency (3) - "Translators" between groups (1) - Learn the language - Integrate spiritual leaders - Multiple outreach materials (1)
				- Accessibility of information (2)	
- Research in "critically endangered mode" (3)	- Include KE in project planning (7) - Diversify results sharing (5) - Different project design form on-set (3) - Use of different creative ways to show results - Media and story-telling (1)			- Skills: trust and acceptance (2) - Effective means (1)	- Simplify (1) - Decision-making culture
- Dead-ends in solution finding (1)	- Research diary			- Constant exchange (1)	- Interpreters to bridge between disciplines/ politics, etc.

Workshop Session 3 - Developing ideas to address the challenges

On the basis of the major answers on integrating knowledge exchange in the research process as outlined in Workshop Session 2, Workshop Session 3 (21.01.2015, 9 - 11 h) focussed strongly on developing specific ideas and solutions. After choosing a topic of interest of Workshop Session 2, the participants came up with sets of ideas for the specific implementation of KE in tropical marine research projects, identified possible barriers to the specific implementation ideas, and finally developed solutions to these barriers in small groups. To better understand the presentation of this session's results, please see the colour code below (Tab. 3).

Tab. 3: Colour code of ideas for implementation, barriers and solutions to the problems.

General ANSWER FOR IMPLEMENTATION Topic 1 - 10			
Specific Ideas ➡		**Barriers** ➡	**Solutions**
Approach 1		Barrier 1	➢ Solution 1
Tool 1	Tool 2		
Approach 2		Barrier 2	➢ Solution 2
Approach 3		Barrier 3	➢ Solution 3

Topics that had the highest numbers of people interested were (random order):

Topic 1 - Adaptive learning and co-generation, Topic 2 - Capacity development/ building, Topic 3 - Development of new narratives, Topic 4 - Different project design from onset, Topic 5 - Communication, Topic 6 - Integration of KE in project planning, Topic 7 - Motivation and incentives for specific stakeholders, Topic 8 - Sufficient resources for projects, Topic 9 - Transparency and Topic 10 - Diversification of results.

Tab. 4: Results of Workshop Session III - part 1 (21.01.2015, 9 - 11 h) - Ideas, Barriers and Solutions. Topics 1 - 3.

Topic 1: Adaptive learning and co-generation		
Ideas ➡	**Barriers** ➡	**Solutions**
Project planning	Funding and time	➢ Integration of all SH into project planning, local experts
basic science & outreach / Pilot study		
Transdisciplinarity	Cultural/ spatial and language barriers	➢ Cooperation, local context
Constant reflection	Scientific view	➢ Regular meetings

Topic 2: Capacity development/ building		
Ideas ➡	**Barriers** ➡	**Solutions**
Capacity building of researchers ... • to identify SH (needs) • to translate to decision makers • to translate to managers • in intercultural situations and language • to work in interdisciplinary teams	Academic requirements Funding schemes Hierarchies and power structures Lack of tools, technology	Demonstration of measures and sites Integrate capacity building and communication in project design ➢ Adapt Academic Criteria ➢ Design projects in transdisciplinary teams ➢ Teach on all levels (kids, pupils, students)
Training in targeted communication and (social) media	Training fatigue, reluctance to learn, lack of appreciation of communication strategy	
Capacity building of citizen scientists and new researchers	Lack of "application" and appreciation of skills needed for capacity building	

Topic 3: Development of new narratives		
Ideas ➡	**Barriers** ➡	**Solutions**
Trust building from an early stage	Role of emotions	➢ Have a beer or tea :) Find the topic
Narratives that everybody can tell	Language !	➢ Make science understood
Room for communication	Strict/ missing communication structures	➢ E.g. writing on cards, include all SH!!!
Many to many	One to many, Diverse SH	➢ Define/ control time limits of speakers
"Conflict" as potential for transformation	Missing, unreflective or unprofessional moderation	➢ Moderation and mediation professionals
Flexibility in approaches	hierarchical structures	

Tab. 5: Results of Workshop Session III - part 2 (21.01.2015, 9 - 11 h) - Ideas, Barriers and Solutions. Topics 4 and 5.

Topic 4: Different project design from onset	
Ideas	**Barriers**
Clear concept about projects Cultural training Clear expectations from all SH Ownership of SH for project Continuous communication	Lack of time Lack of funding Conflicting expectations External pressure

Solutions		
Proper preparation	Personal relationships/ trust	Capacity building
Cultural/ language training	Appropriate communication channels	Funding schemes
Improved knowledge sharing platforms	Communicate results	Include external partners
Participatory workshops with external facilities experienced in conflict resolution	Involve community in data collection and interpretation	Be flexible, enthusiastic, open-minded and honest

Topic 5: Communication	
Ideas	**Barriers**
RELEVANCE? Why bother? Any Changes? - Why good science? - Why worth investing?	Lack of incentive Working reality, traditional measurements
Scientist **Why?** Funder	Different expectations
Science People **Real why** on the ground	Cultural differences
Know your who`s Context, background etc.	Lack of resources and skills

Solutions	
What does "impact" mean? Solution principles	
Values	**Tools**
Honesty, Transparency	Introduction Who am I, why am I here Take time and show respect
Real dialogue (Listening!)	Facilitation skills, appropriate communication skills
Compromise ➡ practical solutions	Planning and flexibility
Know the context	Ongoing informal evaluation

Tab. 6: Results of Workshop Session III - part 3 (21.01.2015, 9 - 11 h) - Ideas, Barriers and Solutions. Topics 6 - 8.

