



Land-Ocean Interactions in the Coastal Zone



INPRINT

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Sea level rise and storms threaten small islands (Photo: Bernhard Glaeser)



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Please use the LOICZ online database for address updates and
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This newsletter is also available online at www.loicz.org

LOICZ Affiliated Activities



CHARM: Coastal Habitats and Resources Management project in Thailand and mainstreaming of co-management practices into policies

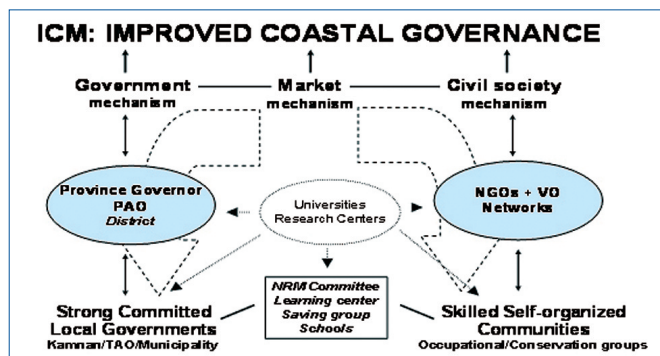
Yves Henocque¹ and Sanchai Tandavanitj²

The CHARM Project was a 5-years project (2002–2007) of the Royal Thai Government supported by the European Union. Its focus on developing coastal habitats and resources co-management processes is based on the assumption that the most important aspect of inefficient use of coastal resources lies in governance practices. Among the different types of governance, self-organizing networks are believed to be of particular relevance when sharing a common pool of resources. It involves the transformation of a system of local government into a system of local governance, including complex sets of organizations drawn from the public and private sector. Beyond the so-called community-based management approach, the project seeks to establish dialogue and communication throughout the governing process. Primarily this has been tried through the development of self-organizing networks between organizations and communities within the Southern Thailand project areas of Phang Nga Bay and Ban Don Bay in more than 40 coastal “Tambon” or sub-districts distributed in 5 provinces from the Andaman Sea to the Gulf of Thailand. After the Tsunami hit the coast of Thailand in December 2004, the approach by CHARM in rehabilitation and development of the affected areas was about partnership with the local authorities and communities. This was aimed to strengthen the capacity of these local governments in respect to the needs of the communities. With such a scope of intervention and a constant presence in the field, the project has gained the global positive image of a project that implements what it says through negotiation and “learning by doing” with the coastal communities and local authorities. Through a nested governance approach, co-management arrangement and practices feed policies towards a national strategy for coast and ocean integrated management.

(Source Charm)

Co-management arrangement scheme: *improved coastal governance towards Integrated Coastal Management (ICM) depends on government, market and civil society mechanisms. At local level, it is conditioned by both skilled self-organized communities and strong committed*

local governments with negotiation and planning (Natural Resources Management Committee), learning (Learning centre) and financial (saving group) facilitating platforms. The awareness and contribution of the Education sector (schools) is considered as crucial for today and tomorrow. The upscaling process operates through the provincial governance level and volunteer organisations (VO) supported by coordinated Department provincial offices and NGO networks. As a driving force, the market mechanism calls for Public-Private partnership agreements. Knowledge centres (universities, research centres) got committed in the governance process through practicing useful knowledge transfers to users and decision-makers.



The financing agreement indicated results of (1) Habitat, socio-economic and institutional baselines obtained and sampling strategy developed, (2) Policy and legal reform requirements characterised, (3) Individuals trained and build capacity amongst key actor groups and institutions built, (4) Appropriate (less damaging) livelihoods developed, (5) Co-management procedures and plans developed and (6) Lessons learned and information disseminated. The project had problems with the baseline data and sampling strategy, and never achieved the high-level result expected. Work on policy and legal reform was efficient overall and did lead to a final policy brief and green paper. However the project was correct to focus more on procedural and governance aspects rather than to attempt legal or policy reform. The project adopted a shotgun approach to livelihood development and did a far greater number of interventions than expected. A more



The backbone of LOICZ: Affiliated Activities

One aim of LOICZ is to provide a framework to encourage the fullest participation of multi-national, regional, and national research activities in its global research. These activities shall contribute to achieving the goals, aims and objectives outlined in the LOICZ Science Plan and Implementation Strategy (SPIS). A way we accomplish this is to actively engage with the international research community concerned with natural and social sciences on Global Environmental Change in the coastal zone. LOICZ is a forum to assimilate, synthesize and integrate the outputs of the research community. It provides an opportunity to communicate, discuss and disseminate these outputs making them available to the global audience of scientific peers, the general public, and decision-makers in policy and practice. Information on Affiliated Activities is held in a central database that is accessible online through the LOICZ website. It makes basic information and regular updates available to the wider global community as well as to LOICZ for its assessment and synthesis task and its reporting requirements.

We encourage coastal scientists to seek affiliation of their research project/s, PhD thesis or capacity-building activities to LOICZ and become a member of the global science community and network of researchers and practitioners. Since 1993, more than 400 individual activities from all over the world have already been involved in this LOICZ research portfolio.



Early stage research

We particularly encourage early stage researchers from PhD student to Post-Doc level to seek affiliation of their projects. LOICZ acknowledges that much of the work contributing to coastal Earth System science is being carried out by young scientists. Therefore LOICZ wants to support these efforts by enhancing their visibility and introduction to scientific peers in the global research community. Affiliated early stage research will thus contribute to the global research portfolio and its products and information will also feed into the global LOICZ synthesis likewise with the larger affiliated projects.

Affiliation will give early stage scientists comprehensive information about the variety of scientific activities in their field and allow them to foster their network with senior scientists and the global research community. They may also have easier access to participation in workshops, conferences and meetings organized by LOICZ that relate to their own work. By promoting their individual research on a global platform, early stage researchers will be given the opportunity to contribute to LOICZ aims and objectives directly.

Application for affiliation of scientific work at PhD and Post Doc level needs the same set of principle information and delivery of appropriate documents (e.g. thesis outline instead of a project proposal if applicable). In addition and to guarantee a good conduct in quality control LOICZ kindly asks for a co-signature and professional affiliation details of the supervising scientist. The review conducted by the LOICZ scientific peers will apply the same standards as for senior projects. Detailed information on the affiliation procedure is available on the LOICZ website in the 'Projects' section

<http://www.loicz.org/projects/index.html>

Synthesis of Affiliated Activities

LOICZ is preparing for an interim scientific synthesis in 2010, and as part of the synthesis the Affiliated Activities will be evaluated in the context of the LOICZ scientific framework. The synthesis is an opportunity to share your research findings with the global LOICZ community and value your contribution to coastal and global change research. We therefore encourage

you to regularly check and update the project information on the LOICZ database

<http://kopc01.gkss.de:7777/loiczdb/faces/app/Welcome.jspx>, including relevant publications and reports on your research findings. In order to edit your project information on-line, you need to log in with your user name and password. If you require any assistance, please contact the IPO.

Call for affiliation of research activities

LOICZ seeks to expand its network of scientists by endorsing research activities concerned with any of its priority topics on a global, regional or national level.

Within these topics LOICZ strives to develop:

- methodologies or models that allow data assimilation, processing and synthesis, including up and/or down scaling;
- scenarios of change and/or response to change in socio-ecological systems;
- scientific context for the evaluation of existing policies and structures;
- globally applicable tools for scientific synthesis, decision support and structure development; and
- dissemination interfaces to provide information and assist sustainable coastal development on appropriate scales.

To achieve this, LOICZ is calling for proposals to bring high quality research activities into the LOICZ cluster of Affiliated Activities. As well as fundamental science projects, LOICZ also looks for projects that have a multidisciplinary perspective, especially combining natural and social sciences. Projects can focus on global, regional or local scales and address coastal sciences and/or coastal management questions. Projects that collaborate with other Earth System Science Partnership (ESSP) elements, especially with other Core Projects of IHDP and IGBP, are sought in particular. Also projects that synthesize and analyze research outcomes already available or involve dissemination and outreach that will lead to better public knowledge are most welcome. LOICZ particularly encourages affiliation of early stage research at PhD and Post-doc level. Details about projects already affiliated to LOICZ can be found in the LOICZ Project database accessible through the LOICZ website.

Although LOICZ cannot offer funding to Affiliated Activities, its endorsement provides the following benefits:

1. support in the state of proposal for funding;
2. promotion of the project and associated activities, its contributing team, outputs and outcomes through the LOICZ website and/or newsletter;
3. contribution to workshops, conferences and meetings organized by LOICZ and hence establish linkages to other projects operating in similar fields and/or addressing similar issues;
4. access to a wide circle of information related to funding and the science community that is available through the LOICZ database; and
5. Principle Investigators of Affiliated Activities are offered a Corresponding Membership to the LOICZ Scientific Steering Committee (does not apply to PhD level). This appointment is subject to annual review.
6. Affiliated Activities will generally feed into the global LOICZ synthesis (Interim Synthesis planned for 2010).

Researchers whose work fits into the LOICZ portfolio are encouraged to submit proposals to the LOICZ IPO as soon as possible. The required form is accessible after registration to the LOICZ project database and additional information can be obtained from the LOICZ website or via contacting the LOICZ IPO.

efficient result would have been achieved if fewer, more strategic, interventions were chosen. The strategy being to maximise lessons learned. The quality of the co-management approaches and linked monitoring control and surveillance systems was very high and more diverse than expected. Lesson learning was reasonable and the quality of communication materials was excellent. However the tracking of what people did with the information and lessons learned were poor. The project also produced some very high quality unexpected results such as the plan for the Krabi Marina which will satisfy international EIA standards. The final project logical framework contained nine results, ignored baselines and added participatory linkages (networks), monitoring and evaluation, multiplier effect (actually impact) and project management. Overall the project's cost efficiency was good because the number of people positively affected by the project was very high.

Financial sustainability for project outcomes comes from three sources: 1) private sector investment, large and small, 2) access to loans and credit including revolving funds set up by the project and 3) public funds at Tambon, Provincial, and national levels which can be augmented by donors. The mission found relevant and excellent examples of all three sources still in place almost one year after the project had finished. Large scale investment for a Marina in the port of Krabi had been secured. The Marina would follow EIA advice and conform to principles of coastal co-management contributing funds of 5 million baht per year to the province that could be used for habitat restoration. Small-scale investments include the many community-based tourism initiatives e.g., at Liled, where tourism is linked to the improvement and maintenance of coastal habitats. The Kamnan (traditional headman) at Liled has also provided an investment in kind in the form of his speed-boat for monitoring control and surveillance. Most project communities now have greater access to loans than before the project and many still maintain the revolving fund e.g. at Liled where the funds retained equate to 183,000 baht. The Liled tambon will now invest 300,000 baht for community-based tourism. Krabi province now has a two-year budget for coastal co-management amounting to 400,000 baht for mangroves, 200,000 baht for sea-grass and 500,000 baht for awareness raising. The Department of Fisheries budgets will now be influenced by the project in a big way in that its five year plan, known as the Marine Fisheries Management Master Plan of Thailand, has many of the project suggested procedures at its core.

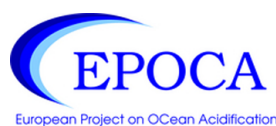
One year after the project ended, the ex-post monitoring study concluded the following: **Efficiency:** A key lesson learned related to the need for an inception report within 6 months of a project starting. This should include the plan for monitoring and evaluation. The adequacy of this could be checked by the Delegation, and sufficient scope

and inputs agreed on. **Effectiveness:** The most important lesson learned overall is that to deliver effective co-management, a two-track approach is needed. For line departments they need to be aware of the limitations of laws and regulations and recognise that there are individuals and agencies around that can be used to facilitate and develop the positive at low cost to themselves. For coastal communities the need is for demonstrations, individuals and or communities that they can visit to learn about alternatives to habitat-damaging jobs and relationships. The project did achieve good progress on both tracks but it is sad that they did not have the analytical capacity to derive a minimalist approach or simple recipe for replicable success. **Impact:** The major lesson learned about improving impact in projects producing management prescriptions to improve habitats is to pick cases that can rapidly show income benefits and diversity improvements. For the coast this means community-based tourism linked ventures and emphasis on mangroves. Once demonstrated in these areas, more problematic livelihood solutions and ecosystems can be tackled. Another lesson learned is to pick areas with motivated staff or counterparts at provincial or tambon level, able to draw on services from line departments. **Sustainability:** The most important lesson learned on sustainability by the mission, is that it is vital that private capital and enterprise is brought into any plan for the co-management of coastal resources. The two-track approach needs capital to cover the opportunity cost of change. The project has demonstrated this for community-based tourism.

More details: www.charmproject.org

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In November 2008, approximately 40 scientists from 10 countries met at IFM-GEOMAR in Kiel, Germany to establish an international agreement on best practices for ocean acidification research. The workshop was sponsored by the European Project on Ocean Acidification (EPOCA), the International Ocean Carbon Coordination Project (IOCCP), the US Ocean Carbon and Biogeochemistry Program (OCB), and the Kiel "Future Ocean" Excellence Cluster. It covered seawater carbonate chemistry, experimental design of perturbation experiments, measurements of CO₂-sensitive processes and data reporting and usage.



The participants agreed on the recommendations that would appear in a guide as well as on authors and timelines for drafting each section. While this first workshop was kept necessarily small, the development of the best practices guide is meant to be an open community-wide activity. EPOCA invites interested experts to visit the EPOCA web site (<http://epoca-project.eu/> under "Best practices guide") to review the presentations from the meeting, the timeline for drafting and reviewing the guide, and contacts.

Priority Topics

PRIORITY TOPIC 1

Linking social and ecological systems in the coastal zone

Research Mission to Pekanbaru, Riau Province (Sumatra, Indonesia), 9–14 November 2008

Bernhard Glaeser

The objective of the mission to Pekanbaru was threefold: to present LOICZ research activities, to prepare a workshop in Pekanbaru in early March 2009, and to prepare a research plan as part of LOICZ research on socio ecological systems (SES-PT1). This was an activity within the SPICE project. SPICE (Science for the Protection of Indonesian Coastal Ecosystems) is a LOICZ affiliated project; Riau Province on Sumatra is one of three SPICE project sites, the other two being Spermonde Archipelago in southwest Sulawesi and Segara Anakan in southwest Java.

The mission to Pekanbaru was divided into three activities:

1. International workshop „SPICE II Roundtable Meeting“;
2. Break-outs and meetings to prepare a workshop in Pekanbaru in early March 2009;
3. Field trip as part of the activities above.

1. International workshop „SPICE II Roundtable Meeting“

The „SPICE II Roundtable Meeting“ presenting the state of the art of SPICE research, included cluster group meetings, and prepared a first draft report on SPICE future research perspectives, to be submitted to the SPICE steering committee. Marion Glaser (LOICZ SSC) presented „SPICE Cluster 6: Governance and management of coastal social-ecological systems – a cross-regional and transdisciplinary social science project“. The main objective is an integrated analysis of natural and social

dynamics in Indonesia. Bernhard Glaeser (LOICZ SSC) complemented the report by presenting „Riau Province in West Sumatra: Tentative themes for SPICE II SES research“.



