



## Land-Ocean Interactions in the Coastal Zone



## INPRINT

-  Scientific Highlight: Sea Level Rise Vulnerability of Southeast Asian Coasts
-  LOICZ Affiliated Activities: EPOCA – a European research effort to understand ocean acidification and its consequences
-  SCOPE workshop on environmental costs and benefits of biofuels
-  PT1: Integrative Thinking for Complex Futures: Creating Resilience in Human-Nature Systems
-  PT2: SCOR/LOICZ/CAS Working Group 132 visited LOICZ IPO: Land-Based Nutrient Pollution and the Relationship to Harmful Algal Blooms in Coastal Marine Systems
-  PT2: LOICZ workshop in Chennai: developing nutrient budgets for South Asian coastal ecosystems and evaluating the ASSETS trophic status index software
-  Snapshots: Canadian High Arctic and Delta of the Lena river



*Merry Christmas and  
a Happy and Prosperous New Year*

**Contents**

<b>LOICZ People</b>	2
<b>Scientific Highlights</b>	3
Sea Level Rise Vulnerability of Southeast Asian Coasts	3
<b>LOICZ Affiliated Activities</b>	6
EPOCA – A European Research Effort to Understand Ocean Acidification and its Consequences	6
First SCOPE Workshop on Environmental Costs and Benefits of Biofuels	8
<b>PRIORITY TOPIC 1</b>	12
Integrative Thinking for Complex Futures: Creating Resilience in Human-Nature Systems	12
<b>PRIORITY TOPIC 2</b>	14
New SCOR/LOICZ/CAS Working Group 132 on Land-Based Nutrient Pollution and the Relationship to Harmful Algal Blooms in Coastal Marine Systems	14
LOICZ Workshop in Chennai, India	16
<b>LOICZ News</b>	18
LOICZ Listed in the Yearbook of International Organizations	18
<b>IPO Notes</b>	20
More than Water – Oceans and Global Responsibility	20
Catharina Meyer – Intern at the LOICZ IPO	22
Geography Symposium for Teachers: Coast and Climate	22
<b>Young LOICZ</b>	22
Hamburg's Pupils interested in Global Environmental Change	22
LOICZ Supports Children's University	23
<b>Report</b>	24
Summer School on Satellite Oceanography	24
<b>Publications</b>	25
Coastal Basins on the Edge – UNESCO-SCOPE-UNEP Policy Brief No. 7	25
<b>What's new on the web</b>	25
Coastal Fluxes in the Anthropocene – the LOICZ first decade synthesis	25
<b>Have you seen</b>	25
7th International Conference on the Human Dimensions	25
GKSS Summer School: Coastal Systems under Pressure	26
October 2009: 6th GKSS School on Statistical Analysis in Climate Research	26
<b>Coastal Snapshot</b>	27
Research in the Realm of the Mammoth	27
The Call of the North: A 13-month Field Program in the Canadian High Arctic	28
<b>Position announcement</b>	30
<b>Calendar</b>	30



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## Scientific Highlights

### Sea Level Rise Vulnerability of Southeast Asian Coasts

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Vulnerability of coastal areas to sea level rise is driven by both global environmental changes, socio-economic development, as well as the ability of affected communities to cope with such changes, which in turn, is influenced by interacting social, economic and environmental factors (Amadore et al., 1996; Mimura, 2001; Adger, 2003; Lasco and Boer, 2006; Nicholls et al., 2007). There is a necessity therefore for an integrated analysis to determine their collective effect on adaptation capacities of human communities.

This collaborative effort for Southeast Asia was conceptualized during the Inaugural Open Science Meeting for the second phase of LOICZ held in the Netherlands in 2005 with the active participation of representatives from Indonesia, Malaysia, The Philippines, Singapore, Thailand, Vietnam and Japan. The guiding principle of the whole endeavour led by the LOICZ Regional Node SEAsia is to effectively influence policy and decision makers in the selection of strategic and sustainable adaptive measures to reduce the future impact of GEC.

Our method of approach is to primarily focus on training workshops (funded by the Asia-Pacific Network, for Global Change Research, APN and the APN-START) which expose regional participants to available assessment tools and synthesize secondary and primary data from collaborating countries. There were two previous studies that involved participatory assessment with local scientists. One is the Regional Workshop on Climate Change Vulnerability and Adaptation Assessment in Asia and the Pacific sponsored mostly by U.S. and Philippine Institutions and the Asian Development Bank which highlighted the GEC vulnerability of islands and coastal nations in general and agriculture, water and forest resources in particular (Amadore et al., 1996). The other is the SURVAS project (Synthesis and Upscaling of Sea-Level Rise Vulnerability Assessment Studies) funded by the EU, the ENRICH Network, the APN, and the IGBP/IHDP-LOICZ core project. This endeavor resulted in inputs from China, Indonesia, Japan, Malaysia, Thailand and Vietnam and provided for validation of ongoing global assessment efforts in the DINAS-COAST

Project (Nicholls and de la Vega-Leinert, 2001). It was the LOICZ affiliated DINAS-COAST project that produced the DIVA tool (Dynamic Interactive Vulnerability Assessment) which is one of the initial tools used in this study.

### The Tools

Our method chosen for the regional assessment is to apply the DINAS-COAST DIVA model (Dynamic Interactive Vulnerability Assessment) which integrates natural and socio-economic variables in the analysis

(<http://diva.demis.nl/>; Hinkel, 2005; Hinkel and Klein, 2008; McFadden et al., 2007).

Cases were simulated with different combinations of adaptive strategies and the scenarios derived from the Intergovernmental Panel on Climate Change Special Report on Emission Scenarios (IPCC SRES) storylines (Figure 1).

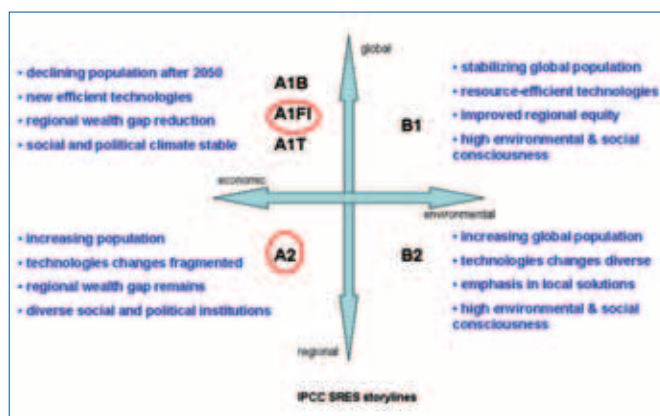


Figure 1: The IPCC SRES storylines from the 4<sup>th</sup> IPCC Report. Highlighted in red are the scenarios with the highest predicted carbon production from fossil combustion.

The analysis was done on a regional scale with a high regionalized sea level rise and on a per country scale with low, medium and high regionalized sea level rise. Two adaptation options for coasts under threat of sea level rise are considered in the DIVA model: dike protection and beach nourishment. DIVA implements these options according to several predefined adaptation strategies





such as “do nothing”, full protection or protection according to a cost-benefit analysis of damage and adaptation cost. Dike protection strategies are further divided into different flood return periods against which to protect (e.g., 10 years, 100 years or 1000 years events).

In order to get a handle on the inter-country similarity and disparity country data and model results were further analyzed using a geospatial clustering tool produced during LOICZ I, the LOICZ-DISCO (Deluxe Integrated System for Clustering Operations), (<http://fangorn.colby.edu/disco-devel/index.php> Smith and Maxwell, 2002; Buddemeier et al, 2008).

Clustering was done using natural and socio-economic country parameters available in the coastal database of the DIVA model, as well as, all the scenario results of the DIVA simulations for the countries of Southeast Asia.

## Regional Results

Overall vulnerability is seen in the number of people affected by flooding and the land being lost near the coast, including wetlands.

There is a high cost to doing nothing. For example, without any adaptation strategy results show a uniform linear increase of migration due to land loss from the present rate of 1000 persons per year to 3000 persons per year by 2040. After 2040 the response diverges with volume of migration depending on the IPCC SRES storyline (Figure 2).

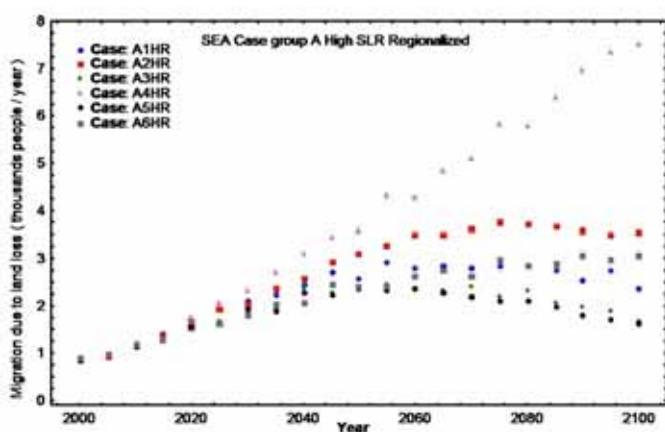


Figure 2: Predicted migration due to land loss if no adaptive strategy is applied. There is uniform linear increase expected until 2040 but after 2040 the response diverges with volume of migration depending on the IPCC SRES storylines.

Highest migration was seen for the A2 followed by the A1FI scenarios. With adaptation measures the migration can be reduced by 40–95 %.

Full nourishment seems to be the more cost-effective option with lower total adaptation cost and better effi-

cacy towards minimizing loss of wetland areas, including coastal forests and mangroves; loss sand; net land loss and the consequent migration due to this land loss. It should be noted that sustainable coastal nourishment, in our point-of-view, should incorporate coastal cover rehabilitation (mangrove and seagrass).

Dike protection was found to be the better option specifically for mitigating the number of people actually flooded, land loss due to submergence and the costs of damage due to flooding from the sea. There is minimal advantage of the dike height that protect against the one in 100 year flood events over that of one in 10 year events until 2050. Thereafter, the cost-benefit advantage of the higher design return period is significant for the A1B and A1FI scenarios.

DIVA does not include adaptation measures that mitigate the problem of salinity intrusions to the groundwater induced by sea level rise.

## Per Country Evaluation and Comparison

Vietnam ended up in a cluster by its self with a characteristic high coastal floodplain population. By 2040, it is expected to experience a relatively high land loss due to submergence resulting in migration of about 1100 people annually. By 2100, the continuing sea level rise is expected to result in a moderate net loss of wetland area and nearly 22 million people experiencing flood every year.

Malaysia, Thailand, and the Philippines exhibit an overall low land loss due to submergence and a moderate net loss of wetland area. This land loss will result in an average annual migration of about 150 to 200 people each for Malaysia and Thailand. No migration is expected for the Philippines. The moderate-size population living on the coastal floodplains is expected to experience flood with up to 2 to 5 million people affected by 2100 in each of these three countries. Overall, the Philippines are expected to fare a little better with a predicted lower total residual damage cost.

Cambodia and Singapore are clustered together due to their small total coastal length. Yet this similarity does not lead to similar consequences. Cambodia, characterized by low coastal exposure will experience only low land loss due to submergence, and a moderate net loss of wetland area. By 2100 about 25 thousand people are expected to experience annual flooding. Singapore also has a projected low land loss but no significant loss of wetland area. Being an island state however, it is expected that a higher amount of their population will experience flooding with around 800 people affected annually in 2040 and up to 660 thousand by 2100.

Indonesia is takes a unique position. Aside from the high

coastal population, the vulnerable elements identified for this country include its high coastal forest and mangrove cover. It is expected to experience a high land loss due to submergence with around 800 to 1000 people expected to migrate annually due to land loss. In addition, a high amount of wetland area is expected to be lost by 2100 with up to 26 million people expected to experience flood every year.

The high land loss due to erosion, wetland loss, and migration in response to land loss in Vietnam and Indonesia was modelled to be more effectively mitigated by beach nourishment. In comparison, beach nourishment is only slightly advantageous as compared to dike protection for the mitigation of predicted wetland losses in Malaysia, Thailand, the Philippines, and Cambodia. For Singapore dike protection was recommended to mitigate the predicted land loss. In fact, protection from flooding of tens of millions of people living near the coasts in each of the countries in SE Asia requires dike protection.

### Consequence of the Different SRS Storylines

In all the countries, the B1 Sea Level Rise Scenario (SRS) exhibits the least amount of damage in terms of natural resources loss due to sea level rise and actual number of people flooded or having to migrate due to submergence. Scenario A1T is also an acceptable alternative especially for the countries of Vietnam, Indonesia, Malaysia, and Thailand.

Surprisingly, the rather resource taxing A2 scenario also exhibited a lower total residual damage cost. However, it was noted that mitigation measures specifically addressing loss of total wetland and abating costs of sea flooding are significantly less effective for the A2 scenario.