Topic 6: Integration of KE in project planning		
Ideas ➡	**Barriers** ➡	**Solutions**
Transdisciplinarity - problem definition - process - dissemination	Time constraint Capacity abilities Funding	➢ Informed lobbying and awareness raining amongst donors ➢ Interest group formation
Capacity development - individual - organisational - institutional	Local conditions	➢ Internal transdisciplinary capacity development
Public Relations - podcasts - radio - local papers	Available - tools - personnel	➢ Budget and hire professional PR
Evaluation and monitoring	Appropriate indicators	➢ Coordination of proposal writing with regard to Knowledge Exchange ➢ Long-term commitment

Topic 7: Motivation and incentives for specific stakeholders		
Ideas ➡	**Barriers** ➡	**Solutions**
Researchers	Career incentives	➢ Societal impact rating for all researchers
Resource users	Time Money Distance Power and dependence	➢ Internet exchange platform ➢ "Separate and envoice"
Powerful interests (Industries, Police)	Power differences, interest conflicts with researchers	➢ Public-private partnership ➢ common emotional driver
Innovation/ solution group		
Inclusive analysis workshops		

Topic 8: Sufficient resources for projects		
Ideas ➡	**Barriers** ➡	**Solutions**
Use local contact people - communication as integral part of projects	Lack of contacts No funding Lack of reliable partners Specific calls	➢ Joint ventures: Volunteers, local NGOs Crowd-funding ➢ Provide institutions with funds for projects ➢ Approach and convince funding agencies about relevance of KE in research projects ➢ KE as a criteria for proposal reviews
Outside meetings and small scale pilot project prior to project development		
Trust building within funding agencies		
Focus on Knowledge Exchange and Training		➢ On-site training courses ➢ Implementation
Creation of a project website, social media, blogs, TV documentaries (dynamic)		

Tab. 7: Results of Workshop Session III - part 4 (21.01.2015, 9 - 11 h) - Ideas, Barriers and Solutions. Topics 9 and 10.

Topic 9: Transparency	
Ideas	**Barriers**
Clarify all expectations:	Know yourself
"Social Contract"	Lack of flexibility to understand other fields of research
Mutually agreed "specific" process	Mobility is needed, but environmentally unfriendly
Keep process open to adaptation	Definition of outcomes without impact models
Information exchange on SH steps	
Enable mutual reaction	
Joint evaluation of individual projects	

Solutions		
To be developed by ZMT	Charter or "social contract"	Coded provisions for obligations

Obligations and recommendations		Values
MUST: ➢ return research in appropriate format ➢ acknowledgement of contributors	SHOULD: ➢ encourage partners to publish ➢ jointly identify new research topics	Adaptive learning Transparency

Topic 10: Diversification of results			
Funding Institutions	**Researcher**	**Research and Academic Institutions**	**Publisher and Journals**
Longer term funding cycles	Look for incentives to Knowledge Exchange outside	Restructure incentive structures	Incentivise interdisciplinary articles
Money for communication and dissemination	Simplify and generalise results	Hire for balance, science, creativity and communication	Promote special issues on Knowledge Exchange
Remove barriers: Simplify proposal application process	Identify groups to reach and include in project planning	Expand non-academic partnerships	Open Access information
	Puppets, podcasts, blogs, theatre, music, games, poetry, painting	Innovative outputs Encourage and challenge	
	- Support social change agents - Inter-sectoral learning - Support solution networks - Evaluation includes on the ground impact not only Impact Factor		
Impact on the ground			

Panel Discussion

In an open Panel Discussion different salient issues were collected, the four most essential ones determined via a quick vote and then discussed within the group. Apart from defining key terms, such as knowledge exchange, four other topics were of special interest to most of the participants (ranked by relevance): “Metrics of transdisciplinary KE and success factors”, “How to measure the impact?”, “To what extent are researchers really willing and successful in incorporating local needs into KE projects?” and “How to achieve upscaling?”.

With regard to **defining “knowledge exchange”**, there seemed to have been a common consent that strict definitions should be avoided and instead characteristics should captured, as there often is no common understanding of the concepts. Thus, the focus could lie on the project’s impact in the target area instead of the theory. By mentioning the connection between knowledge or information and power, one participant triggered the line of thought that to successfully engage in knowledge exchange and co-creation, one might need to be willing to empower partners and accept that one’s scientific understanding is only “a little piece of the cake”. To establish a reciprocal knowledge exchange, non-scientific knowledge will also have to be respected, feelings and emotions need to be integrated, and the project itself needs to become a part of a broader system. Researchers might be very specialised technically and have a lot of information to transmit, but this is in most cases only a small segment of the whole process. Addressing the “Issue of scales”, one participant highlighted that there might exist different realities in different areas, and thus overcoming transboundary issues and encouraging co-management (global analysis of approaches for regional level implementation) are key. Scientific advice might at times not be considered for policy development, as it sometimes is neither clear nor applicable and seems to be too complex including too few disciplines.