Workshop Pekanbaru. Bernhard Glaeser, Marion Glaser, Luky Adrianto, Agus Kristijono (from left)

2. Break-outs and meetings to prepare a workshop in Pekanbaru in early March 2009

The aim of the sub-meetings was to prepare a workshop, possibly including a summer school, to present SES research activities, to enhance further international and interdisciplinary collaboration, and – with establishing a short-term summer school – to teach methods related to SES research.

Field trip as part of the activities above

A field trip downstream Siak river to Sri Indrapura and back complemented the above activities.

Participants from the region were Dr. Suardi Tarumun (UNRI: University of Riau, Pekanbaru) and eight UNRI research students (mostly M.Sc. students in the Environmental Health program of UNRI).





Plywood industry, closing down



Pulp and paper company

Potential research themes/areas within the socio-ecological systems framework were identified:

- public health and river health
- poverty alleviation and rural development
- gender aspects
- pollution by oil and chemicals disrupting fisheries.

A follow up mission to Indonesia took place between 20 February and 11 March 2009. This time Pekanbaru, Riau Province (Sumatra) and Spermonde Archipelago (South Sulawesi) were the target regions. Bernhard Glaeser and Marion Glaser provide a feature article on this second mission which sketches a socio geographic overview of this interesting region. This second article is therefore published in our section "Coastal Snapshots".



*Field trip on Siak River—Suardi Tarumun, Bernhard Glaeser, Indonesian MSc students and Marion Glaser (from left)
(all photos by Bernhard Glaeser)*

PRIORITY TOPIC 2

Assessing and predicting impacts of environmental change on coastal ecosystems

Hypoxia, Nutrients, Fisheries, and their Ecosystems

Denise Breitburg¹, Karin Limburg², Lori Davies³, and Dennis Swaney⁴

Background

Globally, fisheries are in decline, humans increasingly affect the coastal zone with nutrient loadings, and hypoxic areas are increasing in occurrence, size, and duration. The question of how these phenomena are related, and how to identify interactive effects of eutrophication and fisheries removals on fish abundances and landings, were the subjects of a planning workshop and open lunchtime discussion at the January, 2009 meeting of

ASLO (American Society of Limnology and Oceanography) in Nice, France. These discussions marked the first in a series of three planned workshops of the LOICZ-affiliated project, Nitrogen, Hypoxia and Fishes: Moving Beyond Fisheries Data to Understand Effects on Upper Trophic Levels in Estuaries and Semi-Enclosed Seas', organized by Denise Breitburg and Karin Limburg. The aim of the workshop and special session was to discuss the relationships between nutrient loading, hypoxia, and marine fish populations, to engage the broader community of coastal and marine scientists in these issues, and to plan the next stages of this work.

Descriptions of coastal waters in both the popular and technical press evoke contrasting images of massive 'dead zones' and productive fisheries in systems affected by hypoxia. These contrasts emerge from the juxtaposition of nutrient enrichment, habitat degradation, and high population densities in the coastal zones of the world's waters. Nitrogen enrichment generally increases biological production (Nixon & Buckley 2002), while hypoxia reduces biomass through reduction in habitat quality and quantity (Caddy 1993, Diaz 2001, Rabalais & Turner 2001). The effects of nitrogen enrichment and hypoxia on food webs and fisheries may therefore be strongly influenced by the extent to which these two factors co-occur, and the ways in which their effects are either masked or exacerbated by fisheries removals. It is both important and challenging to disentangle the causal factors, understand synergistic interactions, and move toward more holistic management.

Sunday Workshop

Ten scientists, including SSC members Alice Newton (SSC Chair) and Dennis Swaney, met in a pre-conference workshop to lay out the issues. Denise Breitburg kicked off the workshop with an overview of the topic, presenting results from a synthesis undertaken by her and collaborators. Breitburg presented evidence that in some cases, hypoxia is associated with declines in fisheries, but not in others, and discussed compensatory factors that might limit effects of hypoxia at the whole-system or population scale (Breitburg et al. 2009; Fig. 1).

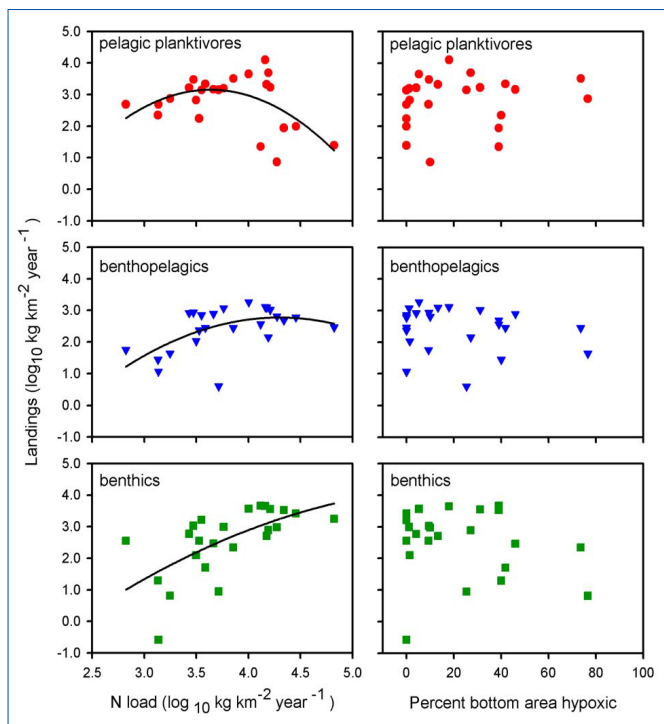


Figure 1: Different relationships between fisheries landings, nitrogen loading, and spatial intensity of hypoxia are evident from synthesis of a broad literature (Breitburg et al. 2009)

Dennis Swaney presented an overview of methods for estimating nutrient fluxes to coastal regions, and a discussion of the LOICZ nutrient budgeting approach, noting that budget approaches include information in addition to terrestrial nutrient fluxes that may be useful in explaining patterns of variation of marine organisms. Such multidimensional approaches can become the basis of coastal typological analyses, and a considerable database of coastal data exists (both within LOICZ and elsewhere) that could be applied to analyses and classification of hypoxic zones. Karin Limburg presented a review of trophic ecological interactions (top-down trophic control and trophic cascades, Carpenter et al. 1985) that could potentially play a role in the persistence of effects of elevated nutrients, even after abatement.

After lunch, Olle Hjerne and Susa Niiranen, both from Stockholm University, presented a modeling framework, EcoPath with EcoSim and EcoSpace, they are employing in the Baltic Sea. This framework, developed by Jeffrey Polovina, Villy Christensen, Carl Walters and Daniel Pauly, is widely used for ecosystem-based analyses of fisheries. Olle presented an application of EcoPath with EcoSim (EwE) to the Baltic Sea. The Baltic Sea is subject to periodic hypoxia/anoxia covering large areas (Fig. 2) that is strongly influenced by nutrient inputs from the surrounding catchment.

The areas of low oxygen tend to be the saltiest in this low-salinity system, and these areas, if oxygenated, would be the best spawning areas for cod, as their eggs require at least 11 psu to be viable. The Baltic EwE is entering a second phase of development, which will include incorporating eutrophication and anoxia. Susa Niiranen has developed a first generation version of a Baltic EcoSpace model, where phytoplankton, zooplankton, and key fish species are spatially distributed according to optimal habitat, and hypoxia is accounted for in "reproductive volume", a multiplier of cod reproduction (Fig. 3).

Questions that she intends to address include: what are the impacts of different fishing pressure (e.g., heavy fishing vs. marine protected areas) on regional eutrophication through top-down control mechanisms? and conversely, what are impacts of hypoxia on food webs (via bottom-up and top-down mechanisms)?

Daniel Conley (Lund University) wrapped up the presentations with a discussion of recent work on the hysteresis of ecosystems receiving excessive nutrient loading. A study published recently in *Estuaries and Coasts* (Duarte et al. 2009) suggests that a return to original conditions, once nutrient loadings are abated, is unlikely in many coastal ecosystems (i.e., they exhibit a "shifting baseline"). The causes may be multiple, but the implication is that large investments in regional nutrient management plans may not always produce the desired result. The degree to which fisheries and/or hypoxia affect the persistence of elevated nutrients was a topic of discussion and will be one of further research.

Figure 2:
Extent of hypoxia and anoxic bottom water in the Baltic Sea, autumn 2008.
Source: HELCOM

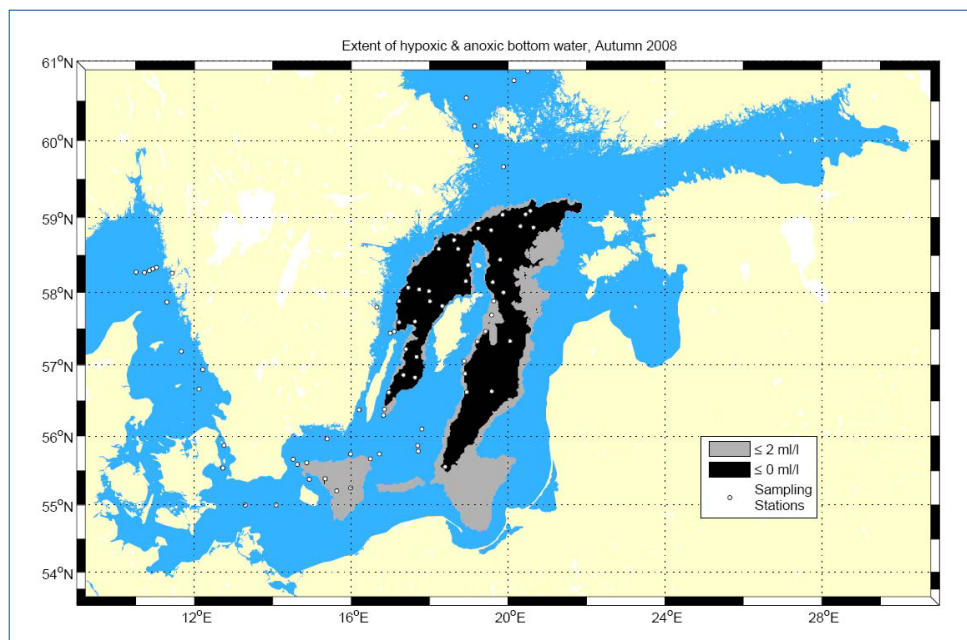
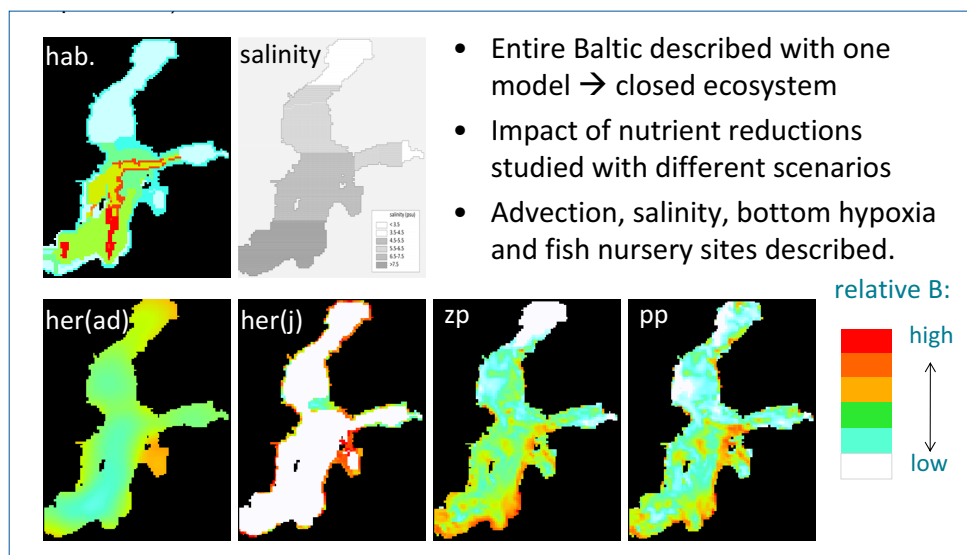


Figure 3:
Available habitat for key organisms. Graduate student Susa Niiranen is currently developing an EcoSpace model that will help predict effects of nutrient reduction on the Baltic food web. The model incorporates effects of advection, salinity and bottom-layer hypoxia as well as other factors on the spatial distribution of relative biomasses (relative B) of important species and trophic groups. Organisms sort out on salinity gradients, and are prevented from colonizing hypoxic/anoxic areas.

Key: her (ad) = adult herring
her (j) = juvenile herring
zp = zooplankton
pp = phytoplankton



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result. The degree to which fisheries and/or hypoxia affect the persistence of elevated nutrients was a topic of discussion and will be one of further research. The meeting wrapped up with discussions and ideas presented by workshop participants on how to use existing and developing EcoPath and EcoSim models, and calibration datasets on which they're based, as estimates of fish biomass in cross-system comparisons. This approach would allow analyses to use biomass and species composition as endpoints of statistical models, and use nutrient loads, hypoxia, fisheries removals and system characteristics as independent variables.

Tuesday Discussion Session

The goals of this session, scheduled during the ASLO meeting itself, were to evaluate interest from other



scientists who might have data or ideas to contribute and to put together a list of contact information and area of expertise from participants. The meeting drew over 30 attendees representing eight countries and a breadth

of disciplines, from chemical oceanography, to ecosystem science, watershed management, and fisheries science (Fig. 4).



Figure 4: Denise Breitburg and Karin Limburg give a project overview to participants in the Tuesday lunch workshop

After a brief review of the highlights of the workshop and the broader issue of nutrients, hypoxia and fisheries, a lively discussion ensued in which participants described their own experiences and perspectives on the issues. Questions and comments from the group were diverse. Among the interesting ideas emerging from the discussion were:

- the importance of including a paleoecological perspective,
- the potential to better understand the effects of hypoxia and nutrient enrichment by comparing upwelling systems with estuaries and semi-enclosed seas,
- the potential importance of categorizing systems by the intensity of fisheries exploitation as well as hydrology and physical characteristics,
- the need to consider joint management of fisheries and nutrients,
- the importance of considering different sources of nutrients,
- accounting for spatial and temporal decoupling of data sources, and
- the potential importance of including other sources of habitat degradation in analyses.

Future Goals and Next Steps

One of the goals in organizing the initial meeting (beyond providing the opportunity for a discussion) was to solicit help and participation in developing a database that includes not only nitrogen loads, but also the spatial extent of hypoxia, fisheries landings and estimated abundances of fishes and mobile macroinvertebrates targeted by fisheries (crabs, shrimp, lobsters, cephalopods). This will be a community database that can be used to improve

understanding of the large-scale effects of nutrient enrichment and hypoxia in systems stressed by human influences that include both these factors and fisheries removals. Sound management of our coastal ecosystems is not possible unless we can correctly identify the effects of individual and interacting stressors that alter food webs and system productivity. Members of the LOICZ community, and coastal researchers in general, who are interested in participating in contributing data and participating in this effort should contact Denise Breitburg (breitburgd@si.edu) or Lori Davias (daviasl@si.edu). We look forward to your participation, and value your contributions.