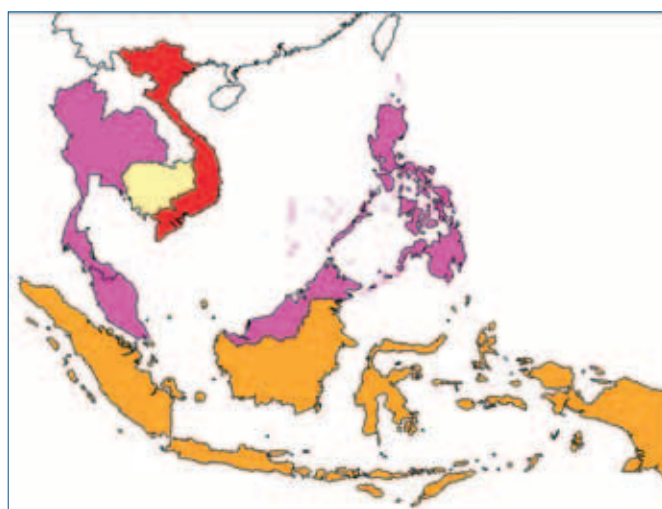
### Implications to Policy and Planning

Adapting to and preparing for the foreseen sea level changes in Southeast Asia needs a two-pronged approach. Engineering measures were seen as a necessity in order to ensure limited damage to the human population and coastal resources. The cost-benefit relation between beach nourishment and sea walls/dikes is country-specific and target-specific. The more vulnerable countries like Vietnam and Indonesia, for example, will benefit more from beach nourishment which will have to mitigate their predicted high rate of migration due to land loss. On the other hand, for Singapore whose vulnerability is determined by the 660 thousand people who will be flooded by year 2100, dike protection is recommended. At the same time however, analysis showed that the extent of impact anticipated to affect the coastal zone differs depending on the underlying IPCC SRES storyline. Therefore, on global political and governance scales, effort must be exerted globally towards targeting the B1

or A1T scenario, which in terms of concrete action translates to reduced demographic pressure, a balanced mix of utilized energy resources, and a substantial increase in equity among the global regions.

### Findings, On-Going Work and Future Recommendations

All participating countries were tasked at the end of the 1<sup>st</sup> workshop to come up with case studies that highlight their respective country's coastal zone sensitivity to extreme events (Figure 3).



**Figure 3:** Clustering results highlight the inter-country similarity and disparity. Vietnam belongs to Cluster 1 characterized by very high coastal population; Thailand, Malaysia and the Philippines belong to Cluster 2 with moderate amount of exposure; Cambodia and Singapore belong to Cluster 3 and have a small total coastal area exposure; Indonesia belongs to Cluster 4 and has a very high people and wetland area exposure.

Each participant was also asked to mobilize a 'sub-network' of socio-economists in their country who participated in the 2<sup>nd</sup> workshop which was focused on vulnerability assessment with valuation analysis. The ensuing discussions regarding the case studies emphasized that the current DIVA vulnerability assessment is appropriate for vulnerability comparison between countries. However, site-specific case studies cannot be addressed adequately at the current scale of the model. In conclusion a regional higher resolution assessment tool (perhaps a regional DIVA SEAsia) may be a consequent future research target.

The DIVA tool in general is being further developed by the members of the former DINAS-COAST consortium. Recent efforts focus on updating the representation of the coastal slopes and population density based on newly available digital elevation models. A further activity aims to ingrate DIVA into standard GIS software in order to make it easier for users to run DIVA with their own data, a need that has frequently been expressed



within this and other applications of the tool. On the longer run it is envisaged to develop regional versions of DIVA applicable at sub-national scales relevant for coastal-zone management. A major challenge to be faced thereby is to move beyond the one-dimensional representation of the coastal zone, a model that has proven to be powerful for the global scale dimension but less appropriate for smaller scale analysis.

In this ongoing project a 3<sup>rd</sup> workshop scheduled for March 2009 will focus on policy and cost-benefit analysis and will involve country experts in charge to identify policy conflicts and gaps relevant to management and governance of coastal areas specifically related to GEC adaptation strategies. The workshop will also address the analysis of the cost of not implementing suggested courses of action in order to effectively market the identified management strategies to policy makers.

### Acknowledgment

Funding for this collaborative exercise was provided by APN and APN-START, as well as, IGBP/IHDP-LOICZ.

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## LOICZ Affiliated Activities



**EPOCA –  
A European Research Effort to Understand Ocean Acidification and its Consequences**  
J.-P. Gattuso, L. Hansson, and the EPOCA Consortium

Besides global warming, another consequence of man's use of fossil fuels is receiving increased attention from the marine and Earth System scientific community. Ocean acidification has been referred to as “the other CO<sub>2</sub> problem”, a much less known but potentially as dramatic result of the approximately 79 million tons of carbon dioxide (CO<sub>2</sub>) released into the atmosphere every day, not only as a result of fossil fuel burning but also from deforestation and production of cement. Over the past 250 years, the world's oceans have absorbed about

one third of the CO<sub>2</sub> released due to anthropogenic activities. Whereas the chemical consequences of this CO<sub>2</sub> uptake are well understood (decrease in pH and shifts in seawater carbonate chemistry) the biological impacts of ocean acidification are poorly known. One of the most likely consequences is the slower growth of organisms forming calcareous skeletons or shells, such as corals and mollusks.

The European Project on Ocean Acidification, EPOCA, is



a four-year-long EU project funded within the 7. Framework Programme (<http://epoca-project.eu>). Launched in May 2008, EPOCA which is affiliated to LOICZ brings together European expertise within various fields of marine research, joining forces to try to shed light on ocean acidification and its possible impacts on the oceanic flora and fauna, as well as on biogeochemical cycling. More than a hundred scientists from 27 institutes<sup>1</sup> and 9 countries bring their contribution to the project, with the ultimate goal to answer the numerous questions associated to a research area that is only in its infancy. The project's research activities are organized into four overall themes:

### Theme 1 – Changes in ocean chemistry and biogeography

What are the past and present fluctuations in carbonate chemistry and biogeography of marine key species? An important part of EPOCA focuses on such variations across space and time. Past variability in ocean chemistry is studied via paleo-reconstruction methods on archives such as cold-water corals and foraminifera. Continuous sampling and measurements in time-series stations and along crossings, mostly in northern latitudes such as the Arctic Ocean and the North Atlantic, constitute the observational component of EPOCA.

### Theme 2 – Biological and ecosystem responses

How will marine organisms and ecosystems react in response to ocean acidification? EPOCA's largest research theme is devoted to the impacts of ocean acidification on marine organisms, from planktonic species to higher trophic levels. Laboratory and mesocosm CO<sub>2</sub> enrichment experiments combined with experimental approaches ranging from molecular to ecosystem scale are used to study key organisms and physiological processes in an attempt to quantify the biological response and assess acclimation and adaptation possibilities.



**Figure 1:** EPOCA investigates ocean acidification using a wide range of techniques: natural CO<sub>2</sub> vents, as well as laboratory and mesocosm experiments. The photograph illustrates the set-up designed at the Plymouth Marine Laboratory that is used to study North Atlantic and Arctic organisms. (Photo: S. Widdicombe, Plymouth Marine Laboratory)

### Theme 3 – Biogeochemical impacts and feedbacks

To what extent will ocean acidification alter ocean carbonate chemistry, biogeochemistry, and marine ecosystems over the next 200 years, and how will these changes feed back on climate change? Results from themes 1 and 2 will be incorporated into biogeochemical, sediment, and coupled ocean-climate models to project future variability in carbonate chemistry, responses to ocean acidification from the Earth system and feedbacks.

### Theme 4 – Synthesis, dissemination and outreach

What conclusions can be drawn when combining the results from themes 1, 2 and 3? Uncertainties, risks and potential critical thresholds or "tipping points"<sup>2</sup> associated with ocean acidification will be communicated to policy-makers and the general public in a comprehensive format and language. The EPOCA strategy aims to contribute high quality science directly to expert groups and committees through the formation of the EPOCA Reference User Group (RUG) of stakeholders. The RUG will advise EPOCA on the format and the nature of key messages arising from the project and on the dissemination procedures.

### Coastal research within EPOCA

Coastal ecosystems are among those studied within EPOCA. The biological effects of ocean acidification are investigated on coastal ecosystems and species (in particular echinoderms, calcareous algae, and sea grasses) in the Mediterranean Sea, the Arctic Ocean, the North Sea, and the English Channel. The modeling component of EPOCA will project future scenarios and evaluate the robustness of the marine coastal and open ocean ecosystems to ocean acidification. EPOCA will also investigate the impact of ocean acidification on biogeochemical processes such as primary production, respiration, calcification and prokaryotic nitrogen cycling both off-shore and in coastal waters.

### Recent and upcoming EPOCA events

The need for standardized protocols and reporting of data is crucial for meaningful comparisons and collaboration within the field of ocean acidification. EPOCA organized this fall, together with the International Ocean Carbon Coordination Project (IOCCP), the US Ocean Carbon and Biogeochemistry Program (OCB), and the Kiel Excellence Cluster 'The Future Ocean', an international research workshop on best practices for ocean acidification research (19–21 November, 2008, in Kiel, Germany; chair: Ulf Riebesell).

1 A complete list of EPOCA participants is available at [www.epoca-project.eu](http://www.epoca-project.eu).

2 A tipping point is the critical point (threshold) in an evolving situation that, if crossed, leads to a new and irreversible state.



The workshop participants are in the process of producing short technical reports for each major topic that was covered (e.g. perturbation and calcification experiments), as well as a Guide to Best Practices for Ocean Acidification Research and Data Reporting.

EPOCA will organize several training workshops for Ph.D students and young researchers. The first one, organized by Richard Bellerby (University of Bergen), will take place 24–27 February 2009 in Bergen, Norway. It will cover the fundamentals of the marine carbon dioxide system and carbon biogeochemistry with ecosystem controls and feedbacks. The course will provide a comprehensive insight into the global carbon cycle, pH scales and dissociation constants, biogenic calcification and the  $\text{CaCO}_3$  cycle, and the physiological processes of autotrophic carbon assimilation.

For more information on EPOCA and its activities please contact the EPOCA Project Office:

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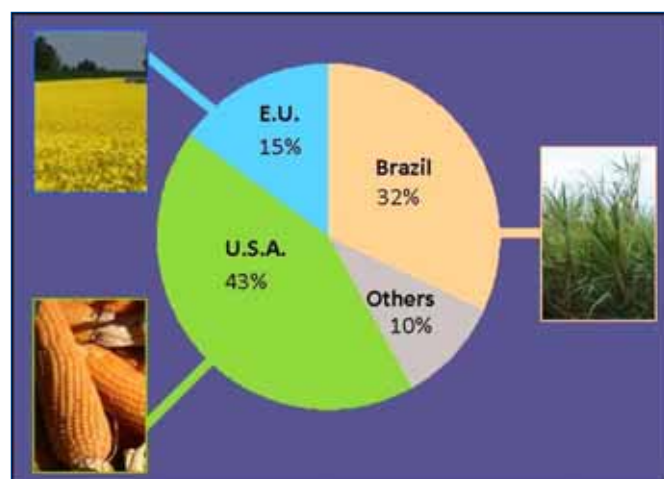
## First SCOPE Workshop on Environmental Costs and Benefits of Biofuels

Authors: Renee Santoro and Dennis Swaney

Liquid biofuels have recently been promoted by many governments as a means to mitigate global climate change, provide energy security, and build rural economies and development, though there is a growing body of evidence indicating that some current commercially viable biofuel systems may not be able to deliver such benefits, and further expansion may incur heavy social and environmental costs. Here, we highlight some conclusions from a recent conference that addressed some of the environmental impacts of biofuels, including those coupling biofuels policies to impacts on coastal waters.

To date, bio-ethanol (predominantly maize and sugar cane) and bio-diesel (predominately rapeseed) have dominated the global biofuel market (Figure 1). Global production of liquid biofuels has tripled since 2000, consuming 5–6 % of the total global grain harvest, 8 % of the vegetable oil, and 28 % of the sugar cane (FAO 2008). Production in 2007, however, substituted less than 2 % of the global transport fuel demand (Jank 2008; OECD 2008). Despite these numbers, many governments have mandated a 10–20 % substitution of liquid fossil fuels within the next decade or two. Production of enough biomass to meet

these targets from current biofuel systems and with current agricultural practices will likely have severe environmental consequences for some regions including increased greenhouse gas emissions, negative local air quality effects, loss of biodiversity, increased deforestation, stressed water resources, and pollution of surface (freshwater and coastal) and ground waters (Hill et al. 2006; Keeney & Muller 2006; Tilman et al. 2006; WWI 2006; Bringezu et al. 2007; Crutzen et al. 2007; Donner & Kucharik 2008; Fraiture et al. 2008; Gallagher 2008; Martinelli & Filoso 2008; Searchinger et al. 2008; Simpson et al. 2008). However, biofuels made from low-input, non-food crops may provide developing countries opportunities for economic growth, local energy security, and, in some cases, re-greening of degraded land resources (Braun & Pachauri 2006). Several aspects of environmental impact analyses for biofuels (i.e. indirect land use impacts,  $\text{N}_2\text{O}$  emissions from biofuel systems, total area available for sustainable use of marginal or degraded land), however, are still highly uncertain and controversial.



**Figure 1:** Proportion of global production of liquid biofuels in 2007. Production in the United States was mostly ethanol from corn, in Brazil was ethanol from sugar cane, and in the European Union was mostly biodiesel from rapeseed. The United States used 26 % of its corn harvest to produce ethanol, which contributed just over 1 % of its use of liquid fuels (transportation fuels plus other uses of liquid fuels). Brazil used 60 % of its sugar cane to produce ethanol for 7.5 % of its liquid fuel use. (Luc Maene, International Fertilizer Industry Association (IFA), adapted from Coyle 2007)

The Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Science (ICSU) has established the International SCOPE Biofuels Project (chaired by Bob Howarth, Cornell University) to assess the current scientific uncertainties and to provide a comprehensive, systematic, and science-based analysis of the environmental benefits and problems of commonly used and potential future biofuels. Phase 1 of the project, an international Rapid Assessment (RAP) workshop on the environmental consequences of commercially viable liquid biofuels, was held in Gummersbach, Germany in



September. Funding was provided by the German Research Foundation (DFG), United Nations Foundation, United Nations Environmental Programme (UNEP), Cornell University, and the Wuppertal Institute for Climate, Environment and Energy.