In order to make science empowering, the different perspectives need to meet and stimulate each other in an enriching process and exchange on a long-term basis.

The next salient issue discussed was “**impact**” and how to measure it. There seemed to be consensus that when trying to define impact, there arise challenges that weren’t anticipated before and that when wanting to trace impact, more challenges can be encountered. In most cases, data on the impact of projects is not available, as the impact is not directly visible and thus difficult to trace. Standard criteria, such as the uptake of MSC-certified fish (WWF), might not fully reflect the actual impact, as loopholes exist and the quality of the certification only really shows in the water. In the UK, some projects are evaluated by their impact on society based on different pathways and looking at single examples.

Moreover, science seems to be in the dilemma of being **“stuck” in the scientific/ academic system** but being expected to create non-academic impact. To achieve the latter, one might have to distance from purely economic indicators for measuring impact and focus on broader, more integrative and transdisciplinary approaches (different means of communication). It might need multiple actors from different spheres to evaluate impact and one should refrain from pure peer-evaluation and rather ask beneficiaries how they would evaluate the impact (target groups are co-evaluators). Additionally, being exposed to power issues, career issues, and funding issues (systemic issues), scientists often struggle to meet the challenge of integrating KE successfully into their projects. Nonetheless, there exist ample tools to convey research messages, esp. with adaptations to non-scientific audiences.

The incorporation of local needs into KE projects may be challenging for researchers and due to their working schedules and approaches there are often cultural “clashes” for both sides (local community/ researchers). For this reason, people need to be approached in ways they understand, local communication is essential and coalitions to organise power need to be build. A mix of different scientific approaches (pure, applied and on-demand) should be provided. In some cases, science on demand - using only little capacity - can lead to “big” results.

Workshop Session 4 - Developing recommendations and guidelines

The last day of the workshop not only offered the opportunity to wrap-up the preceding Workshop Sessions 1 to 3, but also to reflect on the workshop and its outcomes as a whole.

An animated discussion was held on the topic of **Workshop Session 4** (Developing recommendations and guidelines, 21.01.2015, 11:20 - 13:20 h). Contributing participants not only stressed the importance of learning from existing examples, which should be analysed with regard to what worked well and to what has not worked, but also the importance of how research projects are defined and of what the (monetary and non-monetary) values of the project are. Overviews on existing cases, an allocation to a certain “project typology” as well as a check for knowledge exchange (KE) criteria of both existing and new (ZMT) projects could form the basis for integrating and applying the results of the workshop in future research projects.

Several participants mentioned that partnerships, esp. with (local) partners on the ground who are experienced in engaging all stakeholders, are essential. Means to create equal levels of scientific and non-scientific exchange on the same level need to be identified. Furthermore, arts and emotion should be used more to disseminate research results, local knowledge and interdisciplinary approaches should be valued, and “good” and rigorous science should be applied to “hit the ground”. Against this background highlighting ways to engage “pure and fundamental” researchers could lead to an increase in acceptance and motivation to include KE in project planning.

One member of the discussion gave credit to the fact that it is difficult to create and exchange knowledge at the same time and stressed capacity building as the main priority as “one can’t exchange knowledge one doesn’t have”. An international guest recommended the integration of transparent exchange of basic on-the-ground needs (grounded offers according to stakeholders needs) into the projects in order to overcome scepticism in both donor and host countries.

As far as the ZMT is concerned, the Workshop’s results form the basis of:

a) an adaptation of the Bremen Criteria (document reflecting the ZMT’s standards for sustainable research practise)

b) the ZMT strategy for Knowledge Exchange (an orientation for values and a “tool box” for scientific projects) and

c) a scientific publication addressing both the Workshop's approaches and the central hypothesis of Knowledge Exchange relevant to international research on sustainable use of resources.

In summary, collaboration and communication with all stakeholders were outlined as the central elements of the KE process implying that researchers might have to reflect on and change some of their approaches to successfully implement KE in their research projects (Tab. 8).

Tab. 8: Recommended tools and selected workshop results.

Collaboration/ cooperation process	Researchers' approaches
Identification of stakeholders	Know stakeholders' needs
Integration of all stakeholders (availability, hierarchy, interests)	Language and cross-cultural competences
Joint project planning (involve stakeholders)	Build personal relations and establish local relevance of the project
Regular meetings with all stakeholders during the whole research process	Introduce themselves and show respect
Inclusion of local and international experts and/ or professional facilitators	Interpretation for decision makers and managers (communication and media)
Participative workshops	Competencies in mediation and communication
Integration of "citizen scientists", for example in data collection	Good preparation
Adaptation of funding schemes and mechanisms	
Platforms for Knowledge Exchange	