The next workshop will be a working meeting dedicated to compiling and beginning analysis of the dataset that includes EWE model biomass estimates. We are currently identifying possible dates in late summer or fall of 2009.

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SCOPE Biofuels Project: Update on the Rapid Assessment on Biofuels and Environment

Robert W. Howarth and Dennis P. Swaney

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council for Science (ICSU) established the International SCOPE Biofuels Project to provide a comprehensive and objective, science-based analysis of the effects of biofuels on the environment. The SCOPE Biofuels Project held an international workshop in Gummersbach, Germany, organized by Bob Howarth (Cornell University, USA) and Stefan Bringezu (Wuppertal Institute, Germany) from September 22–24, 2008 to develop a "rapid assessment" of these environmental consequences. Scientists from 21 countries representing a diversity of disciplines participated in the assessment. The executive summary and individual chapters of the workshop report are now available online at <http://cip.cornell.edu/biofuels/>. The workshop report is also covered in an article in the March 20, 2009 *Scientific American*: <http://www.sciam.com/article.cfm?id=nitrogen-fertilizer-anniversary>. SCOPE Biofuels is a LOICZ-affiliated project. This excerpt from the executive summary outlines some of the major environmental issues discussed in the report.

The Rise of Biofuels

Many countries and companies are investing heavily in biofuels for transport, motivated by concerns and opportunities related to global climate change, energy security, and rural development. Production targets and mandates for biofuels vary among nations, but many have goals to use biofuels for 10 % or more of liquid transportation fuels in 10 to 20 years (Chapters 2 and 11).

Governmental energy policies have focused largely on liquid biofuels (ethanol and biodiesel) rather than solid biofuels (wood and charcoal), in part because the liquid fuels can readily replace conventional transportation fuels without major modifications in transportation technologies currently used. The convenience of liquid fuels for transportation has long resulted in a price differential between liquid and solid fuels, and as of 2007, crude oil was worth some 12-times more than coal per unit energy (Chapter 1). Global production of liquid biofuels has grown exponentially since 2000 (Figure 1a). Despite this growth, liquid biofuels are still small contributors to the global energy supply. As of 2006, they supplied 1.8 % of the global use of liquid transportation fuels. This is equivalent to 1 % of the total liquid fuel use globally (including liquid fuels used other than for transportation), or 0.4 % of the total global energy consumption from all sources. By comparison, solid biofuels supplied approximately 10 % to 13 % of total global energy consumption, or some 30-fold more energy than liquid biofuels (Chapter 1).

Although many countries anticipate large increases in production, the current global production of liquid biofuels is dominated by just a handful of countries. The combined production of ethanol in Brazil and in the United States has accounted for 75 % or more of the global production for decades (Figure 1b). Ethanol is the major liquid biofuel globally, with a production of approximately 1.2 EJ (1.2 × 10¹⁸ joules, or 55 billion liters) in 2007. China and India are the next largest producers, together accounting for 12 % of global ethanol production in 2006. The global production of biodiesel in 2007 was approximately 0.4 EJ (12 billion liters) per year, about one third the rate of ethanol production (by energy content). Almost 80 % of the world's production of biodiesel occurs in the European Union, and almost 50 % in Germany (Chapter 1).

The vast majority of current production of liquid biofuels is based on crops that can also be used for food: corn (maize) in the United States (the world's largest producer); sugar cane in Brazil (the world's second largest producer); and rapeseed (also called canola) in Germany (the world's third largest producer). In 2007, the United States used 24 % of its national corn harvest to produce ethanol, which contributed 1.3 % of national liquid fuel use (transportation fuels plus other uses of liquid fuels) (Chapter 1). This illustrates the difficulty of reaching current mandates for production of liquid biofuels. Meeting these goals would require some combination of a large



increase in the area devoted to biofuels crops and an unprecedented increase in the yield of biofuels crops per unit of land, water, and fertilizers (Chapter 4). Estimates for the range of new agricultural land required to meet a global target of 10 % biofuel substitution for liquid transportation fuel use range from 118 to 508 million hectares, depending upon the crop produced and the level of crop production assumed. This compares with the current area of arable land in the world of 1,400 million hectares (Chapter 6). Because of constraints on the productivity of biofuel crops such as water availability, the higher end of estimates for land use needs may be most reasonable (Chapters 4 and 16).

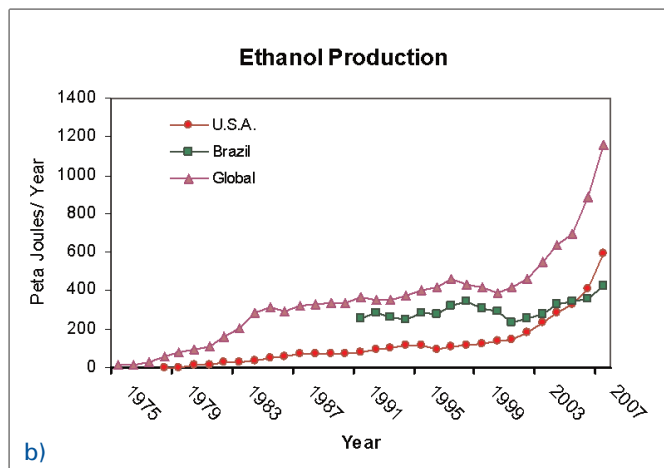
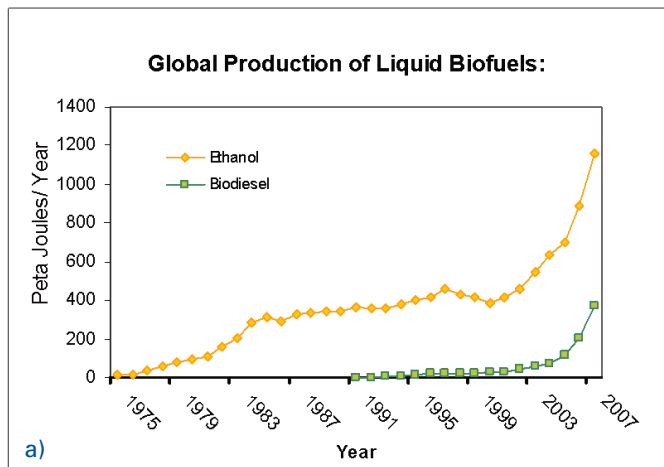


Figure 1: Global production of ethanol and biodiesel (1a, top) and comparison of production of ethanol in the the USA and Brazil with global production 1b, (bottom) from 1975 to 2007. A petajoule is 10¹⁵ (one quadrillion) joules. One thousand petajoules equals an exajoule (EJ). Reprinted from Chapter 1 of the SCOPE Biofuels project report

The challenge of meeting land needs for the expansion of biofuel production must be considered in the context of a growing demand for food. The global population more than doubled since 1960, and world agricultural area per person decreased 2-fold. In the past, food consumption per person was able to increase due to a dramatic increase in crop productivity per area. However, the ability to in-

crease crop productivity is not infinite, and increasing population and improved diets with higher protein content are placing ever greater demands on land for food production so that competition and conflict with biofuel production using current methods can only increase in a world where some billion people are already underfed (Chapter 4).

Biofuel production and consumption have a variety of local and regional environmental impacts. Growing crops is essentially the same for biofuels as for other agricultural purposes. But the environmental impacts of crop production often increase as more land is used, land is farmed more intensively, and so-called marginal lands are placed into agriculture. The environmental consequences of biofuels depend on what crops or materials are used, where and how these feedstocks are grown, how the biofuel is produced and used, and how much is produced and consumed. Both positive and negative effects on the environment can occur. Before looking into effects on greenhouse gases the next paragraph describes initial feedbacks with water and coastal systems.

Biofuels and effects on water and coastal systems

Water pollution can result from runoff from agricultural fields and from wastes produced during biofuel production. Nitrogen losses from corn fields is a particular problem (Figure 2). Compared to most crops, corn is especially leaky of nitrogen because of its shallow rooting system and short period of active nutrient uptake. In regions where soils have artificial drainage such as much of the "corn belt" of the upper Mississippi basin in the United States, nitrogen losses associated with growing corn can be quite high. This is the single largest source of nutrient pollution leading to the "dead zone," or area of low-oxygen water in the plume of the Mississippi River in the Gulf of Mexico. The increase in corn to support ethanol goals in the United States is predicted to increase nitrogen inputs to the Mississippi River by 37 %. This works against the national goal of reducing nitrogen inputs by at least 40 % to mitigate the "dead zone." When perennial crops such as switchgrass are used instead of annual ones such as corn, water pollution is much less (Chapter 9).

Organic wastes from the sugar-cane-ethanol system ("vinasse") are another serious problem. These wastes are nutrient rich, and so can be recycled onto fields as an effective fertilizer. However, excessive fertilization with vinasse results in runoff to surface waters and contamination of groundwaters, and sometimes these wastes are directly discharged to surface waters. The high organic content of the vinasse rapidly consumes oxygen, severely degrading water quality. In Brazil, the government has enacted environmental laws that if followed will greatly reduce the potential impacts of the ethanol industry on water quality (Chapter 9).

Figure 2:

Because of a shallow rooting system and short time period of active nutrient uptake, corn is particularly leaky of nutrients. In regions with artificial drainage, the nitrogen loss associated with growing corn can be quite high. This is the single largest source of nutrient pollution leading to the "dead zone," or area of low-oxygen water in the plume of the Mississippi River in the Gulf of Mexico.

(Photo: Robert W. Howarth).



Biofuels and the Emission of Greenhouse Gases

Biofuels are often promoted as a way to reduce global warming. However, many biofuel systems can increase the release of greenhouse gases relative to the fossil fuels they replace, aggravating global warming. Greenhouse gas emissions from biofuels occur from farming practices, refining operations, and the conversion of ecosystems to cropland for biofuel production. The details of how and where crops are grown, how crops are transported before being processed into fuels, and how fuels are made are all important in determining the net effect on greenhouse gas emissions. Most recent studies based on life-cycle analysis conclude that when ethanol from sugar cane is used to replace fossil fuels in transportation, a substantial reduction in net greenhouse gas emissions may result: an 80 % to greater than 100 % savings are recorded (when low emissions of nitrous oxide are assumed). On the other hand, using ethanol from corn is less favorable, resulting in 30 %–50 % savings relative to burning fossil fuels; in some cases, using ethanol from corn results in an increase of greenhouse gas emissions compared to simply burning gasoline, rather than any saving. Using biodiesel from rapeseed has a benefit intermediate between ethanol from sugar cane and ethanol from corn: greenhouse gas emissions are reduced by 20 %–85 % compared to using fossil fuels. In general, the wide range of reported results for all types of biofuels can be largely attributed to differ-

ences in co-product allocation methods (e.g., whether or not waste products are used for animal feeds) and assumptions made about the types of energy inputs used to make biofuels and transport crops to processing sites. In general, the agricultural and transformation phases account for the vast majority of total greenhouse gas emissions from biofuels (Chapter 5).

The studies summarized in the paragraph above may underestimate the release of one greenhouse gas - nitrous oxide (N_2O) – from biofuel production, and therefore are probably too optimistic. Nitrous oxide is not as abundant as carbon dioxide in the atmosphere, and is not as important as a driver of global warming. However, for an equivalent mass, it is almost 300-fold greater in its ability to warm the planet, and it is currently the third most important gas in causing global warming, after carbon dioxide and methane. Most studies on biofuels and greenhouse gas emissions have used the Intergovernmental Panel on Climate Change (IPCC) approach for estimating emissions of nitrous oxide. Recent evidence suggests that nitrous oxide emissions may well be 4-fold greater than this, with high emissions both from agricultural fields and from downstream aquatic ecosystems resulting from the use of synthetic nitrogen fertilizer. If so, the increased N_2O fluxes associated with producing ethanol from corn is likely to more than offset any positive



advantage from reduced carbon dioxide fluxes (compared to burning fossil fuels). Even for ethanol from sugar cane or biodiesel from rapeseed, emissions of nitrous oxide probably make these fuels less effective as an approach for reducing global warming than has been previously believed (Chapter 1).

There are multiple indirect effects of increased biofuels production, and researchers are only starting to unfold those effects and measure their environmental implications (Chapter 14). One of the greatest concerns is this indirect effect of land-use change on emission of greenhouse gases. The rapidly growing production of biofuels requires additional cropland. In some cases, this comes from agricultural land previously used to grow crops, but in a hungry world, land elsewhere – including in different countries and on different continents – may be converted to agricultural food-crop production to compensate for this loss. Additional cropland is usually made available through the conversion of native ecosystems such as grasslands, savannas, and forests, as well as by returning permanent fallow or abandoned croplands to production. These land conversions can have a substantial impact on the greenhouse-gas balances of biofuels. In general, when biofuel cropping is associated with the conversion of native ecosystems (particularly forests, and especially peat land), the net greenhouse-gas balance is negative, and more greenhouse gases are emitted to the atmosphere than if fossil fuels were used instead. The carbon debt of this conversion in theory can eventually be re-paid through the extended use of biofuels over time, but this requires many decades or even hundreds of years to balance out the initial carbon losses. In the meanwhile, the biofuel system has aggravated rather than helped to mitigate global warming, even for systems where the life-cycle analyses indicate a positive influence on net greenhouse gas emissions (Chapter 6). As one example, conversion of rainforests with peat soils to palm plantations to produce biodiesel can increase the net emissions of greenhouse gas emissions by 20-fold relative to simply using fossil fuels instead (Chapter 5). Plans for such development in Indonesia could cause a globally significant increase in emissions of carbon dioxide to the atmosphere (Chapter 1). If global warming is the primary concern, leaving natural ecosystems (particularly forests) alone is often a better strategy than clearing them to grow crops. Currently, the global emissions of greenhouse gases from deforestation are roughly equal to those emitted while burning fuels for transportation (Chapter 14).

Biofuel crops offer their greatest promise for greenhouse gas benefits if grown on abandoned, degraded, or marginal lands. On these lands, carbon losses from conversion to biofuels are often small. Of course, if the lands have the potential to revert to forests, conversion to biofuels represents a lost opportunity for carbon storage. The environmental consequences of inputs (irrigation water, fertilizer) required to make degraded and marginal lands productive must also be considered. Using wastes

and agricultural and forest residues for biofuels is also likely to produce greenhouse gas benefits, but care must be taken to assure that enough residuals are left behind to protect soil health and productivity which depend on carbon levels.

Other Environmental Effects

Biodiversity: Increased biofuel production will have negative impacts on biodiversity mostly as a result of habitat loss associated with deforestation and conversion of grasslands and savannas to biofuel crops. Small-scale biofuel production systems in which biodiversity is maintained are possible. Particularly promising is the management of natural grasslands and forests for harvest of biofuel material at moderate levels, providing reasonable protection for biodiversity (Chapter 7).