The Gummersbach workshop, hosted by the Wuppertal Institute, engaged a diverse group of invited experts from 19 countries, spanning five continents to discuss key environmental and cross-cutting issues and to outline future perspectives of a more sustainable production and use of biofuels. Prior to the workshop, participants were asked to review a series of invited background papers which detailed environmental and socio-economic risks surrounding liquid biofuels and set the stage for workshop discussions. Participants discussed four cross-cutting topics:

- Towards more environmentally beneficial/neutral biofuel systems
- Developing an integrated and qualitative assessment of biofuel systems
- Biofuels and developing countries
- What are the final land limits?

Some of the main workshop conclusions related to coastal impacts of biofuels are summarized below.

### Water quality

Poorly-planned expansions of current biofuel feedstock cropping will surely have detrimental effects on fresh and coastal water quality. Many of these impacts will be the same as those already attributable to modern agriculture (i.e. nutrient over-enrichment, heavy metal and agricultural chemical contamination, increased turbidity, etc.). However, current mandates for biofuel production will require considerable increases in the land area dedicated to industrial agriculture and an unprecedented increase in yields. Thus, the known environmental impacts of modern agriculture may be greatly magnified by biofuels. Higher fertilization rates and conversion of conservation land, riparian buffers, and other economically (though not always ecologically) 'marginal' lands also need to be considered in assessing water quality impacts. Recent research (Table 1) estimates a 37% or more increase in nitrogen to the Gulf of Mexico as a result of maize for ethanol production in the Mississippi River Basin, putting extensive corn-ethanol production in direct conflict with efforts to reduce the Gulf's "dead zone" (Donner & Kucharik 2008; Simpson et al. 2008). This is likely a conservative estimate since neither analysis accounts for increased fertilizer application rates to maize crops.



Figure 2: Participants at the SCOPE International Biofuels Project rapid assessment workshop held in Gummersbach Germany, 22–25 September, 2008. (Photo: Stefan Bringezu, Wuppertal Institute)

Table 1: Increased nutrient loss with expansion of U.S. Maize acreage in Mississippi River Basin (recalculated from Simpson et al. 2008).

Average shift to support ethanol and other markets	Land area 10 <sup>6</sup> ha	N loss		P loss	
		Average kg ha <sup>-1</sup>	Increase 10 <sup>6</sup> kg	Average kg ha <sup>-1</sup>	Increase 10 <sup>6</sup> kg
New corn land	4.5	33.6	151	3.4	15.3
New soybean land	2.7	25.2	68	3.4	9.2
Converted CRP <sup>1</sup> , idle, pasture and hay lands	6.0	5.6	-33.6	0.6	-3.6
Converted cotton lands <sup>2</sup>	1.2	13	-15.6	1.7	-2.0
<b>Estimated increase in total loss</b>			<b>170</b>		<b>18.9</b>

1 CRP=Conservation Reserve Program

2 Cotton loss estimates from Pease, 2007, presentation at Mid Atlantic Biofuels Conference. <http://www.mawaterquality.org/biofuels>

Biomass processing and combustion may also increase nutrient fluxes to surface waters. Biofuel production by-products such as dried distiller grains (maize) and oilseed cake (rapeseed) are highly concentrated in N and P, and often used to substitute grain (consumed for biofuel production) in animal feeds, leading to higher nutrient concentrations in manure, fields, and, ultimately, downstream waters (Simpson et al. 2008). Field applications of vinasse, a waste product of sugar cane processing and direct effluent discharges from sugar ethanol refining, also impact downstream water quality. Gunkel et al. (2007) and Martinelli & Filoso (2008) have reported substantial increases in DIN, organic matter and water temperatures, and reduced dissolved oxygen downstream from sugar-cane production areas (Figure 3). Though combustion of ethanol and biodiesel can reduce tailpipe emissions of some pollutants relative to petroleum based fuels, they tend to increase nitrogen gases (Pang et al. 2008) resulting in acid rain and increased nutrient loading coastal water (Vitousek et al. 1997; Galloway et al. 2003).

Water quality data for a river draining area  
of high sugar cane production in Sao Paulo State, Brazil

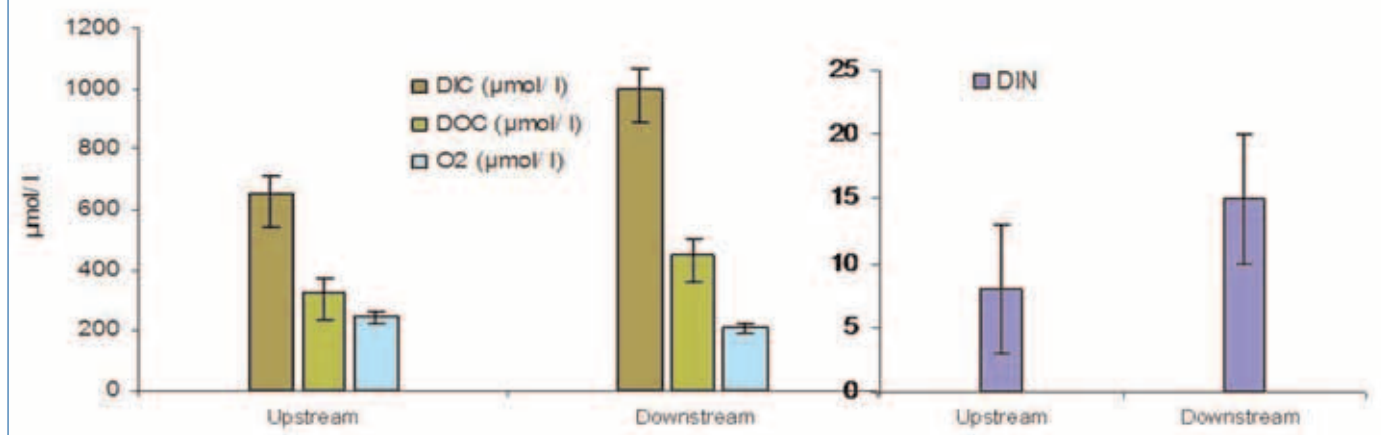


Figure 3: Water quality data for Piracicabia River Basin in Sao Paulo state, Brazil. Reactive nitrogen, organic matter increase downstream from sugar cane production areas; dissolved oxygen is decreased (adapted from Martinelli & Filoso 2008).

Coastal degradation in the developing world is caused predominately by discharges of untreated sewerage, and tropical soils tend to show little nitrate losses because of their high anion exchange capacity (Martinelli et. al. 2002; Selman et. al. 2008). However, it are generally these regions (i.e. Latin America and sub-Saharan Africa) which are predicted to have the greatest area of arable land available for biofuel production (WWI 2006), and are likely to face unprecedented agricultural expansion. Ongoing and continued monitoring of the fate of agricultural chemicals in these regions and especially where coastal water quality is already threatened will be important.

### Water quantity

While sugarcane in Brazil is predominately rain-fed, many ethanol feedstocks (i.e. maize and sugar cane) are water intensive and even some water-efficient biodiesel crops (i.e. *Jatropha*) may require irrigation to maximize oil yields (Jongschaap et al. 2007). Globally, an estimated 44–45 billion cubic meter of irrigation water was used to grow biofuel feedstocks in 2007 (Fraiture et al. 2007). Processing biomass, despite recent achievements in water-use efficiencies, also requires large quantities of water. These additional demands on already stressed freshwater resources may also impact water quality and the overall health of coastal systems by reducing the freshwater inflow to estuaries (Alber 2002).

### A more sustainable way forward

Though some of the impacts discussed here can be alleviated with better agricultural management practices, the sustainability of biofuel systems will depend heavily on the feedstock used, where the feedstock is grown, and what conversion technologies are employed. It is important that biofuel feedstocks not compete with food

crops for land or other resources. Ideally, the feedstocks will not increase or intensify the demand for such resources. Low-input perennial crops, e.g. from short-rotation forestry and grasslands, may be an effective source of cellulosic biomass and a way to reduce erosion and nutrient pollution (Hill et al. 2006; Tilman et al. 2006). Additional benefits may be achieved if cellulosic feedstocks are used to produce biomass to liquid (BtL) hydrocarbon fuels rather than ethanol, which are currently in development. These advanced synthetic fuels are more energy efficient, easier to transport to end-users, can be used in existing fleets without the corrosive problems of ethanol. They may also offer much greater greenhouse gas savings relative to ethanol (Gallagher et al. 2008; Jungbluth et al. 2008), however analyses of the full environmental impacts of these emerging fuels are still scarce. Alternatively, organic wastes (municipal or livestock) can be used to produce fuel without requiring additional land be brought into production. At the same time, the processing of these wastes into fuel reduces nutrient pollution problems associated with confined animal feedlot operations (CAFOs) and municipal sewerage, and may provide a safer fertilizer by-product. Similarly, recovering the energy content of material products made from biomass (e.g. cascading principle) can have multiple benefits, including reduced agricultural inputs and land-use conversions.

Conversion to electric transportation systems may be the best means to reduce fossil fuel use. Direct combustion of biomass to produce electricity provides far greater energy efficiency than liquid fuels. For example, in Brazil, the bagasse produced from sugar cane processing, provides the energy required to process the cane as well as a portion of municipal energy needs, which is more than

three times the energy provided by the sugar cane ethanol (Martinelli & Victoria 2008). It is also important to note that while biofuels may play a role in future energy portfolios, they will not solve the global energy crisis. New energy strategies must include conservation and better energy efficiencies, as well as alternative renewable energy sources.

The Gummersbach proceedings will be published as an on-line book available at no charge. The volume, including an executive summary, invited background papers, and the conclusions of the working groups, in pdf format, will be permanently archived and available for download from Cornell University Library (<http://cip.cornell.edu/bio-fuels>). A policy brief, in coordination with UNESCO, UNEP, and the SCOPE secretariat, is also in production. The brief will summarize the important findings and conclusions from the rapid assessment workshop. Both publications are expected to be released January 2009. The second phase of the project will consist of more detailed regional assessments of costs and opportunities of biofuel systems, and development of better analytical methods to resolve current scientific uncertainties and fulfill the research needs highlighted in the Gummersbach workshop. Included in these goals is a more detailed analysis of economic and environmental impacts of direct-combustion vs. liquid fuels; a more rigorous, economic-biophysical assessment of indirect land-use changes, and development of better analytical methods for evaluating nitrous oxide emissions from biofuel feed-stock production.

For more information on the Gummersbach workshop or the SCOPE biofuels initiative, visit [http://www.eeb.cornell.edu/howarth/SCOPEBiofuels\\_home.html](http://www.eeb.cornell.edu/howarth/SCOPEBiofuels_home.html) or contact Renee Santoro, e-mail: [rls75@cornell.edu](mailto:rls75@cornell.edu).

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## Priority Topics

### PRIORITY TOPIC 1

Linking social and ecological systems in the coastal zone

#### **Integrative Thinking for Complex Futures: Creating Resilience in Human-Nature Systems**

B. Glaeser (DGH, LOICZ)

#### **Introduction**

The XVI International Conference of the Society for Human Ecology (SHE) which took place on 10–13 September 2008 at the Huxley College of the Environment, Western Washington University, in Bellingham (USA), assembled about 200 participants from all continents, representing different disciplines ([www.societyforhumanecology.org](http://www.societyforhumanecology.org)). The program consisted of a mix of plenary keynotes and a variety of concurrent sessions, divided into smaller symposia and roundtables. The overall atmosphere was pleasantly relaxed, the weather was fine – apparently a novelty in the north-western US “wethole”. Needless to say that the ensuing report is a personal one, reflecting the academic interests of the author.

#### **Achieving green building processes: Canada as the world leader**

Among the keynotes, a highlight was certainly John B. Robinson's lecture “Being undisciplined on and off campus: Issue-based interdisciplinarity and the Center for Interactive Research on Sustainability”. As “we have islands of sustainability in a swamp of business as usual” it seems important to work on these islands and connect them. Robinson started off with a broad theory approach and definition section before he discussed interactive social research and its application in Canada, specifically Vancouver. Sustainability means desirability: Sustainability is an emergent property of a discussion of desired futures, and there are different

courses of action to be taken. Noting that a “biophysical systems view” may not coincide with the “actor system view”: Each one views the other as a minute part of their own – Robinson hints that (green) projects need visualization, yet still have limited effects and duration.

We need to foster lasting social change by means of social mobilization through concrete issues, e.g. urban development. Robinson's immediate, concrete goal is to render the whole UBC campus “net energy positive” within 20 years. The ultimate goal is to make Canada the world leader in constructing “green buildings”. Both goals require visualization and simulation techniques to foster community engagement, followed by partnerships and strategies for regional implementation.

A powerful argument in favor of a regenerative building process is: “Be cheaper!” The building process implements sustainability principles: It is “green”, uses renewable energy and exports energy. It produces “happiness”, well-being for the people. And it is cost-effective and “smart”.

#### **Cultural dimensions of climate change: Paradigm changes in society, science, and philosophy**

“Cultural dimensions of climate change” was organized by Thomas Heyd, University of Victoria (Canada), a whole day symposium, split up into three sessions, with an emphasis on philosophy resulting in challenging discussions. Cultural frameworks comprise the ways of living, involving values, beliefs, habits, practices, institutions and material artifacts that condition the production of tangible and intangible goods and services needed for the satisfaction of people's needs and wants.

Cultural patterns emphasizing human “embeddedness” in the natural world are associated with adaptive behaviors, which reduce vulnerability to environmental change by acknowledging the dynamic nature of the natural environment and encouraging the development of appropriate social systems. Heyd draws the conclusion that it may be of key importance to consider the manner in which the separateness from nature, which to a large extent has characterized “Western” ways of thinking, may be a source of maladaptive behavioral patterns. He concludes that a shift in cultural patterns, which takes into account our embeddedness in natural processes, may contribute to the lowering of vulnerabilities.

Marcel Cano, University of Barcelona, introduced the term of “cosmovision” in his presentation “Cosmovision, culture, and climate change”. Cosmovision is the view in which we perceive the world. Cano concludes that we need a cultural therapy to treat the global addiction to consumerism, yet he admits that cosmovisional changes need a long time.

Using a different terminology, Kathleen Halvorsen endorsed the need for change as well, stating that climate change perceptions are often wrong, due to incorrect cultural models (she also suggested "The Great Warming" to be a much better film than "An Inconvenient Truth" by Al Gore). Halvorsen presented the results of a study that examined these relationships using a randomized mail survey of 1500 upper Midwestern U.S. residents. She found that accurate knowledge, concern about climate change, environmental orientation, and political beliefs were among the factors playing important roles in support for personal changes regarding energy usage.

Adrian Parr, an Australian at the University of Cincinnati, dealt with "population vulnerability". In the wake of disaster, gender roles are often redefined or even amplified, and other social values such as a sense of belonging and history suddenly take on a critical function for the sustainability of recovery efforts. In her paper, Parr suggested that although it is important in the immediate aftermath of a disaster – such as the tsunami in South India - valuable time is not lost weighing up the pros and cons of different ways to provide relief, whereby assistance would simply turn into an exercise in cultural relativism. It is also important that all those involved in the relief effort don't take a one size fits all approach. Whilst there may not be one overriding definition of what we might commonly describe as 'population vulnerability' in the aftermath of a disaster, there is a shared sense of how such vulnerability works.

Martin Schönfeld, a German philosopher at the University of South Florida, contended that global warming has made the formerly so ineffable phenomenon "climate" tangible. In science, climate is perhaps the first genuine "whole" that is investigated as such, and climatology may well be the first great interdisciplinary venture that approaches its subject in holistic and explicitly anti-reductionist terms. In his paper, Schönfeld argued that climate is more than the sum of its parts in that it happens to result from parts working together as a whole. A holistic notion of climate needs to appeal to dynamics, in the context of potential, work, and energy. Schönfeld explores some rational consequences, arguing that the ontology of climate discloses it as a field. Climate change, while bad news all around, is nonetheless a rational and cultural cornucopia; it opens up new vistas of thought and promises to trigger a long overdue philosophical paradigm change.

#### **Communities on coasts and fisheries: Tracking social-ecological resilience**

Two sessions were devoted to coastal communities, fisheries, and social-ecological resilience. "Resilient Roads to Management: Processes and Challenges" was organized by Alpina Begossi and Priscila Lopes, Fisheries and

Food Institute (FIFO), Brazil, who had also organized the previous SHE congress in Rio de Janeiro, 2007. This session approached management in broad terms, including resilience as a process and as an outcome of management initiatives. Resilient processes leading to management can be shown through ecological tools, such as models and concepts. Resilient outcomes are strategies to sustainability, such as adaptive management, co-management, among others. Examples of resilient processes or outcomes, or both, can come from different ecosystems and regions of the world.

Alpina Begossi presented "Ecology and Ethno-ecology of Dusky Grouper in SE Brazil", emphasizing that the Garoupa (dusky grouper, *Epinephelus marginatus*) is an important catch for several artisanal small-scale fisheries along the Brazilian coast. Studies compiling local knowledge (ethnoecology) about fish species complement biological data, and have been fundamental for effective fisheries management. In this study, the objective was to obtain data about garoupa through fish catches and analysis of stomach contents and gonad maturation (macroscopic analyses), along with interviews from fishermen from six small-scales communities from the southern (Pântano do Sul, Florianópolis, Santa Catarina State) to the northern Brazilian coast (Porto Sauípe, Bahia State). Begossi concluded that precautionary approaches and 'data-less' management approaches are needed in the coast of Brazil. Research on this species and on the potential of aquaculture for its cultivation are urgent, due to the apparent vulnerability and decrease of garoupa along the coast of Brazil.

Priscila Lopes asked the question: "How Resilient Are Brazilian Fisheries Management Strategies?" Co-management initiatives may work as mechanisms to build socio-ecological resilience, meaning the capacity of the system to absorb shocks without being undermined in its social and ecological aspects. In Brazil, co-managed reserves have been widely created, especially through governmental initiatives, in the Amazon and on the coast. Lopes presented Brazilian case studies of two categories of reserves regarding fisheries co-management: extractive reserves and sustainable development reserves. Ecological resilience is defined through reserve area size and ecological integrity; social resilience through economic diversification and origin of the demand for establishing a reserve. Amazonian reserves have wider areas, apparently better ecological integrity, and people depend on a broader range of natural resources compared to those on the coast. However, dwellers of coastal reserves can rely on external sources of income, such as ecotourism and jobs outside the reserves, decreasing the pressure and dependency on natural resources. In both regions, there are examples of reserves created through a top-down initiative and from local demands. Lopes concluded that co-management



regimes in these areas can add to socio-ecological resilience, by building trust between managers and local people and by considering local social and ecological peculiarities.

Bernhard Glaeser (DGH, LOICZ) presented LOICZ Priority Topic 1, "Linking Social and Ecological Systems in the Coastal Zone" Analysis for Global Coasts". He summarized the discussions at previous LOICZ symposia in Beijing, Rio de Janeiro, Cape Town and the DGH Human Ecology Conference in Sommerhausen/Germany earlier this year. While case studies were very much the main focus earlier, synthesis and analysis will be emphasized in the future. Glaeser argued that the development of interdisciplinary methods for coastal and marine research may become a main focus in the further development of approaches to SES analysis. While a large number of methods and tools from the social as well as the natural sciences can be used in interdisciplinary coastal and marine research, methods to integrate and synthesize knowledge from different disciplines and from sources "beyond the disciplines" are still in their infancy. SES analysis, however, may have the future potential to upgrade ICM and to incorporate it into an interdisciplinary social-ecological (or human ecological) research framework.

The session "Communities on Coasts: Tracking Socio-Ecological Resilience" combined different presentations, such as resilience and community based resource governance in the Peruvian Amazon; Dauphin Island's (Alabama, USA) resilience after two years of hurricanes; urban fishery in Alaska, applying the conceptual framework of robustness rather than resilience; and global integration in local socio-natural systems in Belize. The latter case study by Darcie Reynold, University of Calgary (Canada), relied on in-situ research on a small Belizean caye (coral island) that is experiencing rapid social change as it incorporates tourism into its economic activities. Tourism has brought the world to this small isolated place and therefore has added a real impact, to the previously imagined impact, of globalization on the lives of the people who have historically lived on this caye. Reynold concluded that there is a large gap between the desired outcomes that guide theories of Euro-centric biased development practices and the desired outcomes of the people of the cultures in developing places.

### Concluding remarks

The meeting was characterized by high quality presentations, both as keynotes as in the paper sessions. It is interesting to note that coastal topics, including fisheries, gain importance in Human Ecology discussions meetings. Several sessions were devoted to social-ecological resilience. It is unfortunate, as usual, that parallel sessions prevent participants from attending all that interests.

I identified some prevalent topics. Paradigm shifts were

addressed in many presentations, desired or happening, in real life as in science. Climate change is a construct that calls for social change, but also for change in international relations. The importance of traditional knowledge in the light of climate change becomes evident. Culture and catastrophe are related: Behavior and tradition lead up to or can avoid a disaster. Cultural aspects include consumption patterns. Global change can be witnessed on the local level where adaptation is necessary to reduce vulnerability effects among those impoverished people who are the least empowered to mitigate the effects.

### Outlook

The next International Conference on Human Ecology in Manchester, UK, June 29<sup>th</sup> to July 3<sup>rd</sup>, 2009, will be jointly convened by the Commonwealth Human Ecology Council (CHEC) and the Society for Human Ecology (SHE). The first call for papers was distributed in Bellingham. For further information please contact Ian Douglas (e-mail: [ian.douglas@manchester.ac.uk](mailto:ian.douglas@manchester.ac.uk)).

## PRIORITY TOPIC 2

Assessing and predicting impacts of environmental change on coastal ecosystems

### New SCOR/LOICZ/CAS Working Group 132 on Land-Based Nutrient Pollution and the Relationship to Harmful Algal Blooms in Coastal Marine Systems



Figure 1: Participants at the first SCOR/LOICZ/CAS workshop in Geesthacht. (Photo: Barbe Goldberg)

SCOR/LOICZ/CAS Working Group 132 launched its work during an international kick off workshop hosted by LOICZ headquarters in the GKSS Research Centre Geesthacht, Germany, in late July 2008. The goal of this multiyear effort is to tackle the important question of how nutrient pollution from land-based sources is related



to the increasing proliferation of harmful algae worldwide. Harmful algae are those proliferations of microscopic algae that can cause oxygen depletion and fish kills, seafood poisoning, and undesirable changes in aquatic ecosystems. Harmful alga blooms are increasingly affecting coastal ecosystems worldwide. While such phenomena have long been recognized, it is thought that they are increasing in frequency and geographic distribution at least in part due to nutrient pollution. Nutrient pollution from land comes via rivers from the runoff and leaching of nitrogen and phosphorus from intensive crop production where fertilizer is heavily used, manure generated in livestock production systems, and from densely populated areas, where nutrients come from sewage. A further source of nutrients in the coastal zone itself is finfish aquaculture, which is currently increasing rapidly in many parts of the world. Atmospheric nutrient deposition into the seas exacerbate the anthropogenic footprint.

To date there has not been a global assessment of how nutrient pollution relates to these algal outbreaks. This working group, led by Patricia Glibert of the University of Maryland Center for Environmental Science, USA, and Lex Bouwman, Netherlands Environmental Assessment Agency, includes academic experts from the United Kingdom, Sweden, Mexico, Chile, Oman, and China. The working group is sponsored by the Scientific Committee on Oceanic Research (SCOR), LOICZ, and the Institute of Oceanology of the Chinese Academy of Sciences (CAS).

Nutrient over-enrichment (*eutrophication*) is one of the most serious aquatic pollution problems throughout the world (National Research Council 2000; Smil 2001; Cloern 2001; Howarth et al. 2002; Seitzinger et al. 2002, 2005; Wassmann 2005). Although eutrophication is generally known to stimulate many harmful estuarine and marine algal species (Anderson et al. 2002), the relationship is complex (Glibert, Anderson et al. 2005; Glibert, Seitzinger et al. 2005; Glibert & Burkholder 2006). Estimating nutrient export to the coastal zone has been a challenge, but enormous advances have been made with respect to global models over the past several years. The first global model of nitrogen loading to coastal systems was published less than 10 years ago (Seitzinger & Kroeze 1998). Through improved global, spatially explicit models of nutrient loading from watersheds to coastal systems, and the development of new spatially refer-



Figure 2: Qingdao 2008.

(Photo: Xuanzheng YUAN, Qianguo XING)

enced global databases of HAB occurrences, we are now in the position to begin to link patterns of eutrophication with HAB occurrence around the world in a more rigorous and quantitative way. The IOC Global Nutrient Export from WaterSheds (Global NEWS) working group has made considerable recent advances in the development of models of nutrient export for dissolved inorganic, organic and particulate nitrogen, phosphorus and carbon, as well as for dissolved silica. These models account for nutrient sources (natural as well as anthropogenic, including fertilizer, atmospheric deposition, crops, manure and sewage), hydrology and physical factors watershed characteristics such as river discharge, land use, precipitation intensity, human population and in-stream processing and removal. Results for estimates of the 1995 global condition were published in a special issue of *Global Biogeochemical Cycles* in 2005 (see especially Beusen et al. 2005; Bouwman et al. 2005, Bouwman, Dreht & Hoek 2005; Dumont et al. 2005; Harrison, Caraco et al. 2005; Harrison, Seitzinger et al. 2005; Seitzinger et al. 2005). These models demonstrate that the **amount** of nutrient discharge is unevenly distributed, the **nutrient forms and their ratios** vary with land use and occurrence of urban areas, and the **composition** of the nutrient discharge is changing due to developments in agricultural and sewage systems. These models will be compared to HAB distributions under the SCOR/LOICZ/CAS working group.

An example illustrates the usefulness of such comparisons. The harmful algal bloom species *Prorocentrum minimum*, which develops high biomass blooms in many regions of the world, has been found not only to occur where export of nutrients is high, but especially where those exports are dominated by anthropogenic nutrients



(Heil et al. 2004; Glibert et al. 2008). This species proliferates where fertilizers and manure dominate the export of nitrogen and where human sources dominate the export of phosphorus. Observations of *P. minimum* are rare where biological N<sub>2</sub> fixation and P weathering are dominant, such as throughout Indonesia, or where human sewage is the dominant source of N, as in northern Africa (Dumont et al. 2005; Glibert et al. 2008).