Competition for freshwater: Freshwater is increasingly in short supply and may not meet future demands for food production in many regions. Using irrigation to grow biofuel crops will aggravate these shortages, reducing water available for other uses and further impacting freshwater (and in some cases coastal marine) ecosystems. The water requirements of biofuel-derived energy are 70 to 400 times larger than other energy sources such as fossil fuels, wind or solar. Roughly 45 billion cubic meters of irrigation water were used for biofuels production in 2007, or some 6 times more water than used for drinking water globally. The greatest use is for the production of the feedstock crops. Several approaches exist which could improve water productivity of agriculture for both biofuel and food crops. Also, alternative feedstock crops can be used to reduce the demand for water in biofuel production. However, the water implications of future large-scale biofuel production remain uncertain (Chapter 8).

Local and regional air pollution: The use of ethanol and biodiesel as fuels or as fuel additives to fossil fuels can reduce the emissions of some pollutants from vehicle exhaust such as fine particles and carbon monoxide, but tends to increase other pollutant emissions such as nitrogen gases (Chapters 1 and 10). One of the largest sources of air pollution from biofuel production comes from the practice of burning sugar cane before harvest. The resulting smoke, fine particles, and nitrogen gases in the atmosphere cause acid rain and contribute to a variety of human health impacts.

Swedish-Vietnamese exchange program uses LOICZ tools

Lars Rahm

An ongoing academic exchange program between institutions in Sweden and Vietnam makes use of LOICZ tools as part of its curriculum in water resources. The program currently focuses on Masters-level environmental education, with travel expenses funded by the Swedish

International Development Cooperation Agency (SIDA) as part of its Linnaeus-Palme activity. This year's course is part of an exchange between Linköping University (LiU) and Vietnam Academy for Water Resources (VAWR) in Hanoi. The focus at both locations is on sustainable resource utilization. VAWR is trying to broaden its focus on a more interdisciplinary curriculum, while LiU is developing more material on hydrology and terrestrial processes. The challenge is to create courses that use the available teachers in the best way to meet both objectives.

This year focused on teacher exchange, in which two Vietnamese lecturers visited LiU and two Swedish lecturers travelled to Hanoi. In the March, 2009, course in Hanoi, the two Swedish professors, Lars Rahm and Reinhold Castensson, both from the department of Water and Environmental Studies at LiU, are looking into coastal zone management issues. Rahm is introducing biogeochemical aspects of the coastal zone to his Vietnamese students, and has to some extent relied on LOICZ studies and material. Castensson is a cultural geographer and has his focus on planning and implementation of policy issues including the European Water Framework.

Two coastal nutrient budgets, from the Tien and Hau Rivers (part of the Mekong system), which were developed in previous LOICZ workshops, have been used in the curriculum as examples of the LOICZ methodology, illustrating the biogeochemical process of nitrogen fixation, denitrification, and net ecosystem metabolism, as well as how to estimate them from the LOICZ budget perspective. The course is introductory at this stage, as the students are more inclined to focus on hydrological and irrigation problems, and are relatively new to considering the potential problems of the coastal zone in large. Rahm reports that "despite some problems of communicating in English, the students are nevertheless eager to learn and 25 students passed the final exam. If things go well we will try to expand this project to include a limited master student exchange as well. The question is whether we can expand it further to include PhD-students in future."

For more information on LOICZ nutrient budgets, visit: <http://nest.su.se/mnode/>

For more information on the course, contact Lars Rahm (lars.rahm@liu.se)

or Reinhold Castensson (reinhold.castensson@liu.se).



VAWR students participating in this year's course in Hanoi, supported by the SIDA-funded faculty exchange program



PRIORITY TOPIC 3

Linking
governance and
science in coastal
regions

LOICZ Session

at the IHDP Open Congress, Bonn, 26–30 April 2009

Responding to Coastal and Marine Change: Comparative Assessment of Coastal Governance Initiatives

Andreas Kannen (GKSS, Coastal Futures)

A workshop discussing coastal governance from a set of global case studies, covering examples from the Arctic, Latin America, New Zealand and Europe was organized by LOICZ Priority Topic 3 together with the affiliated project Coastal Futures at the IHDP Open Congress 2009 in Bonn on 30 April. The workshop started with an introduction by the organizer, discussing selected aspects which are relevant for governance of coastal social-ecological systems. Another five presentations discussed core principles and parameters, which they derived from regional case studies. These were followed by one presentation of the IHDP Earth System Governance project and another one outlining the importance of complexity theory in the context of coastal planning and management. Following the presentations, a very lively and controversial discussion among the more than 20 participants developed. A full workshop report will be published in the next INPRINT.

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▲ (Photo: LOICZ IPO)

▼ (Photo: Juergen Weichselgartner)



New LOICZ R&S Report No. 34
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The Analysis of Governance Responses to Ecosystem Change

A Handbook for Assembling
a Baseline

Stephen B. Olsen, Glenn G.
Page, Emilio Ochoa

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Cross-Cutting Activities

Great Barrier Reef Ecosystem Services

Eric Wolanski, James Cook University

A mini symposium organized by G. Lukacs and E. Wolanski was held in Townsville on February 9, 2009 on the ecosystems services of the Great Barrier Reef (GBR). The stakeholders were James Cook University (JCU), the CSIRO, and the Great Barrier Marine Park Authority.

D. Wachenfeld (GBRMPA) opened the symposium, stressing the potential benefits of quantifying the ecosystem services of the GBR.

In the biophysics session, D. Bellwood (JCU) identified critical ecosystem processes or functions of coral reefs. Initial findings suggest that key processes may be dependent on just a few critical species and that biodiversity may not offer the protection we once hoped. There is increased recognition that it is the processes not species that are important if we are to maintain ecosystems and the services they provide. E. Wolanski (JCU) described the oceanic and coastal drivers of the GBR. Ecohydrology modeling predicts a gloomy scenario for coral cover by 2050.

In the ecosystem services session, M. Finlayson (CSU) described the Millennium Ecosystem Assessment methodology to provide a knowledge base to support improved decisions to enhance the contribution of ecosystems to human well-being, particularly by altering the current balance between provisioning and regulating services. M. van Grieken and J. Butler (CSIRO) presented the results for assessing potential trade-offs in the provision of a regulating hydrological ecosystem service, the control of agricultural diffuse pollution by land use management practices and the restoration of native riparian vegetation. Using ecosystem services they explored the

options for improving links between the ecological and social systems, including payments for ecosystem services, and building resilience and adaptive capacity to protect the GBR.

In the ecosystem value section, J. Rolfe (CQU) provided an overview of non-market valuation techniques that are relevant to the Great Barrier Reef, and illustrated some results of recent studies. N. Stoeckl (JCU) reviewed the studies that have estimated economic values associated with ecosystem services in the Great Barrier Reef region. She highlighted gaps in current knowledge that warrant further investigations.

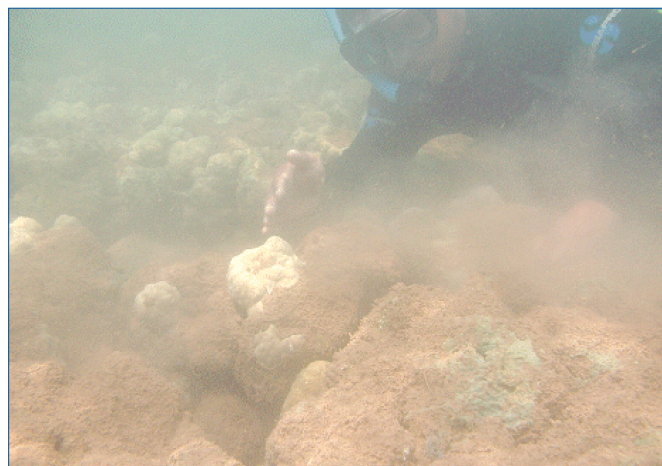
In the threats to the GBR session, K. Fabricius (AIMS) showed that the reefs of the Great Barrier Reef have been losing >0.25 % coral cover per year since ~1970, due to cumulative disturbances. She provided an overview of the main past and present disturbances to the Great Barrier Reef. She discussed how the intensity, frequency and types of threat are continuing to change with increasing CO₂ levels and an exponentially growing human population.

In the ecosystem services overview session, R. Costanza (U. Vermont) demonstrated how an ecosystem services based approach can assess the trade-offs inherent in managing humans embedded in ecological systems.



Healthy inshore reef

(Photo: L. McCook)



Suffocated inshore reef

(Photo: R.H. Richmond)

Evaluating trade-offs requires both an understanding of the biophysical magnitudes of ES changes that result from human actions, as well as an understanding of their impact on human well-being, broadly conceived. The state of the art of ES assessment and modeling was discussed, including the potential of integrated ecological economic modeling. A discussion followed among the 70 participants, moderated by G. Lukacs (JCU); the common thread emerged that (1) the GBR ecosystem is not as resilient as we had thought; (2) it is suffering a lot more from human impact than the politicians and tourist brochures say; (3) the assessment of its ecosystem services need much attention; (4) the survival of the GBR depends on co-managing the land and the sea, something which is not done at present and which could be done using ecosystem services as a common currency for the land and the sea. There is no common currency at present; (5) research much focus on the continued supply of ecosystem services to provide a bridge between various disciplines of science and with the human dimension to help ensure the future of the GBR; (6) Major reform across all levels of state and Commonwealth governments to focus on sustaining ecosystem services in the whole GBR ecosystem (land and sea) may be necessary to achieve the above.

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Deltas at Risk

Ilan Kelman

From New Orleans to Bangkok, from the Okavango to the Volga, more than 350 million people worldwide live in deltas. At least the same number depends on deltas for their livelihoods plus hundreds of millions more people affect, and are affected by, deltas every day. As an inter-

face between bodies of water and land, along with land deltas and dry deltas, deltas often represent the end of rivers yet are a rich mine on which ecosystems and societies have been built.



Deltas are shaped by physical, biological, and social processes. Physical processes include tides, waves, currents, flow rates, and rainfall. Ecosystems affect erosion, create microclimates, and contribute nutrients and nutrient cycling. People dredge and dig, direct rivers and build structures, introduce and exterminate biota. Different cultures have different perceptions of risks and opportunities while fulfilling different needs and desires for livelihoods and luxuries.

These complexities lead to significant challenges in understanding and managing deltas and their regions of influence. They also highlight the dangers facing deltas. Poorly constructed buildings are raised within the river and coastal floodplains and on delta soils prone to liquefaction during earthquakes. Endangered species find homes in deltas caught between interests vying for protected areas, resource extraction, and subsistence living. Environmental changes far away, for instance deforestation, alter a delta's structure and functions (Restrepo & Syvitski 2006).

To understand, and to develop solutions for, these threats and vulnerabilities, a scoping workshop was held in Boulder, Colorado, USA in September 2007 on "Deltas at Risk" or, more formally, "Dynamics and Vulnerability of River Delta Systems". Research and application challenges from deltas were explored by twenty-five attendees from four continents. From modeling geomorphological dynamics (Kubo et al. 2005) to implementing disaster risk reduction (e.g. O'Brien et al. 2006, for comments on hurricane risk reduction for the Mississippi River delta) to overcoming legal and resource challenges in transboundary regions (e.g., Glantz 2005, for Aral Sea deltas), diverse topics were examined in order to establish the pressing research and application questions and the data and techniques available for tackling those questions.

The workshop was hosted by the Institute of Arctic and Alpine Research (INSTAAR; <http://instaar.colorado.edu>) at the University of Colorado and was sponsored by the Global Water Systems Project (GWSP; <http://www.gwsp.org>), Land-Ocean Interactions in the Coastal Zone (LOICZ; <http://www.loicz.org>), and the Community Surface Dynamic Modeling System (CSDMS; <http://csdms.colorado.edu>). Participant presentations covered theory and practice, with case studies as disparate as the Danube (e.g., Giosan et al. 1999) and the Indus (Giosan et al. 2006). The history of deltas looked back decades and millennia while similar timeframes for the future were considered. Delta demographics, ecosystems, morphology, formation, land-atmosphere-ocean interactions, pollution, governance, and management regimes were covered.

Many basic traits of deltas are the subject of ongoing and needed work, including classification and description

methods. Reams of data are available – from three-hourly ocean wave heights to indigenous knowledge digital libraries, from topography and bathymetry to poverty indices and happiness indices - but few databases provide the material on a delta-by-delta basis. And a delta is not isolated. These data are also needed for deltas' catchments and drainage areas.

Scale also emerged as a prominent issue. The appropriate space and time scales for observing and modeling basic delta functions, such as nutrient flows and transformations, are not fully understood. Yet they are needed for establishing baselines to monitor changes along with knowing sources and sinks and being able to correlate micro-scale nutrient changes with macro-scale changes to the delta's morphology and ecology. They would also help to understand the development, lifetime, and devolution of deltas plus deltaic influences on biology and people.

The scales for human interaction with deltas are not well defined either. Activities including river and coastal engineering and farming affect a delta, whether they take place inside or outside the delta. Delta cities create their own microclimates while human-caused climate change has left few deltas, even those isolated from settlements, untouched. Computing power, data, and conceptual understanding are not always sufficient for resolving such scale issues either theoretically or for specific case studies.

The inseparability of humans from their environment, exemplified by the strong shaping of deltas by societies (e.g., Syvitski & Saito 2007) and vice versa (e.g., Rothuis et al. 1998), raised further questions about the data, modeling, and governance and decision processes available for tackling delta vulnerabilities. How could scientific and traditional knowledge bases and techniques be applied to inform and affect individual and collective behavior? How much science and how much tradition are used, and how much of each is needed, for decision analysis and decision-making? How can uncertainties and contrary views be communicated and incorporated without inhibiting delta management? How could human and natural influences and signals be separated in deltas to better understand how they influence each other? How can the available vulnerability work (e.g., Hewitt 2007; Lewis 1999; Wisner et al. 2004) be applied to deltas?

Answering such questions feeds into describing how deltas work and why they are important, which in turn promotes improved management of them (McManus 2002). To make that link, many options are available, covering GIS, role-playing games, participatory processes, inventorying and surveying techniques (for physical, biological, and social processes), expert elicitation, model

coupling techniques, and methods for visualizing observations and model results. Research is also needed for developing, monitoring, and evaluating good practices for applying and combining these options for particular deltaic ecologies and societies.

Many more scientific questions exist, along with the challenges of converting knowledge into policy and action. These are articulated in a LOICZ Reports and Studies volume which is currently in its final editing in collaboration with CSDMS (Boulder Colorado) and GWSP in Bonn. This Volume "Dynamics and Vulnerability of Delta Systems" (No. 35 is soon available on the LOICZ website) has been developed by the workshop participants in order to set the agenda for future delta research and application of resulting knowledge products. That way, a coherent, comprehensive, and doable plan will be available, not only for adding to delta science but also for ensuring that the science is useful and useable.