This working group will be active over the next several years to apply quantitative approaches to this important question. Meetings in the coming two years are planned in China and in Greece.

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## LOICZ Workshop in Chennai, India

Joint authors: Alice Newton, Ramesh Ramachandran, Denis Swaney and Gianmarco Giordani

Ramesh Ramachandran (LOICZ SSC and Director of the Institute for Ocean Management), Anna University, Chennai, India, hosted a LOICZ workshop from 10–13 September, 2008, with the primary aim of developing nutrient budgets for South Asian coastal ecosystems. A second objective was to evaluate the ASSETS model trophic status index software in these estuarine environments. ASSETS stands for Assessment of Estuarine Trophic Status.

The workshop was supported locally by the Department of Science and Technology, Government of India and the National Disaster Management Authority, Government of India and internationally by the LOICZ-IPO. In addition to LOICZ participants from Italy, Portugal, Sri Lanka and the US, the workshop was attended by 32 scientists, students, and dignitaries from different coastal states of India.



The biogeochemical budgets sessions were led by Dennis Swaney and Gianmarco Giordani, while Alice Newton led the session on ASSETS methodology. On days 1 and 2 of the meeting, datasets from coastal systems from all over India were presented, and used in the workshop to develop budgets following conventional LOICZ methodology (see Figure 2 for the location of the systems). Systems for which at least preliminary budgets were developed included: Ganges, Mahanadi, Adyar, Cooum, Cauvery (Pichavaram and Muthupet), Vembanad and Zuari. The sessions also provided an opportunity to evaluate LOICZ CABARET software in creating budgets from flux and concentration data for each system. Laura David of Philippines University, developer of CABARET, participated on-line, to address software problems and other difficulties. As a result of the meeting, we expect to see some changes in the software, which should be downloadable from the LOICZ biogeochemical budgets website in the near future ([www.nest.su.se/mnode](http://www.nest.su.se/mnode)).

A spreadsheet version of the LOICZ budget procedure, developed by Gianmarco Giordani, was also successfully tested. The budgeting spreadsheet and more information are currently available at [www.dsa.unipr.it/lagunet](http://www.dsa.unipr.it/lagunet), and will likewise soon be available at the LOICZ budget website.



Figure 1: Participants of the LOICZ workshop in Chennai, India. (Photo: Gianmarco Giordani)

was tested in a separate session on day three of the meeting. The tool worked well, indicating that the Indian coastal systems spanned a range of conditions from severely threatened to nearly "pristine". The large number of participants allowed us to identify software and methodological issues requiring further clarification, including the appropriate number of compartments required for analysis, and data required to characterize each. Joao Gomes Ferreira was online from Lisbon to help with questions. The ASSETS web-tool is available at <http://www.eutro.org/register/>. More information on ASSETS is available at <http://www.eutro.org>.



Figure 2: Map of India with River Basins Studied. (Source: Maps of India: [www.mapsofindia.com](http://www.mapsofindia.com))

The new web-based tool for applying the ASSETS methodology for assessment of estuarine trophic status

In terms of nutrient loading and apparent ecosystem metabolism, the systems presented here mirrored the range observed around the globe: heavily impacted urban drainages subject to little or no sewage treatment (e.g., Adyar and Cooum) are strongly heterotrophic and generally anoxic. Brackish coastal lagoons (e.g., Chilika lake), subject to strong monsoonal variation, vary from autotrophic to heterotrophic by season, and support local fisheries. The large, spatially complex, receiving waters of deltas of the major regional rivers (e.g., Ganges) are best divided into subsystems and analyzed individually. Many of these waters are transboundary in nature, both in their catchments and coastal ecosystem boundaries, resulting in issues of data confidentiality and quality. They represent a continuing challenge for coastal assessment in the region.

The final plenary session of the workshop included a stimulating discussion about the insights gained in the analyses of these Indian coastal systems. Many of India's coastal lagoons and estuaries are subject to organic nutrient loads in both particulate and dissolved forms. The proper application of the biogeochemical budgets framework in highly turbid environments to estimate ecosystem metabolism may require modification





to treat the special problems of "muddy waters." Plans are underway to develop this further in a follow-up workshop. Another characteristic of these South Asian ecosystems is their strong seasonal variation due to the effects of the monsoonal climate. Finally, the large rivers of the region (e.g., Ganges, Bramaputra) illustrate the difficulties of analyzing trans-boundary systems with currently available data. Linking LOICZ tools such as the biogeochemical budgets and ASSETS should also yield interesting results.



Figure 3: Field trip to Pulicat Lake, Tamil Nadu, India.  
(Photo: Gianmarco Giordani)

On the last day of the workshop, a field trip to Pulicat Lake – the second largest coastal lagoon in the region after Chilika Lake – was organized by Anna University. Participants enjoyed the natural beauty of this coastal lagoon and learned of the socio-economic resource exploitation of the ecosystem. Pulicat Lake and the area adjacent to the lighthouse were badly affected by the tsunami in 2004.

LOICZ thanks Anna University, the sponsors, and all participants for this successful workshop.

## LOICZ News

### LOICZ Listed in the Yearbook of International Organizations

The hardcover edition of the Yearbook of International Organizations contains profiles on 30,000 not-for-profit organizations currently active in every field of human endeavor. The Yearbook is more than just a catalogue of international organizations; it is also a framework for understanding organizational relationships and interaction in the world community. The Yearbook reveals hundreds of thousands links between organizations whose goals cross all economic, political and geographical borders, offering an insight into new, productive relationships.

<http://www.uia.be/node/50>

### New Logos



In tandem with interim synthesis and review and in order to lead into the new LOICZ chapter until 2015, we consider it timely to revamp the way we present ourselves to the global LOICZ community and public. This is visible on the new LOICZ website, featuring multimedia information, current issues of activity reports, interactive maps and calendars, as well as on all up-dated print matters.

The way LOICZ reaches out to the scientific community will also reflect in the harmonized structure of business processes (work flow) in LOICZ. The overall objective is to streamline the multiple activities in LOICZ and to work most effectively with scientific, business, and funding partners as well as the host administration. This includes standardized execution and administration of annual research, outreach and synthesis activities based on transparent process descriptions, definitions of roles with clear responsibilities, guidelines for necessary formalities and activity charts that enable a real time monitoring of LOICZ activities. This reorganization is in progress and aimed to guarantee the most rational use of resources and the best possible quality management in the development, delivery and dissemination of knowledge products and scientific information.

Those logos that carried us through the past 15 years represented LOICZ Phase I and early II and now, at the onset of our interim synthesis we can present the professionally designed new logo to carry us into the future of the continuously challenging and new orientation phase.



For our emerging and future activities we aim to target specifically early stage researchers, young scholars and pupils. LOICZ has therefore designed the Young LOICZ logo. You will find it on the LOICZ website as well as in a LOICZ INPRINT section where the SSC, LOICZ IPO,

Corresponding Members or young scientist themselves are encouraged to communicate their activities. It may ultimately offer a room to present special and LOICZ targeted scientific theses and it will offer material for schools, teachers and pupils, i.e. enable LOICZ to better reach out to the interested public and young research community.

LOICZ thus acknowledges that much of the work contributing to coastal Earth System Science is being carried out by young scientists. LOICZ wants to support these efforts by enhancing their visibility and exposing it to scientific peers in the world wide research community. This network will also be recognized as "Young LOICZ" and its products and information will feed into the global LOICZ synthesis likewise with the larger affiliated projects. LOICZ aims to launch an official call for affiliation of early stage research in early 2009. This will be announced online and in the newsletter.

## The backbone of LOICZ: Affiliated Projects

LOICZ has a mandate to address key issues of coastal change and use in the context of scenarios of future human activity and environmental change. LOICZ endorses and seeks to support both fundamental coastal zone research and research that synthesizes and up-scales results for dissemination within the scientific community, and outreach to policy makers and the public. An important part of this research is carried out by scientists who affiliate their projects to LOICZ thereby becoming part of the global network of LOICZ. These projects build the backbone for up- and down-scaling of LOICZ results and the LOICZ synthesis.

LOICZ provides a forum to assimilate, integrate and synthesize the outputs of its affiliated projects. Additionally, it provides an opportunity to communicate and disseminate these outputs making them available not only to other scientists, but also the public, decision-makers and managers. Information on affiliated projects 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 community as well as to LOICZ for its reporting requirements.

Once a project has been entered to the database by its Principle Investigator (PI), it will be reviewed by the IPO and the coordinator of the theme/topic it is contributing to most. As soon as the project is accepted it will appear in the public part of the database. This lean procedure allows LOICZ to maintain an up-to-date record of global research activity that relates to the LOICZ Science Plan as well as ensure that affiliated projects are given opportunity to fully participate in LOICZ activities such as workshops and joint projects.

Moreover, the database accomplishes an essential element that applies for all LOICZ interdisciplinary studies within and beyond the project namely data sharing and exchange. To facilitate this exchange LOICZ has developed a Data Policy to help affiliated projects and LOICZ to fully benefit from each other. Both documents, the Terms of Reference for affiliated activities and the Data Policy, can be found on the LOICZ website.

LOICZ protects its community members by restricting access to contact details in the public part of the database. But every community member and person interested in the activities affiliated to LOICZ is invited to register and then view full contact details and be able to submit and edit own projects. As the database is linked to the LOICZ contact database, all newsletter recipients are already recorded. If you wish to receive your login name and password for the database, please send us an email to [maike.paul@soton.ac.uk](mailto:maike.paul@soton.ac.uk)

Do we hold your current contact details?

To receive LOICZ INPRINT it is sufficient that we know your email address, or if you receive the newsletter in hardcopy your postal address. But there is much more information available at the LOICZ IPO that does not make it into the newsletter, for various reasons. If you are interested in receiving information targeted to your field of expertise, please request your login details from us and update your profile online.

## Call for research proposals concerned with Land-Ocean Interactions in the Coastal Zone

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 Projects. As well as fundamental science projects, LOICZ also seeks projects that have a multidisciplinary perspective, especially combining natural and social sciences. Projects can have global, regional or local scales and be focused on coastal sciences and/or coastal management. Projects that collaborate with other Earth Science System Partnership (ESSP) projects, especially with other Core Projects of IHDP and IGBP, are sought in particular, as well as projects that synthesize and analyze research outcomes already available or involve dissemination and outreach that will lead to better public knowledge. 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 Projects, its endorsement provides the following benefits:

- support in proposing for funding;
- promotion of the project and associated activities, its contributing team, outputs and outcomes through the LOICZ website and/or newsletter;
- 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; and
- access to a wide circle of information related to funding and the science community that is available through the LOICZ database.
- support in proposing for funding;
- promotion of the project and associated activities, its contributing team, outputs and outcomes through the LOICZ website and/or newsletter;
- 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; and
- access to a wide circle of information related to funding and the science community that is available through the LOICZ database.

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.

## More than Water – Oceans and Global Responsibility

by Hartwig H. Kremer, LOICZ CEO

The XVII<sup>th</sup> Malente Symposium held in the Hanseatic City of Lübeck, Germany, (12–14 October 2008) addressed key issues of Oceans under pressure, Climate Change and Global Responsibility

In a biannual sequence of international symposia which started in 1981 named after the small Northern German Town Malente the German Dräger Foundation address burning issues of global and societal concern. This year's 17<sup>th</sup> Malente Symposium was co-supported by the Zeit Foundation Ebelin and Gerd Bucerius and the Excellence Cluster "The Future Ocean" of the University of Kiel. The focus was on the changing oceans and global responsibility under increasing worldwide pressure and use scenarios. The topic was motivated by the findings of the latest IPCC report which underlines the importance and vulnerability of global oceans as one of the key life-support systems on earth. Under the auspice of Germany's Federal Minister for the Environment, Nature Conservation and Nuclear Safety, Sigmar Gabriel, almost 200 international delegates zoomed in on a variety of priority issues ranging from marine resources and conservation, to our still somewhat limited level of scientific knowledge about oceanic systems and processes and questions of governance including areas of conflicting political interests.

In conclusion of the very comprehensive key notes and the subsequent panels which among others featured views of policy makers, the EEA, the science community (e.g. AWI, Geomar, the Sea Around Us project), the International Tribunal for the Law of the Seas and the media, it can be summarized that Oceans are a global though heterogeneous domain still featuring many unknowns in our understanding of processes and system



*Paul Nemitz, EU-Generaldirektor deputy head of the Commission's maritime task force and DG Mare – Malente Symposium.*  
(Photo: Axel Kirchhof)

feedbacks. The current research gaps are still considerable and scales are complex. Oceans represent both, a coastal thus regional and national domain and global commons and scientific information needs to inform our future decisions across all these complex scales involved.