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Contact: Center for International Climate and Environmental Research (CICERO), Oslo

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1st cross-cutting workshop on Coastal Lagoons at the Université Mohamed V in Rabat, Morocco, May 11–15, 2009

Following up on the IGBP-MENA (Middle East and North Africa) workshop held in Cairo in November 2008, LOICZ held its 1st cross-cutting workshop on Coastal Lagoons at the Université Mohamed V in Rabat, Morocco. The workshop was hosted by Prof. Maria Snoussi. It concentrated on a particular issue each day: residence time (Stephen Mudge), biogeochemical budgets (Gianmarco Giordani), sea-level rise (Georg Umgiesser and Saida Niazi), conceptual diagrams (Sonia Cristina), DPSIR (Alice Newton), assessment of trophic status (John Icely). The workshop also included a field trip to the lagoon of Moulay BouSelhan. 22 researchers, mostly from MENA countries, Morocco, Algeria, Tunisia and Egypt attended the workshop, as well as researchers from Portugal, Spain, France, Italy and the UK.



(Photo: Alice Newton)



LOICZ SSC News

LOICZ has a new Chair Person

Since 1 January 2009, Professor Alice Newton is the new Chair of the LOICZ Scientific Steering Committee. During a ceremonial delivery at Christmas, Prof. Alice Newton has signed the contract at the LOICZ IPO in Geesthacht.



Alice Newton signs the contract at the LOICZ IPO, Geesthacht
(Photo: Barbe Goldberg)

One of the objectives of LOICZ is to identify the most vulnerable coastal regions under global change. Alice's research on coastal lagoons has direct relevance to these fragile and valuable coastal systems that are very vulnerable to eutrophication, changes in sediment supply and sea-level.

Alice's main research interest is **eutrophication**, particularly with respect to the biogeochemical cycles. Eutrophication expresses itself through a cascade of direct and indirect impacts on ecology and economy with major implications for land-use and coastal zone development.

Capacity building is an important part of the cross-cutting activities of LOICZ. The linking of Integrated River Basin Management and Integrated Coastal Zone Management is the major objective of the **Erasmus Mundus** Joint Master of which Alice is the coordinator. The course is the joint effort of 60 Universities that pool human resources to develop a global postgraduate program in Water and Coastal Management.

SSC members and Chair rotate off

By the end of 2008 our Chair for the last 3 years, **Jozef Pacyna**, Norwegian Institute for Air Research (NILU),

and the following SSC Members

Alison Gilbert, Institute for Environmental Studies (IVM), Vrije Universiteit, Netherlands

Anthony Forbes, School of Life and Environmental Sciences, Marine & Estuarine Research, University of Natal, South Africa.

Huang Weigen, State Key Lab. of Satellite Ocean Environment Dynamics, State Oceanic Administration, Second Institute of Oceanography (SIO), China

Yoshiki Saito, Institute of Geology and Geoinformation (IGG), Geological Survey of Japan

have finished their membership in the LOICZ Scientific Steering Committee. We are very grateful for their support and great work for LOICZ in the last years and would greatly appreciate if they keep being related and active in participating in future LOICZ activities. We will miss all of them, Alison, Ticky, Weigen and Yoshi at our next SSC Meeting, which will take place in Kjeller, Norway. Jozef Pacyna who has been with LOICZ for 9 years in total will continue for one more year as a Past Chair and we look forward to his continued senior support.

New SSC Members welcome on board!

LOICZ, following IGBP and IHDP approval has appointed four new SSC members, who officially started their membership on 1 January, 2009.

In the following we like to introduce the first two of our new Scientific Steering Committee members **Masumi Yamamuro** and **Remi Laane** to the LOICZ community. **Professor Zhongyuan Chen** (State Key Laboratory for Estuarine and Coastal Research, East China Normal University, Shanghai) and **Professor Antonio C. Diegues** (Universidade de Sao Paulo Research Center on Human Population and Environment) will be introduced in the next volume.



Remi Laane

DELTA RES

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My experience and knowledge is based on more than 35 years involvement in fundamental and applied scientific studies in the coastal environment all over the world. It started in the Ems-

Dollard estuary and Wadden Sea in the Netherlands where I, as a trained chemist and biologist, could work in a multidisciplinary group to study the estuarine carbon and nitrogen cycle. During this period the scope evolved from national to international studies: various EU projects (e.g. NOWESP, EUROCAT, SPI-WATER, DIPOL) and the

SCOPE-UNEP project "Transport of Carbon and major minerals from world rivers".

My past work at a governmental agency of Rijkswaterstaat and nowadays within DELTARES brings me in the opportunity to bridge the gap between fundamental science and the valorization of the results in national and international policy plans. International networks, as ICES, OSPAR and LOICZ, where the backbone of my work. As a member of (inter)national scientific advisory board of ICES, participation within OSPAR and various LOICZ projects and within the Water Frame Work and Marine Directives of the EU, I learned that capacity building on at least transboundary catchment level is necessary to integrate and to valorize scientific information to policymakers and to technological applications. Especially this last expertise will be mobilized within my future LOICZ work.

Besides being a scientific advisor with DELTARES I am part time professor in marine biogeochemistry at the University of Amsterdam and chairman of the environmental and toxicology section of the Royal Dutch Chemistry Society. I published more than 200 scientific papers and reports and six popular books on various aspects of the North Sea.

Masumi Yamamuro



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Dr. Masumi Yamamuro is a Professor at the Department of Natural Environmental Studies, Graduate School of Frontier Sciences, University

of Tokyo. She also serves as a guest researcher of Geological Survey of Japan, AIST.

Dr. Yamamuro has studied the following themes:

- Nitrogen cycles in coral reefs
- Eutrophication control through food web management in estuarine lagoons
- Measurement of seagrass standing crop using underwater ROV in subtropical coast
- Detection of POP's in detritus feeding coastal fishes
- Dynamism in the complex ecosystem of coral reef, seagrass bed and mangrove forest
- Oxygen consumption process in the hypolimnion of an estuarine lagoon
- Invasion process of biofouling mytilids into an estuary after the decline of seagrass beds.

Her present interest includes the effect of nitrogen loads from acid rain to the water quality of watersheds.

Dr. Yamamuro obtained her academic training from The Faculty of Science, The University of Tokyo (B.A & M.S., Geography) and Ocean Research Institute, The University of Tokyo (PhD, Geography). She began her career at the Geological Survey of Japan (Marine Geology Department) in 1991, and started in academia as professor at the University of Tokyo in 2007.

Dr. Yamamuro is a review editor of "Aquatic Biology", and serves as an expert of limnetic ecology at the International Ecology Institute. She is a member of the Japanese Society of Limnology (Ex-Councilor) and the Oceanographic Society of Japan (Ex-Councilor). She is also a member of the Ocean Development Subcommittee, Council for Science and Technology, Japan.

LOICZ Regional Nodes



(Photo: Cheng Tang)

New address

The Yantai Institute of Coastal Zone Research for Sustainable Development which kindly hosts the LOICZ Regional Node East Asia has moved into a new building. Please note the new address!

LOICZ East Asia Regional Node
Yantai Institute of Coastal Zone Research for Sustainable Development,
Chinese Academy of Sciences
Chunhui Road 26, Laishan District, Yantai, Shandong, P.R. China

Mailbox 1488, Post: 264003

Tel: 86-535-2109021

Fax: 86-535-2109021



IPO Notes

LOICZ Activities in China

Juergen Weichselgartner (LOICZ IPO) and
Cheng Tang (LOICZ Regional Node East Asia)

From 28 October to 3 November, 2008, Dr. Juergen Weichselgartner (Senior Science Coordinator, LOICZ IPO), the LOICZ East Asia Regional Node (EARN), and associates gathered in Shanghai, Yantai, and Qingdao to hold a session at the EMECS-8 conference, discuss various issues of future activities according to the LOICZ Activity Plan, and to meet with the LOICZ Chinese National Committee and the State Oceanic Administration (SOA).

At the EMECS-8 Conference in Shanghai, LOICZ hosted session 5 on "Institutional Models for Regional Collaboration in Coastal Science and Management (LOICZ related)", which took place on 29 October, 2008. In total, 18 presentations were given with only one presenter being absent. The authors came from 12 countries, predominantly from Asia and Europe. The presentations were grouped in 4 sub-sessions and one could divide them in two major thematic groups: (1) presentations that elaborated on institutional models and the achievements in practical implementation of ICZM; and (2) presentations that focused on scientific aspects of coastal management.

The first sub-session, chaired by Prof. P. Shi, had invited speakers, giving a general overview of the ICZM achievements in their respective regions. LOICZ presented current developments and outlined scientific themes and activities, emphasizing capacity building. The Regional Seas Programme of UNEP was represented by two of its plans: MAP and NOWPAP. The former presented the recently adopted regional Protocol on ICZM, an innovative tool for regional coastal governance, while the latter introduced a wide range of activities achieved in relatively short period of time. One presentation dwelled specifically on the comparative studies for coastal zone health assessment. The PEMSEA representative gave an elaborate overview of its activities concentrating on the coastal zone (land and marine) spatial planning.

The second sub-session, chaired by J. Weichselgartner, was mainly concerned with water modeling along the coast with a specific emphasis on sediment flows. Three estuaries were explored: Yellow River and Pearl River in China, and Nile River Delta in Egypt. One presentation elaborated on the ocean-atmosphere model for ocean currents with a view of estimating their renewable energy potential. A science based decision-support system for the Baltic Sea was also presented, with a view of providing the decision makers with the arguments to adopt measures aimed at reducing the pollution flow into the Baltic Sea.

The third sub-session, chaired by O. Matsuda, was very diverse with regards to the contents of its presentations. A general overview of the ICZM in Iran was given with a special emphasis on the delimitation of the coastal zone. Several presentation had a very specific scientific focus, namely on the impact of the strong typhoon on the sea temperature along the coast of Korea; the eutrophication of the coastal area in Australia; and environmental implications of excess heavy metals in the Mikawa bay in Japan. Finally, an interesting case of environmental education in the Seto Inland Sea was presented.

The fourth sub-session, chaired by I. Trumbic, had only three presentations. Simulation of coastal currents and river discharges in the south eastern Black Sea has shown the impact of river basins of Turkey on the Black Sea. The presentation on the sedimentation rate of the tidal flat at Yuantuoqiao Peak in China has shown the extent of the coastal retreat. Finally, pelagic variables in two contrasting coastal systems on the Hokkaido Island in Japan were presented.

The presentations given in session 5 pointed to various barriers that exist between scientists and policy makers. While the scientists strive to excel in their research, sometimes their message seems to be not fully clear to the decision makers. It is fair to say that some of the issues the scientists are confronted with, such as open ocean issues, are not always easy to transmit in a simple language. On the other hand, it is evident that policy makers often want quick solutions and do not always take into account the scientific findings, particularly those that require long-term and costly solutions.

All the presentations were of a high technical and visual quality. After the conference sessions, J. Weichselgartner and C. Tang discussed with APN Science Officer L. Stevenson possibilities of a joint workshop to develop a regional research proposal, which would build on past and current successful collaborations between the APN and LOICZ. It was particularly agreed that a closer collaboration between the APN and the LOICZ Regional Node East Asia would be welcome.

The following two days were filled with presentations and discussions at the Yantai Institute of Coastal Zone Research for Sustainable Development (YIC) and a field trip along the coast. In the morning of 2 November, J. Weichselgartner and C. Tang departed to Qingdao to meet the Chinese Committee of LOICZ at the Institute of Oceanology of the Chinese Academy of Sciences. After a joint lunch, discussions followed with Dunxin HU (IO-CAS), Shikui ZHAI (OUC), Xianshi JIN (YSFRI), Chaolun LI (IO-CAS), and Chongguang PANG (IO-CAS). The next day, a visit of the First Institute of Oceanography, State Oceanic Administration (SOA) was on the agenda. After a warm welcome, Mr. Gong-ke TAN (Director, Office of International Cooperation) introduced the institute. Thereafter, Dr. Xianwei MENG (vice-director) introduced the Marine

Geology Lab of FIO-SOA and Dr. Shuqin QIAO presented an ongoing project on Delta Risk Assessment in China. SOA and the LOICZ host GKSS are both involved in the research project Yellow Sea Observation – Forecasting and Information System (YEOS). The professional and interesting meeting finished with a joint visit of the Marine Geological Museum of FIO-SOA and a subsequent lunch in a nearby restaurant.

The science trip ended in Beijing with a meeting on funding schemes. Together with T. LIU (Helmholtz Association of German Research Centres) and Prof. Xiaoping YANG (Institute of Geology & Geophysics, CAS), J. Weichselgartner discussed current and future LOICZ activities with regard to potential funding mechanisms.



A fisherman sells his catch at the coast of Yantai, China
(Photo: J. Weichselgartner)

Guest from Yantai Institute of Coastal Zone Research for Sustainable Development (YIC), Chinese Academy of Sciences at LOICZ IPO

Cheng TANG

LOICZ East Asia Node Coordinator Cheng TANG has been working in the marine geology department of the South China Sea Institute of Oceanology (SCSIO), Chinese Academy of Sciences (CAS). His PhD work correlates to the Sino-German project “Pearl River Estuary Related Sediments as Response to Holocene Climate Change and Anthropogenic Impact (PECAI)”, which closely relates to the focus of LOICZ, and was funded by the Max-Planck Society in the IOW, Germany, for scientific training from 2004–2005.

In 2006, he moved to the newly established Yantai Institute of Coastal Zone Research for Sustainable Development (YIC). It was a big challenge to step into a multidisciplinary area, but he very much looks forward to helping the new institute and colleagues to join the LOICZ network and activities.

“From May 5th, I will stay at the Institute of Coastal Research at the GKSS and support the upcoming LOICZ

Dahlem-Style meeting in Oslo, Norway in June. During my 10 weeks stay, I will also get informed about the coastal research at GKSS as well as to obtain an overview of national activities in the field of coastal research in Germany and Europe. A general task will be to figure out the plan for a summer school in Yantai, China in 2010, and coordinate this with a capacity building workshop “Toward a secure ecosystem based on environmental monitoring techniques in the coastal zone – effective science communication practice” by UNITAR, LOICZ and YIC in the following October. I hope during this short visit I will familiarize with the IPO running procedures, including how to coordinate with international science programs in coastal zone research, and I hope to apply this kind of knowledge later in the East Asia Node network.”



Cheng TANG

(Photo:
Jens Wegner)

Coastal Cities Summit 2008: Values and Vulnerabilities, Hosted by the US branch of the International Ocean Institute, IOI in St. Petersburg Florida, November 17–20, 2008 www.coastalcities.org

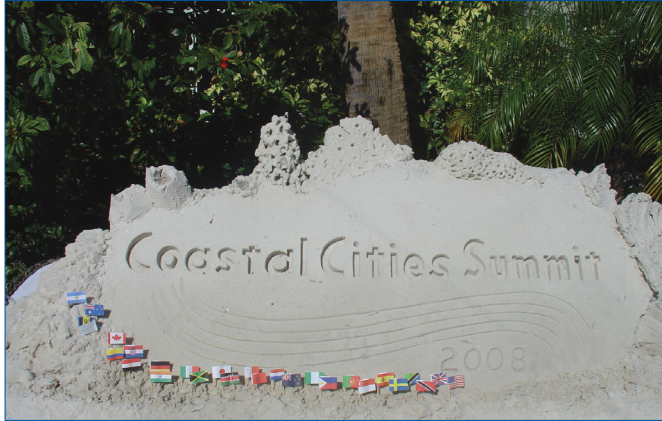
An initial brief comment on this first international workshop targeted to explore the current resilience and future risks for coastal urbanisation and cities

Hartwig Kremer

The newly established US branch of the International Ocean Institute, IOI, founded originally by German author, Thomas Mann's, daughter Elisabeth Mann Borgese accessed rather complex grounds by looking into the values and vulnerabilities of coastal cities now and in the future. It was a first workshop of this kind which successfully



brought together multidisciplinary scientists from all over the world as well as practitioners such as mayors and city planners, funding agencies such as the World Bank and the UN. The overall goal was to explore what global change actually means in terms of increasing hazard risks to coastal urban developments including but not exclusively looking into mega cities.



(Photo: Hartwig Kremer)

Presentations and discussions zoomed in on issues of post war urban planning targeted towards economic development, mobility and welfare but taking little con-

sideration of the rapidly changing world particularly in coastal zones. Storminess, sea level rise, subsidence by human activity and issues of large scale constructions for infrastructure, protection and coastal land and sea use in general were explored. Subsequently a vital discussion evolved in which scientists and practitioners came to quite comparable views on the current and future risks for our fast developing coastal cities.

For LOICZ this summit indicated the high priority the project has in its focus on coastal vulnerability and governance. The importance of exploring the right scales of coastal change, risks and hazards that LOICZ is looking into basically in all its Themes and Topics was confirmed. This includes both spatial and temporal boundaries in the human – environment system as well as institutional dimensions which were also key issues discussed in St. Petersburg.

LOICZ together with the IOI and potential other ESSP partners aims to explore in which way we can engage in future plans for a continued dialogue and assessment of coastal cities in a changing world. We expect a full feature article going into higher detail and also lining out the options for future collaboration on this subject in the forthcoming newsletter.

Research assistant: affiliated projects at LOICZ IPO

Lara Wever joins the LOICZ project office from January to July this year. She is responsible for regularly communicating and collaborating with projects and activities that are affiliated to LOICZ. In this position, she takes care of the project database, regular information exchange with affiliated project partners, and she is developing a framework for scientific evaluation and synthesis of affiliated activities.

management. Her particular area of interest is coastal zone management in the context of global environmental change. Her master's thesis assessed the potential for sustainable, integrated coastal zone management in East Timor.

Lara has an international and interdisciplinary background. In the past she has lived and studied in Brazil, Indonesia, East Timor, and Australia. She is not a newcomer to the Earth System Science Partnership: Lara previously worked as administrative and finance officer at the Global Water System Project (GWSP) office in Bonn, Germany.



(Photo: Lara Wever)

Lara holds an undergraduate degree in international management and a Master with Honours degree in environmental

The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycles

An abstract of the terminal evaluation of the UNEP/GEF, GF/1100-99-07 project which was carried out by LOICZ since the late 1990s. This project formed one of the backbones of LOICZ' biogeochemical research activities in the past years. UNEP has kindly given permission to publish an extract of the key findings.

Peter David Whalley, with additional remarks by the IPO.

Executive Summary

1. This report represents an extract of the Terminal Evaluation of the UNEP/GEF Medium Sized Project: *The Role of the Coastal Ocean in the Disturbed and Undisturbed Nutrient and Carbon Cycle* which was carried out by LOICZ as an implementing research project.
2. The overall goals of the project were:
 - To estimate the impacts of nutrient enrichment on coastal waters;
 - To estimate the changes on regional and global biochemical cycling of nutrients and carbon flux from coastal and shelf seas to the atmosphere;
 - To assist governments in assessing the role of their coastal waters as sinks/sources of carbon;
 - To resolve scientific uncertainties concerning the Global Carbon Cycle....
3. The project has given a first global appreciation of disturbed estuarine and coastal systems, including the regional differences in intensity of disturbance and an array of system performance under differential loading. This has implications for the status of natural resources and the probable trends in system function; information that will have impact on thinking for sustainability options and carbon-nitrogen cycling. The final report provides policy recommendations and reflects the implications of changing nutrient fluxes for management. The report also provides an assessment of project outcomes and implications in the context of the GEF Operational Programmes. This Targeted Research Project is still very relevant under GEF-4 Strategic Programme 2: *'Reducing nutrient over-enrichment and oxygen depletion from land-based pollution of coastal waters in LMEs consistent with the GPA'*.
4. The Executing Agency was the LOICZ-IPO (Land Ocean Interactions in the Coastal Zone – International Project Office). The project duration was initially 30 months starting in July 1999. This was revised and extended to be completed in December 2006, making a total duration of 87 months.
5. The main sources of information for this evaluation have been the UNEP Task Manager, the LOICZ-IPO CEO, and literature from the project and the wider LOICZ initiative. A short email questionnaire was distributed to specialists within UNEP and the project to seek wider information.
6. **The project has:**
 - Enabled estimates of nutrient enrichment in coastal waters to be made;
 - Estimated changes in biogeochemical cycling in coastal waters;
 - Used a typology approach (comparing coastal regions of similar types) which enabled a relatively small number of coastal budget estimates for nutrients and carbon to be extrapolated to provide regional and global estimations of fluxes;
 - Provided training and tools to enable countries to assess the role of coastal waters as sinks/sources of carbon and contributed to the on-going research to reduce the scientific uncertainties in the global carbon cycle.
 - The sustainability of the UNEP/GEF project has been assured by
 - The LOICZ programme continuing;
 - The results from this UNEP/GEF project (and those of the on-going LOICZ) will continue to be an important resource for GEF IW projects;
 - The work of LOICZ will continue to be applied in the activities of UNEP-DEWA.
7. A possible short-coming of the ProDoc was the failure to include the need for management recommendations to enable mitigation steps to be adopted by governments. At the end of the project the Task Manager and the LOICZ-IPO agreed to hold a final workshop to identify options that led to the production of a final report providing UNEP and the GEF (and their International Waters projects) with recommendations on how to utilise the work of LOICZ.
8. Although this project contained a limited M&E system (as considered by current best practice) the project did self-assess performance against the project objectives with indicators defined in the ProDoc.
9. It is not clear how much use of this project (or the overall LOICZ programme) is being made by governments in reporting carbon information to UNFCCC etc., although there are indications that countries surrounding the North Sea, South Africa, and the USA are beginning to adopt the approaches of LOICZ. This is likely to expand further as the work of LOICZ is continued.*

Conclusion and Rating

10. The overall rating of this project was satisfactory. The following important issues were rated as being highly successful with regards to meeting the planned objectives:
 - The project has considerably added to the pool of budget models (170 added**) for nutrients and carbon in coastal waters. The project had a focus on sub-tropical and tropical sites where data was previously limited enabling more comprehensive global assessments to be made.
 - The information collected under the UNEP/GEF project is still being utilised by the scientific com-



munity involved in the on-going work of LOICZ ensuring that the input of UNEP/GEF is sustained.

- The project has reached a wide number of scientific experts from government and academic institutes around the world, and presented an agreed methodology for undertaking coastal assessments of nutrients and carbon.
- The project initiated a role of a 'mentor' to provide regional assistance to the work undertaken by the project and this is still continuing.

Recommendations

11. The following observations are made as an introduction to the main recommendations.

- Targeted research is an excellent instrument enabling the GEF to assist with improving the science base on globally important issues. In this case, on nutrients and carbon source/sinks in coastal waters providing access to scientists from GEF eligible countries to international expertise, thus strengthening national capacity, and providing a mechanism to collect/analyse data from regions where data is scarce leading to better global understanding of problems.
- This UNEP/GEF MSP developed, through the existing international structure of LOICZ, models, budgets of nutrients and carbon, assessments of loads and networks of experts, etc. information and methods that are of significant importance and relevance to the policy objectives of the current GEF-4 International Waters Strategic Programme 2.

12. The following recommendations are made as a result of this evaluation of the UNEP/GEF Targeted Research Project – *'The role of the coastal ocean in the disturbed and undisturbed nutrient and carbon cycles'*

- i. The GEF, in co-operation with the IAs, should develop a strategy to ensure that future targeted research projects have a clear vision from the outset on how the GEF and IAs will utilise the work to assist countries or to facilitate the work of other projects on similar issues.
- ii. UNEP and the GEF need to have a mechanism for absorbing key recommendations that arise from projects (this probably applies to all projects not just Target Research Projects). At the end of the project, UNEP requested a final workshop to develop policy and management recommendations. This was a useful addition to the original project design and provided detailed analysis of how GEF policy could utilise the work with improved linkages between policy and science ...
- iii. Future projects should explicitly develop a strategy (for subsequent use by GEF/IAs) for how the products of the research can best migrate from

the scientific community through to policy change and management actions that can result in mitigation measures. This project did not directly address the use of the scientific understanding in terms of management planning, yet the techniques developed lend themselves to 'what if' scenarios for evaluating pollution reduction actions. (It should be noted that the final report – 'A management perspective' prepared by the project did provide some preliminary suggestions of the next steps to utilise the LOICZ approach for management).

- iv. As a first step to raising awareness on the topic, UNEP should include a detailed summary of the main outputs (in graphical or map format) of the LOICZ work that clearly shows the distribution of global budget model sites, trend information, sinks/sources of carbon and nutrients, etc. This can be largely based on the Final Report of the project and other key publications made by LOICZ.
- v. UNEP should develop a mechanism to further propagate the valuable work undertaken by LOICZ for both on-going and future IW projects involved with nutrients and / or carbon budgets in coastal waters. This should be a more comprehensive programme than just publishing a simple brochure and making references to the LOICZ web site. A plan should be developed to assist IW projects utilise the very technical work of LOICZ and to assist the projects with an appreciation of how this science based information can best aid management decision making. It is important that UNEP continue a close relationship with LOICZ to ensure that the on-going work of this global programme can be assimilated and transferred to IW projects, where appropriate utilising the extensive network of experts familiar with the topic within LOICZ. It could be beneficial in this 'awareness' raising to consider a side-event at the next GEF IW Conference focusing on LOICZ. This could be an opportunity to showcase the work undertaken and to explain how the budget models, results of LOICZ in terms of trends, retrospective baseline conditions etc. and the network of experts in LOICZ could assist IW projects addressing coastal issues of for example, nutrients. However prior to this it would be essential for UNEP to have in place a mechanism to continue support the requests for information and assistance from IW projects on this issue.
- iv. UNEP and GEF should identify means to ensure the results of targeted research projects, and their networks of experts, are integrated into future IW projects addressing similar problems.

The current project offers an excellent set of data and assessments that could assist river and coastal projects with, for example TDA baseline evaluations and scenarios resulting in potential future management actions. For example, an important publication by the LOICZ programme, utilising information obtained by the UNEP/GEF project indicates a three-fold increase in coastal nutrients between the 1970s and 1990s. Whilst acknowledging that these estimates were derived in different ways, the paper states there are clear evidence that the increases are 'real' as a result of human activity.

- vii. UNEP and GEF require a better mechanism for engaging scientists and policy makers in discussions to ensure that relevant tools are developed to assist management decisions and that tools that are available are understood and applied. Such a mechanism would be valuable in assessing the design of projects and programmes to ensure their relevance to global environment issues.
- viii. UNEP should ensure that the recently approved GEF MSP 'Global: Enhancing the use of Science in International Waters Projects to Improve Project Results' integrates the findings of this evaluation within the project's work programme.***

Remarks form the LOICZ IPO:

LOICZ appreciates this evaluation and the permission by UNEP to publish an extract of key findings and recommendations. They touch upon a central discussion on how best to design an active and adaptable science policy interface – an issue which is continuously being addressed also by the new LOICZ. LOICZ is now also a core project of the International Human Dimensions Programme on Global Environmental Change a mutually beneficial link by which the goal to inform better management through sound scientific information of interdisciplinary kind is underlined. Special points of interest:

* a major development in the context of biogeochemical budgets and estuarine assessments is carried out by the Mediterranean network LaguNet which strives for a whole regional sea budget.

** meanwhile some 400 budget sites applying the same methodology exist – the application including model review, refinement and complementary approaches is ongoing, driven largely by scientists' own initiative

*** LOICZ has been invited and agreed to take an active role in the upcoming IW Science MSP

For a list of directly resulting LOICZ reports the LOICZ IPO recommends to check Reports and Studies volumes and the Policy Implications report under www.loicz.org.

Among the list of LOICZ affiliated projects and core and cross-cutting activities there are also a number that keep using and further developing LOICZ methodologies from this project in various systems such as lagoons.

LOICZ Host GKSS – The COSYNA project

Coastal research: Helmholtz Association to invest twelve million euros in a new observation system for the North Sea to be developed and implemented by GKSS.



(Photo: GKSS)

With the major COSYNA project (Coastal Observation System for Northern and Arctic Seas), a comprehensive observation system is being created in the area of the German North Sea for the collection, prediction and scientific analysis of the current condition and development of the coastal sea. This project is being coordinated by the GKSS Research Centre Geesthacht.

“Today's major problems of the coasts and the seas include overfishing, overfertilisation with nutrients and the discharge of toxic substances – on top of this, there are the effects of climate change. However, we lack the scientific tools to precisely assess and predict parameters such as currents, water temperature or algae concentration”, explains Prof. Franciscus Colijn, head of the Institute of Coastal Research of the GKSS Research Centre Geesthacht.

“With the comprehensive data from COSYNA, we hope to better understand the development of the system of the coastal sea as a consequence of physical, ecological and biogeochemical processes in detail and thus allow its prediction”, Colijn continues.

For the COSYNA measurement network, the Helmholtz Association is providing money in the amount of EUR 12 million. COSYNA is later to be extended to the Arctic Ocean. A national initiation workshop will be held on



15 January 2009 at the Federal Maritime and Hydrographic Agency (BSH) in Hamburg.



(Photo: GKSS)

Observing, understanding, predicting

On the operation method of the researchers: The automated measurement systems used by the scientists, such as radar technology, measurement buoys or satellites observing the planet, establish, for instance, current conditions, salinity or oxygen levels, the temperature and motion of the sea or the concentration of algae.

This data is fed by the Geesthacht coastal researchers into complex simulation models, with the help of which the physical, ecological and biogeochemical condition of the North Sea can be derived in high temporal or spatial resolution. The first objectives of the model are short-term forecasts on the current conditions in the North Sea.

The complex COSYNA measurement and model system improves the understanding of the North Sea as a system and thus allows well-founded analyses of the risks and options of the current climate change and use of the North Sea.