This becomes particularly evident when scientific research strives for a better understanding of oceanic system response to climate change. In terms of goods and services the oceans are pool of various traditional and new use forms which may have considerable implications for environmental protection and sustainability. Not only do we expect some 25 % of presently undiscovered hydrocarbon reserves in polar ocean floors, but on top of that new resources such as methane hydrates – the burning ice on the sea floor – are increasingly considered as a potential future energy resource and coastal areas are facing a rapidly growing industrial transformation in the form of wind parks and tidal energy exploitation. All these new developments need to be paralleled by appropriate institutional frameworks and governance structures that enable sustainable political regulation and economic decisions. A key question to be answered in future will be to delineate the temporal and spatial but also cultural scales on which this governance structures need to be established or to which they need to be adapted to foster informed decision making. Transboundary issues are increasingly important, be it along the water continuum scale of catchment – coast systems or in territorial and access issues. All this needs to be informed by sound science which in many fields of concern is challenged to involve such a broad scope of interdisciplinarity that is only gradually developing. Regional seas, in particular semi enclosed ones and the Arctic for example feature rapid change that is driven by climate forcing but also sociopolitical drivers, e.g. the Baltic and Black Sea. Resulting are emerging paradigms of societal expectations for human welfare and livelihood which may in future exacerbate global pressures on oceanic systems. In a nutshell, the challenge will be to inform flexible governance patterns that are likely to be required in acknowledging the multiple teleconnections in an increasingly globalized economy and development.

In depth discussions were entertained in four working groups, addressing

- 1) Oceans as a global source for resources?;
- 2) Oceans and climate change: consequences and actions;
- 3) Habitat ocean: How to save the ocean's biodiversity; and
- 4) Navigating the oceans: transport security, transport technology, and maritime infrastructures.

LOICZ was invited to participate particularly in WG2 which was probably the one which accommodated most of the discussions relating to coastal issues and feed-



backs of oceans such as coastal management, urbanization concepts, cost and financing instruments and legal regulations. Participants in this very interdisciplinary group, chaired by Martin Visbeck (IfM Geomar, Kiel, Germany), were Ralph F. Keeling (Scripps Institute of Oceanography, La Jolla, USA), Hartwig H. Kremer (LOICZ, GKSS, Geesthacht, Germany), Till Requate (Institute for political economy, Univ. Kiel, Germany), and Markku Wilenius (Allianz SE, Munich, Germany). Key findings were developed along different domain oriented and interdisciplinary perspectives. They were based on the overall paradigm that stewardship of the planet and its oceans needs to be underpinned by sound scientific information which is transported into the decision-making process in appropriate language addressing the different stages and target audiences of the policy cycle.



*Dr. Sylvia A. Earle, President, Deep Search International; Member of the Board, Marine Conservation Biology Institute, Bellevue, WA, USA discussing with Hartwig H. Kremer at Malente Symposium. Background: Dr. Sarah Cornell, Dept. of Earth Sciences University of Bristol, Research Fellow – QUEST; Michael K. Orbach, Professor of the Practice of Marine Affairs and Policy, Nicholas School Faculty. (Photo: Axel Kirchhof)*

Just to highlight a few examples and with regards to physical challenges the group underlined the invaluable importance of improved, harmonized and maintained global observing efforts. Too much is still in the dark zone such as long standing questions regarding the thermohaline circulation or changes in geomorphology and material transports into coastal seas rather than to neglect the dynamic further development of earth observation. In the context of chemical dimensions any attempt to influence the CO<sub>2</sub> cycle needs to account for the role of the oceans in the global system response. We currently face the phenomenon of increasing ocean acidification with anticipated adverse effects on reef stability and formation as well as ultimately on reef island/atoll based communities; we also see a decrease in mid depth tropical layers of the oceans as an emerging issue seeking scientific attention. In the socio ecological systems perspective, i.e. focused on the humannature interaction coastal zones feature their multiplicity of scales in terms of pressures, state changes and responses. Providing at least an estimated half of the worldwide ecosystem goods and services to

humanity, coastal zones are a kind of “society's edge” reflecting a wide trajectory of socioeconomic and cultural development and heritage. Climate change incl. sea level rise and storm surges are drivers of increased coastal vulnerability though currently there are a variety of land-based anthropogenic drivers such as river diversion, groundwater abstraction, damming, oil and gas mining, urbanization etc. which contribute at least in the same order of magnitude to coastal change such as erosion as does the climate. The standing stock of natural water in land-based impoundments has increased by some 900 % since the 1950s, and the OECD estimates that until 2070 people and assets in global ports may face a 10 to 100 fold increase in risk, respectively to be exposed to the 1 in 100 years storm surge. Most vulnerable are the people in Asian fast developing economies while for the assets also western mega cities, e.g. in the USA, are on the top 20 list. To manage coastal zones as well as oceans there must be a careful weighting of mitigation options versus adaptation and it needs a joint collective effort of markets, governments, and society to enhance the effectiveness of governance. In terms of figures it is estimated that one ton of extra carbon equals damage of 30–50 \$ US, i.e. reduction by 1 ton is of the same value. Current policy reflects this way of thinking by trading EU emission certificates for 24 \$ US. Thus markets can be an instrument, incentives produced by market instruments may actively assist in improving global carbon emissions. But it all fails if this is not subject to a global coherent effort. Other technological efforts such as carbon sequestration may be useful but are far from being scientifically explored sufficiently. Also an economic footprint reflects increasing globally insured losses. This changing paradigm can be attributed to an increase in global economic commodities, in higher numbers of insured assets and a total increase in number and strength of catastrophic events. Again science is challenged here to come up with reliable future risk assessments but in parallel an international approach is necessary to respond and adapt.



*Hartwig H. Kremer, Malente Symposium. (Photo: Axel Kirchhof)*



These key findings only of the group No 2 underline the complexity of issues that lie in the issue of improving our responsibility for sustainable ocean developments and they highlight the socio-ecological system structure and feedbacks in ocean and coastal systems and their land-based and atmospheric drivers of change. Human are integral to these systems and interact often exacerbating natural changes. That's why Nobel price winner Paul Crutzen in 2001 described our current age the age of the "Anthropocene".



**Catharina Meyer –  
Intern at the LOICZ IPO**

(Photo: Barbe Goldberg)

Since 1 September, 2008, Catharina Meyer, geography student at the Goethe University in Frankfurt/Main, was supporting the LOICZ IPO at the Institute of Coastal Research at the GKSS. For a period of ten weeks, she engaged in preparing material that translates complex global environmental change science for teaching purposes in Young LOICZ activities. The IPO will profit from her experience she already gained in age-specific science communication and knowledge transfer by leading a "Summer of Geo-sciences" workshop at the children's academy in the city of Fulda. A main focus of her work was the preparation and organization of the Children's University in Backnang (Baden-Württemberg).

## Geography Symposium for Teachers: Coast and Climate



Lecture Uni Hamburg, symposium on Coast and Climate.  
(Photo: Barbe Goldberg)

The Department of Geography, University of Hamburg, together with Landesinstitut für Lehrerbildung und Schul-

entwicklung (a teachers training institute) and supported by the KlimaCampus Hamburg and Westermann-Verlag Braunschweig organized a two-day symposium on Coast and Climate, which took place from 31 October to 1 November, 2009. The symposium was targeted to inform teachers, teacher trainees, and students involved in subjects – such as geography, biology or social sciences – of the latest scientific findings and discussions in interdisciplinary coastal research featuring human geographic and natural science perspectives. Part of the program was Hartwig H. Kremer's lecture on "Regional Seas in a socio-ecological context: The Baltic Sea under the influence of global change and multi-sectoral use".

## Young LOICZ



### Hamburg's pupils interested in Global Environmental Change



Senior Science Coordinator J. Weichselgartner (LOICZ) and J. Doerffer (Norddeutsches Klimabüro) in front of a poster with climate change-related questions formulated by the pupils. (Photo: Barbe Goldberg)

How many countries will no longer be habitable due to climate change? Will soon many Dutch and Danish people immigrate because their countries are flooded? Will Hamburg city center be flooded in twenty years? Will it still snow here again sometime? These are only some of the questions the 13–15 year-old pupils of the comprehensive school in Bergstedt prepared to be answered. "It is good to have interest", Senior Science Coordinator Dr. Juergen Weichselgartner believes, "above all, today's children and young people are the ones who will be impacted by the profound consequences of the ecological, economic and social processes of global environmental change."

On 10 September 2008, around eighty pupils got the an-



swers to their questions: „I am very glad that two experts followed our invitation and will present to us the current scientific information on the topic“, welcomed class teacher Anke Gastmann the presenters Juergen Weichselgartner and Julika Doerffer (Norddeutsches Klimabüro, i.e., North German Climatic Office based at the GKSS). Both, LOICZ and the Klimabüro outlined present global coastal change processes and highlights specific findings and implications in the local and regional context respectively. And aside from current facts and figures they also referred to concrete life situations. Consequently, the pupils described their own experiences, e.g., with storm surges and floods in Hamburg.



*Hamburg's pupils show active interest in global environmental change aspects (Photo: Hartwig H. Kremer)*

After presenting some prevention and adaptation mechanisms, the lecturers called for discussion by asking one of the pupils' question back to the audience: "What will the earth look like in 70 years?" Despite divergent opinions, everybody agreed on one thing: the lecture was a successful bridge-building effort between school and science.

Contact: <http://www.norddeutsches-klimabuero.de>

### LOICZ Supports Children's University

On the occasion of the fifth Children's University in Backnang, primary school children had the possibility of learning during their half-term holidays. "What influences us" was this year's topic and for one week the children could learn something about nutrition, advertising, dependence and global environmental change. Approximately 70 children participated in the opening event on Global Change and listened attentively to the lecture of Dr. Juergen Weichselgartner and Catharina Meyer.

At the beginning, the two scientists invited the children on a discovery journey with Antoine de Saint-Exupéry's Little Prince who guided them through the scientific contents.



*J. Weichselgartner and intern C. Meyer presenting the Young LOICZ working stations, age-specifically designed for school children to explain global environmental change aspects. (Photo: Barbe Goldberg)*

"Important was that we included the young listeners into our presentation", described Juergen Weichselgartner this LOICZ activity of working with elementary school children. Following the presentation, the children put what they learned into practice at five different stations. At the first station (Continent Puzzle), the children discovered how and why the earth has moved over time by shifting continental plates. The second station (Past &







Today) illustrated by means of photos how human life has changed over time. At the third station (Water Levels), the young researchers experimented and discovered the diverse solubility of sand and salt, resulting in different water levels. The fourth station (Knowledge Quiz) offered a questionnaire to test the acquired knowledge, and the fifth station (Greenhouse Effect) illustrated how society influences the earth's climate.

Offering valuable insights in the complex topic of global environmental change, the lecturers actively involved the children with numerous questions, a short movie about the greenhouse effect, and an age-specific language. "It was great to watch how much energy and enthusiasm the children showed in mastering the challenges presented by the work stations" Catharina Meyer summarized the new experience. The closing award ceremony showed that the applied concept – an age-specific presentation plus creative practical teaching elements – was a success for both parties: the kids and LOICZ.

For more impressions visit the LOICZ website at:  
[http://www.loicz.org/young\\_loicz/kids\\_university/index.html.en](http://www.loicz.org/young_loicz/kids_university/index.html.en)

## Report

### Summer School on Satellite Oceanography



**Christoph Sebald**  
(Research Assistant  
LOICZ & GEM –  
Erasmus Mundus student)

The international summer school on "Satellite Oceanography" has taken place every second year since 1999. This year, in August 2008, it was held for the sixth time in Ensenada, Mexico. The main focus was on extreme events, but because of the importance of the coastal zone which is one of the most significant sub-systems on

our planet, coastal and terrestrial remote sensing applications were also taken into consideration. The summer school intended to improve students' ability to read and understand the oceans using data acquired from satellite imagery. The study of satellite imagery and prediction of extreme events with regards to numerical modeling was also part of the objective of the curriculum. These goals were set and reached to provide students with the know-how in order to build on a new generation of remote sensing users in the face of climate change.

Postgraduate students, research scientists as well as undergraduate students in their final year, from fields like physics, oceanography, marine and environmental sciences, applied physics and mathematics, engineering and related subjects took part in this three week course in satellite oceanography. This year's participants and lectures travelled to Ensenada from nearly all over the world with the majority of attendees having made their way from Latin America to Ensenada. However, there were also a good number of people flying in from Europe, Africa, Asia, and Australia enriching the intercultural environment and experience of this year's summer school. In addition, participants contributed to an interesting learning and working environment due to their broad mixture of professional backgrounds in both the economic and scientific fields. The same is true for the lecturers, who ranged from applied oceanographers to representatives of the economic sector in the field of remote sensing.



*Figure 1: Participants of the international summer school on Satellite Oceanography in Ensenada, Mexico.  
(Photo: C. Sebald)*

During the three week summer school, lectures efficiently prepared and equipped students with a profound share of theoretical knowledge in satellite oceanography. Lessons ranging from basic to advanced remote sensing were held so that all attendees received their individual training according to their prior level of knowledge. Fundamentals of ocean surface dynamics as well as the importance of oceanographic and meteorological phenomena were discussed. Moreover, the basis was set in connection with physics in the vicinity of this interface and different ways to observe, visualize, and measure the sea surface and its fractal behavior from space. Every day complementary lab sessions were held to practice the utilization and application of specific remote sensing programs and their potentials. Acquired knowledge during the day was thus put to good use in these late afternoon lab sessions and this paved the way to understand the links between theory and applied oceanographic science while using tools for mapping and analysis in that specific field.

Because of the occasional intense remote sensing terminology, content in the lectures and backgrounds of the students did not match perfectly, and thus there were always lectures which were easier to understand for some people but difficult for others. This was often due to the limited knowledge in the field but also due to language difficulties some faced. Nevertheless, the coffee breaks in the morning as well as in the afternoon, and the hour for lunch in CICESE's brilliant canteen, allowed students time in between to reflect on lecture content with either lecturers or fellow students, thus helping each other out to further understand the subjects. In addition, extra time was set aside for students to put up posters of their own work. These were presented and discussed with valuable feedback as part of the curriculum.