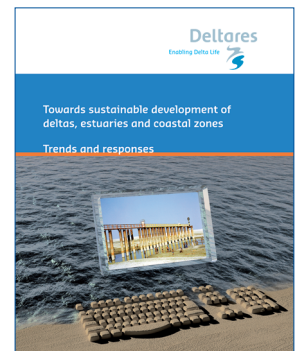
This provides the foundations for managing the coasts. Specific future research questions might include: How do the intensity and distribution of the current and motion of the sea or salt and acid levels change in the short and long term? How does a temperature rise affect the ecosystem? What controls the occurrence of algae blooms or jellyfish swarms? What zones in the Wadden Sea must be protected as a priority in the event of oil spills?

COSYNA is being developed in close coordination and cooperation with the German Marine Research Consortium (KDM) and the relevant bodies of federal and state governments. In a first step, a feasibility study will show how COSYNA can be linked with observation systems of countries with a North Sea coast in the future.

Detailed information on COSYNA can be found at:
http://www.gkss.de/imperia/md/content/gkss/presse/unter_uns/iii2008/titelthema.pdf

Publications

Towards sustainable development of deltas, estuaries and coastal zones – Trends and responses, Deltares, January 2009, Delft, The Netherlands



Abstract

The report describes the responses in deltas to a number of drivers such as economic growth and climate change as well as to a number of trends in society such as privatization and decentralization. The research described in the report has explored the perspectives of and experiences with four response themes: management and restoration of natural systems, extension and revitalization of infrastructure, development and adaptation of land and water use and governance of delta management.

Some of the responses described may already be classified as 'best practices' (at least in the local context), others are yet promising approaches. An effort has been made to arrange these practices into trends. These trends, illustrated with examples taken from deltas all over the world, provide a comprehensive overview of the type of current activities and developments to enable delta life.

The research described in the report was part of the preparation of the Aquaterra 2009 conference, the World Forum on Delta and Coastal Development.

Delft, April 2, 2009
Herman van der Most, DELTARES

Coastal Wetlands

An Integrated Ecosystem Approach

Edited by

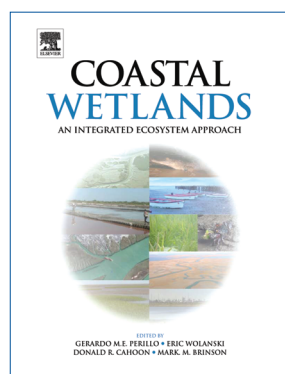
Gerardo Perillo, Instituto Argentino de Oceanografía, Bahía Blanca, Argentina

Eric Wolanski, **James Cook** University, Queensland, Australia

Donald Cahoon, Patuxent Wildlife

Research Center, US Geological Survey, Beltsville, MD, USA

Mark Brinson, East Carolina University, Greenville, NC, USA



Description

Coastal wetlands are under a great deal of pressure from the dual forces of rising sea level and the intervention of human populations both along the estuary and in the river catchment. Direct impacts include the destruction or degradation of wetlands from land reclamation and infrastructures. Indirect impacts derive from the discharge of pollutants, changes in river flows and sediment supplies, land clearing, and dam operations. As sea level rises, coastal wetlands in most areas of the world migrate landward to occupy former uplands. The competition of these lands with human development is intensifying, making the landward migration impossible in many cases. This book provides an understanding of the functioning of coastal ecosystems and the ecological services that they provide, and suggestions for their management. In this book a CD is included containing color figures of wetlands and estuaries in different parts of the world.

Target audience

students, engineers, scientists, researchers on coastal environments, and resource managers with special interest in coastal wetland ecosystems.

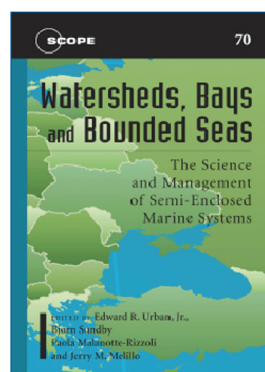
Order at ELSEVIER:

http://www.elsevier.com/wps/find/bookdescription.cws_home/716674/description#description

Watersheds, Bays and Bounded Seas

The Science and Management of Semi-Enclosed Marine Systems

Some of the world's most important bodies of water, from the Black Sea to the Bay of Bengal, are classified as "semi-enclosed marine systems" (SEMS). Separated from the open seas by a strait, island archipelago, or physical process, SEMS are particularly vulnerable to environmental damage and particularly difficult to fully understand and manage. Watersheds, Bays, and Bounded Seas provides state-of-the-science information about these complex systems and identifies best management practices to preserve them. With contribu-



tions by natural and social scientists, the book examines both the political and biophysical forces affecting semi-enclosed marine systems.

SEMS comprise a substantial portion of the coasts-areas with high population density – and we rely on them for often-competing services such as navigation and transport, disposal of waste, provision of food, extraction of minerals, and leisure. The book describes how human activities could irrevocably alter these fragile ecosystems, exploring threats from runoff to climate change. It also addresses the unique challenges of managing SEMS, including cooperation between multiple nations.

Edited by **Edward R. Urban, Jr.**, **Bjørn Sundby**, **Paola Malanotte-Rizzoli**, and **Jerry M. Melillo**

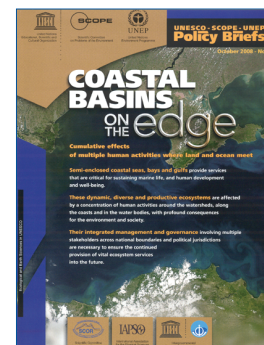
Edward R. Urban, Jr. is SCOR Executive Director. Bjørn Sundby is professor at the Université du Québec à Rimouski and in the Department of Earth and Planetary Sciences at McGill University, and is the SCOR President. Paola Malanotte-Rizzoli is a professor of Physical Oceanography in the Department of Earth, Atmospheric, and Planetary Sciences at the Massachusetts Institute of Technology and past president of IAPSO. Jerry M. Melillo is past president of SCOPE and co-director of The Ecosystems Center of the Marine Biological Laboratory in Woods Hole, Massachusetts.

New Policy Brief:

UNESCO ■ SCOPE ■ UNEP

Coastal Basins on the edge

Coastal Basins on the Edge: This policy brief, based on the report Watersheds, Bays and Bounded Seas, provides a summary for policymakers, students, and non-scientists of the importance of semi-enclosed marine systems, the consequences of human impacts on these systems, and recommendations about how to manage human impacts.



Copies are available from SCOPE, UNESCO, UNEP, and SCOR.

The policy brief can be found at <http://www.scor-int.org/Publications/PB07.pdf>

Enhanced ocean carbon storage from anaerobic alkalinity generation in coastal sediments

H. Thomas^{1,2}, L.-S. Schiettecatte³, K. Suykens³, Y. J. M. Koné³, E. H. Shadwick¹, A. E. F. Prowe^{1,4}, Y. Bozec⁵, H. J. W. de Baar², and A. V. Borges³

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³ University of Liège, Chemical Oceanography Unit, Liège, Belgium

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Abstract

The coastal ocean is a crucial link between land, the open ocean and the atmosphere. The shallowness of the water column permits close interactions between the sedimentary, aquatic and atmospheric compartments, which otherwise are decoupled at long time scales (≈ 1000 yr) in the open oceans. Despite the prominent role of the coastal oceans in absorbing atmospheric CO_2 and transferring it into the deep oceans via the continental shelf pump, the underlying mechanisms remain only partly understood. Evaluating observations from the North Sea, a NW European shelf sea, we provide evidence that anaerobic degradation of organic matter, fuelled from land and ocean, generates total alkalinity (AT) and increases the CO_2 buffer capacity of seawater. At both the basin wide and annual scales anaerobic AT generation in the North Sea's tidal mud flat area irreversibly facilitates 7–10 %, or taking into consideration benthic denitrification in the North Sea, 20–25 % of the North Sea's overall CO_2 uptake. At the global scale, anaerobic AT generation could be accountable for as much as 60 % of the uptake of CO_2 in shelf and marginal seas, making this process, the anaerobic pump, a key player in the biological carbon pump. Under future high CO_2 conditions oceanic CO_2 storage via the anaerobic pump may even gain further relevance because of stimulated ocean productivity.

Final Revised Paper (PDF,630KB)

<http://www.biogeosciences.net/6/267/2009/bg-6-267-2009.pdf>

Discussion Paper (BGD)

<http://www.biogeosciences-discuss.net/5/3575/2008/bgd-5-3575-2008.pdf>

Have you seen

Second Open Science Meeting

HABs and Eutrophication

18–21 October, 2009, Beijing, China

The GEOHAB Programme, endorsed by SCOR and IOC of UNESCO, is an international programme aimed at fostering and promoting cooperative researches in marine and brackish waters directed toward improving the prediction of harmful algal bloom events.

The GEOHAB Scientific Goal is to improve prediction of HABs by determining the ecological and oceanographic mechanisms underlying their population dynamics, integrating biological, chemical, and physical studies supported by enhanced observation and modelling systems. The GEOHAB Mission is to foster international co-operative research on HABs in ecosystem types sharing common features, comparing the key species involved and the oceanographic processes that influence their population dynamics. Eutrophication is recognized as one of the factors contributing to the increasing proliferation of harmful algal blooms in coastal areas worldwide. After the first Open Science Meeting on

"HABs in eutrophic systems" held in Baltimore in 2005, the second OSM meeting is designed to bring experts together from around the world to review the state-of-the-art knowledge on eutrophication and HABs, and to take steps in designing the next phase researches to address this critical global issue.

Meeting Website:

www.geohab.info; www.geohab-osm-bj.ac.cn

Ocean Colour Training Course – Tanzania

As a contribution to the ChloroGIN network, the Joint Research Centre (EC), in conjunction with the Institute of Marine Sciences, University of Dar-es-Salaam (Tanzania), is offering a training course on "Methods and Applications of Ocean Colour Remote Sensing in African Coastal and Regional Seas". The course will take place from 12–23 October, 2009, at the University of Dar-es-Salaam, Stone Town, Zanzibar, Tanzania and will be co-sponsored by several organisations.

The course will provide the theoretical basis of satellite ocean colour measurements, as well as key applications in monitoring and managing the coastal zone, in protecting marine ecosystems and resources. It is intended for scientists, environmental managers, graduate students, and post-doctoral fellows from all African and Western Indian Ocean countries. Candidates should be fluent in English and have adequate computer skills. A limited number of scholarships will be awarded to help cover travel and accommodation expenses.

Further information on the course, plus the necessary Application Forms are available on the training course website at:

<http://amis.jrc.ec.europa.eu/oc2009africa.php>.



Coastal Snapshot

Trip to Pekanbaru, Riau Province, Sumatra and Spermonde Arcipelago, South Sulawesi 20 February – 11 March 2009

Report by Bernhard Glaeser and Marion Glaser, LOICZ SSC

The trip to Indonesia in early 2009 led the LOICZ/SPICE team Marion Glaser and Bernhard Glaeser to two destinations: first to Pekanbaru in Riau Province (north Sumatra), February 20–24, then to Makassar and the nearby Spermonde Archipelago in southwest Sulawesi, February 27 to March 11. Both visits consisted of a workshop with summer school for Indonesian (in Pekanbaru for German and Indonesian) students and a field trip.

Whereas the field trip to some coral reef islands in the Spermonde Archipelago marked the beginning of an Indonesian-German research activity which is largely funded by the German Ministry for Education and Research (BMBF) and the Indonesian Ministry for Research and Technology (RISTEK) the much shorter workshop and field trip in Riau assembled a team of Indonesian and German researchers and students without funding, designed to develop a future research plan and proposal.

SPICE (Science for the Protection of Indonesian Coastal Ecosystems) is a LOICZ project. SPICE Cluster 6 "Governance und Management of Indonesian Coastal Social-Ecological Systems" is coordinated by Marion Glaser and Agus Heri Purnomo. It is related to LOICZ Priority Topic 1, Social-Ecological Systems (SES) Analysis and a pioneer project in empirical SES analysis.

1. Riau/Sumatra

Riau Province on Sumatra is one of three SPICE project sites, the other two being Spermonde Archipelago in southwest Sulawesi (see below) and Segara Anakan in southwest Java.

The German-Indonesian SPICE meeting in Pekanbaru consisted of two parts. Part 1 was a two day field trip to the Siak river estuary and to the Districts of Bengkalis and Siak, on February 21–22, 2009, funded by LOICZ. Part 2 was a two day International Workshop and Summer School on February 23–24, 2009, which was prepared and funded by UNRI (Riau University in Pekanbaru).

Participants were Indonesian and German researchers as well as public health students from both countries.

The arrival in Pekanbaru, the province capital, was overshadowed by smog which darkened not only the city but large parts of northern Sumatra, the Malacca Strait, Singapore and south Malaysia. The smog was caused by illegal forest burning and clearance and lasted for several days. The objective was to have space for new palm-oil plantations. Indonesia is one of the world's largest palm-oil exporters. Plantation pesticides and other chemicals pollute the Siak river, one of the largest Indonesian rivers. The population in the villages along the river uses its water for different purposes, such as fishing, washing, cooking, and even drinking. Negative health effects are likely to happen.

Observations in Riau along the Siak river have shown that, between 2006 and 2008, most pulp and paper plants had been shut down because there were no more trees to be felled. Deforestation was complete. Regional development cannot be maintained, sustainable forest production is lacking. Reafforestation on the cleared territories was limited. Instead, pulp and paper was replaced with monocultural palm oil plantations and industries whose effluents pollute the river.

Indonesia as a whole has seen rapid deforestation caused by large scale conversion projects, mainly for palm oil plantations. Deforestation reached 1.8 million hectares per year between 1987 and 1997. It rose sharply to 2.8 million hectares annually from 1998 to 2000 and then declined again to 1.8 million hectares between 2000 and 2006 (The Jakarta Post, February 25, 2009: 5).

The aim of the field trip was to have an impression of the pollution in the river, caused by riverine industrial plants, including palm oil industry and pulp and paper, and to interview villagers in the adjacent and nearby villages about possible health effects and waterborne deceases. As an example: About 400 families live in the town of Siak Sri Indrapura. Twenty percent of the population use the river water for daily use like washing, laundering clothes and brushing teeth, but they hardly drink the river water. In 1985/86, fish started to die, presumably caused by factory effluents. The number of fishermen has not increased since then. Pollution comes and goes. The villagers smell the chemical substances when they arrive, usually two to three times a year. This year, chemicals appeared already. The respondent reported that the fish was unconscious. They do not eat dead fish but they eat them when they are still alive but seem to be dazed. The occurrence of pollution is usually reported to the local fishery department, but until now no measure has been taken. Skin diseases are the most prominent problems.

Presentations at the following workshop presented scientific findings and confirmed the complaints encountered in the villages. According to Dr Christine Jose, food scientist at the Chemistry Department of Riau University,

- 🌍 Siak river is a source of potable water, but contaminated by E. coli
- 🌍 Siak river is a sink of urban drainage and industrial effluent
- 🌍 People are exposed to water borne diseases
- 🌍 As Siak water is used for daily life, food, glassware and utensil may be contaminated by E. coli
- 🌍 Heavy metals are also present in the water and contaminate fish
- 🌍 The bioactive component in the heavy metal contaminated fish may enter the human body as people consume the fish
- 🌍 The bioactive component may pass through the cell nucleus and negatively affect the DNA and RNA

Outcome: The workshop participants agreed to develop a framework for a research proposal („skeleton“). All collaborators were requested to fill in and to add „flesh to the bones“. Indonesian and German public health theses form the research nucleus. The first ones are expected to be ready in early 2010.



A joint publication is planned as a book chapter: "River health and community health" (working title). Within the conceptual framework of social-ecological systems (SES) and governance analysis, the focus is on poverty, health and sustainable development within the Siak river catchment area in Riau Province.

2. Spermonde/Sulawesi

The preparation of the Spermonde research, including questionnaire development, was done in Bremen (ZMT) and Makassar (UNHAS University) during the winter time of 2008/2009. A final preparatory workshop was conducted in Makassar on February 27–28 before a nine day field trip (March 1–9) was started to visit four coral reef islands in Spermonde. A local style white ship named Cinta Laut (Love of the Sea) embarked about 30 participants: Indonesian research students, Indonesian and German supervisors and researchers, a film team, a Jakarta Post reporter, and crew members, including two cooks.

The four islands visited appeared to be, much to the surprise of some of the Indonesian students, totally different from one another, economically, socially, or politically. Let me attach nicknames to highlight their peculiarities as the research team identified them, no doubt with a subjective bias. We visited "Haji Island", "Conflict Island", "Women's Island" and "Pirate Island". The Spermonde population speaks three different Malay languages: Bahasa Indonesia (the official Indonesian national language), Makassarese and Buginese—a fact that renders research somewhat difficult, even for Indonesians.

The routine was the same for all four islands, namely two days' visits, including two overnight stays: Arrival mid-day, followed by an official welcome, lunch, and discussion with the villagers at the village office or in a school. After that, the research team split up into sub-teams to assemble focus groups, consisting of two male and two female groups representing more or less influence and wealth. In the evening, a film was shown publicly at a central village place. The second day was reserved for further focus group discussions or individual interviews. On the third day, the ship moved on to the next island.

"Haji Island" (Barrang Caddi) is dominated by an innovative fish entrepreneur and trader (punggawa). At the same time, he is a haji (pilgrim to Mecca) and thus an eminent leader due to religious credentials. The social capital of a prominent figure (tokoh) is gained in one or more of the following fields: religion (agama), economy (ekonomi), social network (sosial), knowledge, including innovation (pengetahuan). Our leader dominates in all of them.

"Conflict Island" (Badi) is divided. The population is segregated into two fractions that don't get along well since

long ago. Fishermen for one boat don't mix, women do not visit the houses on the other (eastern) side. Excursion participants suffered low-grade aggression (verbal, pushing, grabbing) from people from the poorer (western) part of the village. The excluded part in the west has erosion problems – quite a few houses had been washed away by the waves – and less development money or projects. Wooden wave breakers had been installed but were not very effective.



Women work in a crab processing factory (Photo: Bernhard Glaeser)

"Women's Island" (Saugi) is characterized by women's labor. Women work in a crab processing factory, they are seasonally employed in seaweed (rumput laut) culture, and they are self-employed as small village traders. This island looks traditional, tidy and well-kept: Flowers and fruit trees (bananas) have been planted, roads are clean, gardens have fences, goats are on leashes. Different from other islands, village assemblies don't show a strict right-left segregation between men and women as is the custom in a mosque. Women on Saugi island earn money on a regular basis. This is an extra family and village income in addition to what the fishermen earn. The fact that women earn money renders them more influential and may cause social change.



"Pirate fishers" take off to bomb the reef (Photo: Bernhard Glaeser)

“Pirate Island” (Karanrang) builds on “pirate fishing”, using bombs and cyanide for fishing whereby the fishermen destroy the reef, the fundamental biotope to support a highly diverse biocoenosis, including fish. This island is the wealthiest and the most “modern”. The welcoming lunch was chicken (not fish) and was served in styrofoam boxes.

One could see TV sets and mobile phones. The population included 40 hajis, which means that 40 trips to Mecca had to be financed in one year. A huge mosque had been constructed recently.



“Pirate Island” (Karanrang) – Villagers discuss past developments and future options with researchers (Photo: Marion Glaser)

The overall picture was slightly depressing. Fish resources have been depleted. A sixty-five year old Saugi fisherman phrased it like this: “Crabs are much smaller now. Formerly, four to five crabs weighed one kg, now it takes 12 crabs to reach that weight. Whereas the small ones used to be thrown back, now everything is taken. In former times, we went fishing only when the weather was good. Now, they go every day, even when it storms. When a storm came, previously, we would throw the anchor and stay. Nowadays, the boat would sink. This proves that the waves are higher now.”



Sea level rise and storms threaten small islands (Photo: Bernhard Glaeser)

Many local inhabitants acknowledge that present fishing practices, if unchanged, will result in the degradation, if not destruction, of the reef. Sea level rise is threatening the islands. Houses have been destroyed, already. People moved to relatives or left their island. There are few sources for income. A vision or concept for future development seems to be non-existent. The respondents simply hope for more fish in the future. The conviction of a God-given destiny is ever present.

A positive exception were the women on Saugi Island who found employment or were self-employed. They went to work when the men came home from fishing. Employment opportunities for women and aquaculture (sea cucumbers, fish cages, algae cultivation) seem to be a way out of the stagnant economic situation and should be pursued by on the provincial and district level to promote local and regional development. Reef restoration is an option to reduce beach erosion. Social-ecological systems analysis aims at understanding how to increase reef resilience and to enhance people's livelihoods.

Indonesia's Fisheries Minister Freddy Numberi advocates a policy shift to focus the country's development on the oceans: “An ocean policy, made with the cooperation of all stakeholders ..., will set us on the right course to realize the full potential of our marine resources” (The Jakarta Post, February 26, 2009: 4).



Bernhard Glaeser and Marion Glaser (LOICZ SSC members and authors of the article) discuss questionnaires (Photo: unknown research student; Bernhard Glaeser's camera)

Outcome: The research will be continued in May, 2009. A final report will be prepared which includes the islanders' reconstruction of their long term historical time lines and their future visioning, social networks, and spatial and seasonal mapping in order to understand which people, resources and locations are of special importance to the community and what constitutes the specific social-ecological focus system(s).



Calendar

2009

2nd International Conference on Water Economics, Statistics, and Finance

3–5 July 2009

Alexandroupolis, Thrace, GREECE

http://www.soc.uoc.gr/iwa/2009/iwa_page.php?IWAdoc=

PAGES 1st Young Scientists Meeting

6–7 July 2009

Oregon State University, Corvallis, USA

<http://www.pages-osm.org/>

7th International Conference on Geomorphology (ANZIAG)

Ancient Landscapes – Modern Perspectives

6–11 July 2009

Melbourne Convention & Exhibition Centre, Australia

<http://www.geomorphology2009.com/>

ECOSUD 2009 – 7th International Conference on Ecosystems and Sustainable Development

8–10 July 2009

Chianciano Terme, ITALY

http://www.wessex.ac.uk/images/stories/pdf_cfps/2009/ecosud_09.pdf

PAGES 3rd Open Science Meeting

Oregon State University, Corvallis, USA

8–11 July 2009

<http://www.pages-osm.org/>

MARE Conference – People and the Sea V

9–11 July 2009

Amsterdam, The Netherlands

http://www.marecentre.nl/people_and_the_sea_5/index.html

Third AMMA International Conference

20–24 July 2009

Venue: Hotel Azalai Independance, Ouagadougou, Burkina

<http://amma-international.org>

iLEAPS Science Conference

Call for sessions: iLEAPS Science Conference 2009

iLEAPS, the Integrated Land Ecosystem-Atmosphere Processes Study (<http://www.ileaps.org/>) is organizing a Science Conference 24–28 August 2009 in Melbourne, Australia.

2nd International Conference on Progress in Marine Conservation in Europe 2009

10–14 August 2009

Stralsund, Germany

<http://www.sesame-ip.eu/public/news>

ECSA Symposium: Estuarine Goods and Services

29 August – 4 September 2009 Venue: Dublin, IRELAND

<http://www.ecsa-news.org/>

7th Baltic Sea Science Congress 2009

17–21 August 2009

Tallinn, ESTONIA

<http://www.bssc2009.org>

ECSA Symposium: Estuarine Goods and Services

29 August – 4 September 2009

Dublin, IRELAND

<http://www.ecsa-news.org/>

24th International Meeting on Organic Geochemistry

6–11 September 2009

Bremen, GERMANY

<http://www.marum.de/imog2009/>

5th International Conference on River Basin Management

7–9 September 2009 Venue: Malta

<http://www2.wessex.ac.uk/09-conferences/river-basin-management-2009.html>

European Marine Biology Symposium 2009

7–11 September 2009 Venue: Liverpool, UK

<http://www.liv.ac.uk/marinebiology/embs.html>

Water Resources Management 2009

9–11 September 2009, Malta

<http://www.wessex.ac.uk>

Coastal Processes 2009

14–16 September 2009, Malta

<http://www2.wessex.ac.uk/09-conferences/coastal-processes-2009.html>

Coasts, Marine Structures and Breakwaters 2009

16–18 September 2009

Edinburgh, UK

<http://www.ice-breakwaters.com/>

ICES Annual Science Conference

21–25 September, Berlin, Germany

www.ices.dk/asc2009/

OceanObs'09

21–25 September 2009, Venice, Italy

<http://www.oceanobs09.net/>

session: High-resolution deltaic architecture at:

IAS 2009 27th Meeting

Alghero, Island of Sardinia, Italy

20–23 September 2009

The second circular of the IAS 2009 meeting is now available on the web site: <http://www.ias2009.com>

CarboOcean Final Conference

5–9 October 2009, Bergen, Norway
 Contact: Christoph Heinze
Christoph.Heinze@gfi.uib.no

6th GKSS School on Environmental Research

School on Statistical Analysis in Climate Research
 in Lecce, Italy, 6–16 October 2009

<http://coast.gkss.de/events/6thschool>

Contact: Götz Flöser
 Telefon: +49 4152 87 23 45
 Telefax: +49 4152 87 28 18
Goetz.floeser@gkss.de

HABs and Eutrophication

SECOND OPEN SCIENCE MEETING

18–21 October 2009 Beijing, China

Meeting Website: www.geohab.info; www.geohab-osm-bj.ac.cn

First international conference on Asia Quaternary Research (AsQUA)

Beijing, 19–23 October 2009, in conjunction with International Symposium on Paleoanthropology in Commemoration of the 80th Anniversary of the Discovery of the First Skull of Peking Man.

If you have any questions, please contact Prof. GAO Xing
gaoxing@ivpp.ac.cn.

Second DIVERSITAS Open Science Conference:

Biodiversity and society: understanding connections, adapting to change, 13–16 October 2009, in Cape Town, South Africa

Contact: Mélinna SEENEEVASSEN

DIVERSITAS Secretariat

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Fax: + 33 1 40 79 80 45

Email: secretariat@diversitas-international.org

<http://www.diversitas-international.org>

Coasts and Estuaries in a Changing World (CERF 2009)

1–5 November 2009 Ort: Portland, Oregon, UNITED STATES

<http://www.erf.org/newsletter/Winter07-CERF09-ExecDir.html>

MEDCOAST 2009

The Ninth International Conference on the Mediterranean Coastal Environment

10–14 November 2009, Sochi, Russia

www.medcoast.org.tr

The East Asian Seas (EAS) Congress 2009 in Manila, Philippines on 23–27 November 2009

Calls for Abstracts and for Exhibitors are also now open. To know more about EAS Congress events and participation opportunities, please visit www.pemsea.org/eascongress

For further inquiries, please email the EAS Congress Secretariat at congress@pemsea.org.

To register, please visit: www.pemsea.org/eascongress/registration

20th biennial conference: **CERF 2009 Coasts and Estuaries in a Changing World**, 1–5 November 2009, Oregon Convention Center, Portland, Oregon USA .

3rd International Conference on Aquatic Resources ICAR-09 "Prospects and Challenges"

17–20 November 2009, Alexandria, Egypt

<http://www.empnetwork.net/icar09/>

4th European Conference on Coastal Lagoon Research

Research and Management for the Conservation of Coastal Lagoon Ecosystems, South-North comparisons
 Montpellier from 14–18 December 2009

<http://www.ecolag.univ-montp2.fr/lagoon-conference>

2010

An **ICES Symposium on the Collection and Interpretation of Fishery Dependent Data** will be held during the summer 2010, in Galway, Ireland with N. Graham (Ireland), K. Nedreaas (Norway), and W. Karp (USA) as Conveners.

A Scientific Steering Group will be established with members nominated by relevant Working Groups to assist the Conveners in planning the Symposium. The Symposium will be co-sponsored by the Marine Research Institute of Ireland and the United States National Oceanic and Atmospheric Administration and will be held in association with FAO. In consultation with the Conveners, the General Secretary will solicit further co-sponsorship as appropriate.

ASLO-NABS 2010 Meeting

Global Changes from the Center to the Edge

June 6–11, 2010

Santa Fe, New Mexico, USA

<http://www.aslo.org/forms/santafe2010.html>

Session proposals must be submitted online by 23:59 U.S. Central Daylight Time, 30 September, 2009

11th INTERNATIONAL MEETING on STATISTICAL CLIMATOLOGY

JULY 12–16, 2010, UNIVERSITY OF EDINBURGH, SCOTLAND

<http://cccma.seos.ubic.ca/imsc/11imsc.shtml>

An **ICES/NASCO/NPAFC Symposium on Marine Mortality of Salmon** will be held in October 2010 in Europe with Niall Ó Maoiléidigh (ICES), Malcolm Windsor (NASCO), and Jim Irvine (NPAFC) as Conveners.

A Scientific Steering Group will be established with members nominated by each organization to assist the Conveners in planning the Symposium.

2011**International Symposium on Integrated Coastal Zone Management**

12–16 June 2011

Arendal, NORWAY

<http://www.imr.no/iczm/>

All dates are also available on our website:

<http://www.loicz.org/calender/index.html.en>



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LOICZ in brief

LOICZ aims to provide science that contributes towards understanding the Earth system in order to inform, educate and contribute to the sustainability of the world's coastal zone. LOICZ is a core project of the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP).

The LOICZ IPO is hosted by the Institute of Coastal Research at GKSS Research Centre which is part of the Helmholtz foundation.

LOICZ research as outlined in the science plan and implementation strategy is organised around five themes:

- Vulnerability of coastal systems and hazards to society
- Implications of global change for coastal ecosystems and sustainable development
- Human influences on river-basin-coastal zone interaction
- Biogeochemical cycles of coastal and shelf waters
- Towards coastal system sustainability by managing land-ocean interactions

The Science Plan and Implementation Strategy is available electronically on the LOICZ website and in hard copy at the LOICZ IPO.

Get involved

If you wish to contribute to LOICZ INPRINT please send an e-mail to: loicz.ipo@loicz.org or visit the LOICZ website www.loicz.org for article requirements.

If you have a project you would like to affiliate to LOICZ please go to www.loicz.org and click on research for detailed information.