Although dispersed across Ensenada, which made collective activities or meetings for dinner rather challenging the students used various opportunities to get to know each other in a more social setting and relaxed atmosphere.

In conclusion, I would say that I learned a lot during this summer school and since the group was conformed of

excellent people, I met many interesting lecturers and students, and these relationships and knowledge of their research will definitely help me with my own work in the future. I would thus definitely recommend this summer school to other students.

Last but not least I would like to express gratitude to J. Campo Torres (Paco) and his team of diligent helpers at CICESE for making this summer school a success.

Satellite Oceanography 2008, CICESE Ensenada B. C., Mexico 1 was co-sponsored by ESA, GKSS/LOICZ, CSTARS, CONACYT, SCOR, NSF, UABC, IOC, DLR, CICESE.

For more questions visit <http://www.cicese.edu.mx/> or contact the course secretariat:

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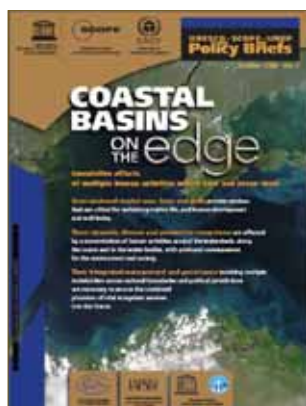
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Fax +52 (646) 175 0568

## Publications

## What's new on the web



### Coastal Basins on the Edge – UNESCO-SCOPE-UNEP Policy Brief No. 7

This recently published policy brief No. 7 resulted from a workshop in 2007 jointly sponsored by the Scientific Committee on Problems of the Environment (SCOPE), the International Association for the Physical Sciences of the Ocean (IAPSO), and SCOR. Many individual from

SCOR projects and working groups were involved in the process and as authors. The brief by using plain language avoiding scientific jargon provides an overview on key issues and drivers as well as management implications in semi enclosed marine systems under global and regional change pressure ([www.icsu-scope.org](http://www.icsu-scope.org)).

The next published outcome will be a book expected for early 2009. Island Press will make it possible for anyone who wishes to use the book for a class to examine it for 90 days for free (see <http://www.islandpress.org/educators>). Since this activity is contributing strongly to the LOICZ scientific scope and Priority Topics LOICZ will introduce the book subsequent to its release.

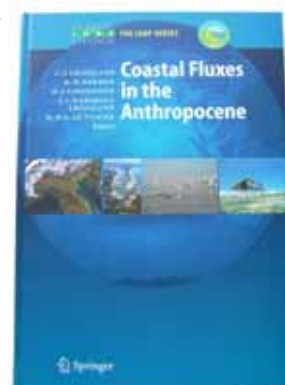
Please note that a policy brief based on the book can be found at <http://www.icsu-scope.org/Latest%20News/USUPB07%20SEMS.pdf>.

### Global Change – The IGBP Series

#### Coastal Fluxes in the Anthropocene – the LOICZ first decade synthesis

is now available for download on the LOICZ website at

[http://www.loicz.org/products/publication/books/coastal\\_fluxes/index.html.en](http://www.loicz.org/products/publication/books/coastal_fluxes/index.html.en)



## Have you seen

### 7th International Conference on the Human Dimensions

The registration for the 7th International Conference on the Human Dimensions of Global Environmental Change, the IHDP Open Meeting 26–30 April 2009, is now open with special discount rates for early registrations, as well as students and participants from developing countries.

Please note that the Early Bird Registration ends on 31 January, 2009.

For more information about how to register to participate in the IHDP Open Meeting 2009,

please refer to [www.openmeeting2009.org](http://www.openmeeting2009.org)

or send an email to [openmeeting@ihdp.unu.edu](mailto:openmeeting@ihdp.unu.edu)

## GKSS Summer School: Coastal Systems under Pressure



Five days in Lauenburg – five days in Büsum: the common annual Summer School of the GKSS Research Centre, the Alfred-Wegener Institute for Polar and Marine Research, the Baltic Sea Research Institute in Warnemünde, and Research and Technology Centre Westcoast was organized the seventh time since 2002. Participants were diploma and PhD students as well as post-docs with experience in the fields of marine biology, analytical chemistry, and coastal engineering.

16 young scientists from nine countries participated in the course from September 23 to October 4 and learned about the latest developments in coastal research. „They are a very active and interested group“, as Dr. Götz Flöser, GKSS coastal researcher and organizer of the School, says: „They often ask questions during the lectures, and they are particularly interested in the theme of scientists' responsibility for the environment.“



Figure 1: Qaamarujuk Fjord (West Groenland)  
mit Blick auf die Alfred-Wegener-Halbinsel.  
(Photo: Doris Schiedek)

Special emphasis in this year's school was on the changes in Arctic coasts. Anthropogenic influence is particularly pronounced there, not only because climate change is double as fast in the Arctic as in temperate areas, but also because of increasing oil and gas mining. Lectures were given in the classical coastal research disciplines geology, physical oceanography, chemistry of trace elements, and ecosystem changes, but also on ecosystem modeling and coastal zone management. The program was completed by excursions to wind energy power plants and to an oil drilling location in the Wadden Sea.

## October 2009: 6<sup>th</sup> GKSS School on Statistical Analysis in Climate Research

The science of statistical analysis in Climate research is certainly most important for the determination of anthropogenic contribution to climate change. In 1993 a summer

school on this subject took place on the Island of Elba, funded by the European Union, and organized by Hans von Storch and Antonio Navarra. It resulted in the Springer volume von Storch, H., and A. Navarra (Eds.), 1993: Analysis of Climate Variability: Applications of Statistical Techniques. This book is nowadays often referenced – and was printed in two (almost unchanged) editions. The chairs Antonio Navarra and Hans von Storch have now decided to repeat the event, in the same spirit as in 1993 – namely of reviewing state-of-the art statistical methods, without falling into the trap of fashionism and without the usage of cook-book like recipes. Some of the concepts dealt with in 1993 will again be on the agenda, but also some new ones will be presented, such as co-linearity, long memory and networks, historical reconstructions, quality assurance of statistical models using extended climate simulations, Bayesian thinking in analysis and parameterization construction, attribution and detection – concepts some of which have been developed in econometrics and theoretical physics in the past years.



Figure 2: Otranto –Lecce.  
(Photo: Vito Arcomano;  
Copyright: Fototeca ENIT)

The event will take place in Lecce, Italy, 6–16 October, 2009, as 6<sup>th</sup> GKSS School on Environmental Research (<http://coast.gkss.de/events/6thschool>), organized by Götz Flöser.

Telefon: +49 4152 87-2345 • Telefax: +49 4152 87-2818  
[Goetz.floeser@gkss.de](mailto:Goetz.floeser@gkss.de)

Contributing Lecturers:

Antonio Navarra, CMCC, Bologna, Italy:

- Statistical thinking in climate science
- Climate modeling

Hans von Storch, GKSS, Geesthacht, Germany:

- Pattern analysis – EOFs, SVD, POPs, MCA, CCA
- Storm proxies

Jin-Song von Storch, Max Planck Institute, Hamburg, Germany:



- Time series analysis – autocorrelation functions and spectra
- Fluctuation/dissipation theory

Francis Zwiers, Environment Canada, Toronto, Canada:

- Detection and attribution
- Climate Extremes

Armin Bunde, Institute for Theoretical Physics, University of Giessen, Germany:

- Long term memory
- Networks

Søren Johansson, Department of Mathematical Sciences, University of Copenhagen, Denmark:

- Cointegration in non-stationary time series

Phil Jones, Director of Climatic Research Unit, University of East Anglia, Norwich, United Kingdom:

- Homogeneity and homogeneization of climate data
- "Analysis" data sets – CRU, ERA

Eduardo Zorita, GKSS, Geesthacht, Germany:

- Testing advanced statistical models in the context of extended climate simulations

Jürg Luterbacher, University of Bern, Switzerland:

- Proxy climate data
- Constructing comprehensive historical climate variations

Robert Livezey, NOAA, Silver Springs, USA:

- Toolbox for Climate Statistics
- Elba Chapter 9

Richard Tol, Economic and Social Research Institute, Dublin, Ireland:

- Conditional Heteroskedasticity in Meteorological Data

Dennis Lettenmaier, Surface Water Hydrology Research Group, University of Washington, Seattle, USA



## Coastal Snapshot

### Research in the Realm of the Mammoth

From Dr. Roland Doerffer,  
GKSS, Institute of Coastal Research  
E-mail: roland.doerffer@gkss.de

Squeezed between kitbags, petrol barrels and all kind of equipment we are huddled together in the military helicopter, which will bring us from the Siberian harbor town

Tiksi to the research station Samoylov in the delta of the Lena River. Below us a unique landscape stretches across the horizon. A network of polygon structures, speckled with innumerable ponds and lakes and the multifarious arms of the Lena River. It could have been constructed by a mathematician.

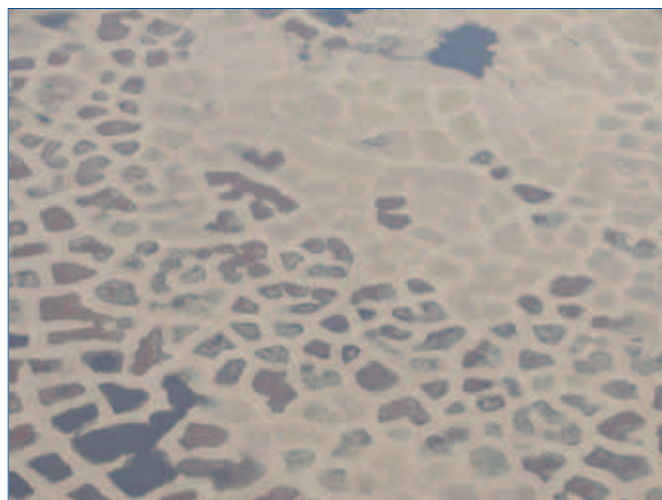


Figure 1: Polygon structure of the Permafrost soil, Lena Delta. (Photo: Karsten Reise, AWI)

Under a nearly cloudless sky we have a panoramic view through the opened portholes over the wide landscape, created from the permafrost during thousands of years. We, this is a group of scientists from AWI, GKSS and our Russian partner institutes, on a pathfinder mission, who are searching for future research possibilities at the arctic coast of Siberia.



Figure 2: Research Camp at the Lena Coast. (Photo: Karsten Reise, AWI)

The research station Samoylov, located on one of the many islands of the Lena Delta, belongs to the Lena Reserve and is used by scientists of the AWI and partner institutes for permafrost research. Research topics include aspects of climate change and its impact on the

permafrost soil, such as carbon cycle, methane formation and emission by microbial processes in the active soil layer and the ponds.

During the past years many thesis have been written here from mainly Russian and German young scientists. An extension of this research program to include coastal processes is now planned within the German Polar regions and Coasts in a changing Earth systems program PACES and a Russian-German cooperation project.



*Figure 3: Erosion of a ice bluff. (Photo: Karsten Reise, AWI)*

It will deal with the erosion of the coast and all its cascading effects on transport of suspended matter and carbon and on the coastal ecosystem. It will give us the opportunity to extend our experience from research on the soft bottom coasts of the North Sea to the permafrost coast of the Arctic.

The first station we visit is the borehole at *Cape Mamontovy Klyk*, the mammoth cliff. Here a temperature profile is observed, which goes some 80 m down, to monitor changes in the Permafrost. From the cliff of the lonely tundra landscape we have a wide view across the pack ice of the North Polar Sea, which meets the coast here this year.

After an hour with maintenance work we fly to the research station. We experience eager activities in the wooden house, which harbors laboratories, kitchen, storerooms, living and bedrooms. Our accommodations for the 10 days to come are tents, from which we have a beautiful view across the Lena landscape. Fortunately, our day of arrival coincidences with the sauna day. After surviving the hot steam in the sauna cabin we enjoy the fresh water of the lake just below, under a beautiful sunset, which last the whole night. During the next days we undertake cruises with the patrol boat of the Lena Reserve to visit different areas of the Lena region and inspect sites for future research work.



*Figure 4: Bluff with ice complexes. (Photo: Karsten Reise, AWI)*

Most impressive are the bluffs with their huge ice complexes. We can watch erosion in nearly minute's intervals. Huge chunks of ice and soil are released from the melting ice wall and are crashing down to the beach. Nevertheless, the Lena is rather quiet now in August.

In spring she rises to a furious river by ten or more meters. Then the ice flows scratch along the banks and tear the sediment away, wash up new sandbank elsewhere and transports huge amounts of sediment into the Lantev Sea and the Arctic Ocean. More than 750 km<sup>3</sup> of fresh water are flushed into the Sea per year. By this a wide belt of fresh water surrounds the Lena mouth. During our cruise we did not meet any traces of marine water. But the high turbidity with suspended matter concentrations of more than 100 mg l<sup>-1</sup> were present every- where.

After 10 days our short pilot expedition comes to an end while we are returning by ship to Tiksi. Numerous notes about our observations, photos and videotapes have now to be evaluated to establish our research plan for the next years. The joint expedition report with many questions and ideas evolves already during our return to Germany.

### **The Call of the North: A 13-month Field Program in the Canadian High Arctic**

from Elizabeth Shadwick and Helmuth Thomas,  
Department of Oceanography, Dalhousie University, Canada  
E-mail: elizabeth.shadwick@dal.ca

The record low coverage of sea-ice in the Arctic this past winter contributes to the growing evidence supporting the rapid pace of global climate change. Communities in the high North experience the impacts of this change most dramatically, and as such, Canadian researchers across many disciplines are joining forces to gain a better understanding of the consequences of climate change in the Arctic.

As part of the Canadian International Polar Year (IPY), the Circumpolar Flaw Lead System Study (CFL, website: <http://www.ipy-cfl.ca>) brings together over 200 scientists from more than a dozen countries for a multi-year study in the Canadian High Arctic. The 13-month field program was conducted aboard the CCGS Amundsen, a Canadian icebreaker that has been refit to become a world-class research platform.

The field season extended from October 2007 to August 2008, with scientific staff and the ship's crew on a 6-week long rotation. The study area was located west of Banks Island, the southwestern most of the islands in the Canadian Arctic Archipelago.



*Figure 1: CCGS Amundsen frozen in the ice in front of Banks Island.  
(Photo H. Thomas)*

Throughout the winter months the ship was deliberately frozen into the ice, making weekly visits to the open flaw lead system and affording us the opportunity to over-winter the icebreaker in this fascinating and understudied region. Our small team of 5 from Dalhousie University in Halifax collectively manned eight 6-week legs over the course of the 13-month field season. Canadian groups from McGill, Montreal, QC, University of Manitoba, Winnipeg, MB, and the Institute of Ocean Sciences, Victoria, BC complemented the annual sampling with help from colleagues from Gothenburg University in Sweden.

In order to better understand the carbon cycling at the Canadian Arctic Shelf, and in particular its seasonal variability, we collected water samples for on-board analysis of dissolved inorganic carbon (DIC) and total alkalinity (TA). Additionally, continuous recordings of the surface water CO<sub>2</sub> partial pressure were made. We have now begun to investigate the seasonality of the carbon cycle, considering governing processes such as riverine and terrestrial inputs, mixing of the major water masses from the Arctic, Atlantic, and Pacific Oceans, cross shelf carbon exchange, and the role of the atmosphere-ice and ice water interfaces.

Water column sampling could be continued in the winter season, when we were frozen in to ice several meters thick, through the moon pool of the Canadian coastguard ice breaker. Despite the full ice coverage, the moon pool permitted us to lower the CTD, and zooplankton nets, into the water from the interior of the ship and without having to dig a hole in the ice. Only the very few meters close to the ice-water interface were collected from outside, in temperatures often below than -30 °C, by drilling a hole with an ice-corer and lowering a homemade contraption that consisted of a small pump, with a small anchor, and a couple meters of garden hose, into the hole to collect water a several depths.

On the 'Christmas Leg', from December 20<sup>th</sup> to February 2<sup>nd</sup>, we were in almost complete darkness for our first month on board. We saw spectacular Northern Lights, but almost no wildlife, except for the occasional Polar Bear, and a ringed seal that took up temporary residence in the moon pool. On trips out onto the ice the views of the ship were spectacular. We were completely isolated from any other human life, and walking on the thick sea ice you'd never have known there was an ocean beneath your feet, if it weren't for the imposing icebreaker whose bright searchlights illuminated the horizon.



*Figure 2: The CCGS Amundsen in the dark Arctic winter.  
(Photo: E. Shadwick)*



*Figure 3: The CCGS Amundsen in the endless summer sunshine.  
(Photo: E. Shadwick)*





Mid-summer provided a stark contrast with 24-hours of sunlight and frequent polar bear and whale and sea bird sightings. In open water, the CTD was deployed from the deck, with sampling taking place at all hours of the day and night. Throughout the 13-month field program, nine teams of scientists studied everything from the physics of sea ice, to benthic life and zooplankton distributions, to carbon fluxes through the ice and mercury contamination in the water and in marine mammals. This project provided a unique opportunity to collaborate with, and learn from, researchers in all disciplines of Arctic oceanography and ecology. We look forward to the breadth of scientific understanding that emerges from the CFL project, and inevitable insight gained from studying this breathtakingly beautiful piece of our globe.

If you also want to become a "LOICZ Snapshot Reporter" please send your "Snapshot article" to: [b.goldberg@loicz.org](mailto:b.goldberg@loicz.org)

## Position announcement

Postdoctoral Position in Aquatic Ecological Modelling  
Université Libre de Bruxelles  
Ecologie des Systèmes Aquatiques  
Applications including a detailed Curriculum Vitae, a summary of work previously carried out; a letter of intent explaining interests and motivations in the post-doctoral position and contact details for 2 academic referees, should be sent to Prof Christiane LANCELOT ([lancelot@ulb.ac.be](mailto:lancelot@ulb.ac.be)), before 15<sup>th</sup> December 2008. [www.loicz.org/news/jobs/index.html.en](http://www.loicz.org/news/jobs/index.html.en)

## Calendar

### New Calendar:

We have updated the LOICZ Calendar on our website. This might be useful for your planning. If you want to announce your conference, workshop or session on the LOICZ website, please write an e-mail to: [loicz.ipo@loicz.org](mailto:loicz.ipo@loicz.org)  
<http://www.loicz.org/calendar/index.html.en>



### 2009

**5th EGU Alexander von Humboldt International Conference Iphakade\*: Climate Changes and African Earth Systems – Past, Present and Future. 12–16<sup>th</sup> January, 2009.**  
The 5<sup>th</sup> Alexander von Humboldt International Conference will commence with registration, the opening session and a social function on the afternoon of Sunday 11<sup>th</sup> January 2009 and the main scientific program of the conference will run from

Monday 12<sup>th</sup> January to Friday 16<sup>th</sup> January 2009, University of Cape Town, South Africa.  
[HTTP://WWW.AFRICACLIMATESCIENCE.ORG/HUMBOLDT](http://WWW.AFRICACLIMATESCIENCE.ORG/HUMBOLDT)  
<http://www.humboldt5.uct.ac.za/>

### Earth Explorer User Consultation Meeting (including A-SCOPE and BIOMASS)

20–21 January, 2009, Belém Cultural Centre, Lisbon, Portugal  
A critical input to the decision making process which will lead to a recommendation on what mission candidates to select for feasibility studies. The six candidate missions are: A-SCOPE, BIOMASS, COREH20, FLEX, PREMIER, TRAQ.  
<http://www.congrex.nl/09c01/>

### Monitoring Effects of Aquatic Oil Pollution

20–22 January, 2009, Leipzig, GERMANY  
<http://www.ufz.de/index.php?en=16987>

### ASLO 2009 AQUATIC SCIENCES MEETING

25–30 January 2009 Venue: Nice, FRANCE  
<http://www.aslo.org/nice2009/>

### Realizing Low Carbon Cities: Bridging science and policy

16 February, 2009, Nagoya, Japan  
Contact: Shobhakar Dhakal: [shobhakar.dhakal@nies.go.jp](mailto:shobhakar.dhakal@nies.go.jp)

### Towards Low Carbon Cities: Understanding and analyzing urban energy and carbon

17–18 February, 2009, Nagoya, Japan  
Contact: Shobhakar Dhakal: [shobhakar.dhakal@nies.go.jp](mailto:shobhakar.dhakal@nies.go.jp)

### Climate Change and Ocean Acidification (at the 11<sup>th</sup> Pacific Science Inter-Congress) 2–6 March, 2009, Tahiti

This is one of the five sub-themes of the conference. The aim is two fold: (1) Describe and assess the variability of climate, past and future, in the context of the present greenhouse effect. (2) Document the extent, magnitude and future trajectory of ocean acidification in the Pacific region, its impact on marine organisms and ecosystems, and its potential socio-economic implications. Co-chair: Julie Cole and Jean-Pierre Gattuso ([gattuso@obs-vlfr.fr](mailto:gattuso@obs-vlfr.fr)). For more information: <http://www.psi2009.pf> (Inter-Congress website)

### International Scientific Congress on Climate Change (IARU) 10–12 March, 2009, Copenhagen, Denmark

The purpose of the congress is to try and capture some of the enormous research energy currently being devoted to the elucidation, mitigation and adaptation to climate change. Multiple sessions on the carbon cycle.  
Organised by the International Alliance of Research Universities (IARU)  
Website: <http://climatecongress.ku.dk/>

### International climate change conference for Perth

Burswood Convention Centre in Perth from 23–26 March, 2009  
Further Information: Paul Holper, CSIRO Marine and Atmospheric Research: [paul.holper@csiro.au](mailto:paul.holper@csiro.au), 03 9239 4661  
For more information about Greenhouse 09 visit: <http://www.greenhouse2009.com/>

### 'International Symposium on Sediment Transport and Sedimentation on Asian Continental Margins'

March 23–27, 2009, National Sun Yat-sen University, Kaohsiung, Taiwan. More information is available from web site at <http://mgac.nsysu.edu.tw/liu/symposium/>

### 12<sup>th</sup> International Scientific Wadden Sea Symposium 2009, Wilhelmshaven, 30 March – 3 April 2009

This scientific conference will focus on how research and mon-

itoring can provide input to conservation and management, by developing new methods and assessment tools. In addition, limitations or gaps in knowledge will be identified.  
<http://www.waddensecretariat.org/news/symposia/ISWSS-2009.html>

#### 10<sup>th</sup> International Coastal Symposium, ICS 2009

13–18 April, 2009 Venue: Lissabon, PORTUGAL  
<http://e-geo.fcsh.unl.pt/ICS2009/index.html>

#### European Geosciences Union General Assembly

19–24 April, 2009, Vienna, Austria Multiple sessions on the carbon cycle. <http://meetings.copernicus.org/egu2009/>

An ICES Symposium on issues confronting the deep oceans will be held in the Azores, 27–30 April, 2009. The prime focus will be on the North Atlantic (ICES + NAFO Areas) but relevant contributions from elsewhere will be included. Conveners will be Robert Brock (USA) and Gui Menezes (Portugal). A scientific committee will be established to include relevant scientific disciplines and regulatory authorities. In consultation with the conveners, the General Secretary will solicit appropriate co-sponsorship. <http://www.interridge.org/en/node/5622>

#### IHDP 7th Open Meeting, "Social Challenges of Global Change"

26–30 April, 2009, Bonn, Germany. The 7<sup>th</sup> International Science conference on the Human Dimensions of Global Environmental Change (Open Meeting) originally scheduled for 15–19 October, 2008, in India, will take place from April 26–30 2009 in Bonn. The new venue will be the former German Parliament premises (World Conference Center Bonn) at the United Nations Campus 2008. <http://www.openmeeting2008.org>.

#### Science-based management of the coastal waters

4–8 Mai, 2009 Venue: Liege, BELGIUM  
<http://modb.oce.ulg.ac.be/colloquium/>

#### Climate Change

The environmental and socio-economic response in the southern Baltic region. Szczecin, Poland, 25–28 May, 2009. [www.baltex-research.eu/SZC2009](http://www.baltex-research.eu/SZC2009)

#### 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.

#### ECSA Symposium: Estuarine Goods and Services

29. August–04. September 2009 Venue: Dublin, IRELAND  
<http://www.ecsa-news.org/>

#### 5<sup>th</sup> International Conference on River Basin Management

07–09 September, 2009, Malta, MALTA  
<http://www2.wessex.ac.uk/09-conferences/river-basin-management-2009.html>

#### European Marine Biology Symposium 2009

07–11 September, 2009, Liverpool, UNITED KINGDOM  
<http://www.liv.ac.uk/marinebiology/embs.html>

Water Resources Management 2009, 09–11 September, 2009, Malta, MALTA. <http://www.wessex.ac.uk>

Coastal Processes 2009, 14–16 September, 2009, Malta, MALTA  
<http://www2.wessex.ac.uk/09-conferences/coastal-processes-2009.html>

Session: High-resolution deltaic architecture at:  
**IAS 2009 27<sup>th</sup> Meeting**, 20–23 September, 2009, Alghero, Island of Sardinia, Italy

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](mailto:Christoph.Heinze@gfi.uib.no)

#### 6<sup>th</sup> GKSS School on Environmental Research

School on Statistical Analysis in Climate Research, 6–16 October, 2009, in Lecce, Italy  
<http://coast.gkss.de/events/6thschool>  
 Contact: Götz Flöser: [Goetz.floeser@gkss.de](mailto:Goetz.floeser@gkss.de)  
 phone: +49 4152 87-2345; fax: +49 4152 87-2818

#### First international conference on Asia Quaternary Research (AsQUA)

Beijing on October 19–23, 2009, in conjunction with International Symposium on Paleoanthropology in Commemoration of the 80<sup>th</sup> 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](mailto:gaoxing@ivpp.ac.cn)).

#### Coasts and Estuaries in a Changing World (CERF 2009)

01–05 November, 2009, Portland, Oregon, UNITED STATES  
<http://www.erf.org/newsletter/Winter07-CERF09-ExecDir.html>

#### Second DIVERSITAS Open Science Conference:

Biodiversity and society: understanding connections, adapting to change, 13–16 October 2009, in Cape Town, South Africa  
 Contact: Méline SEENEEVASSEN, DIVERSITAS Secretariat  
 Muséum National d'Histoire Naturelle (MNHN), Maison Buffon  
 57 rue Cuvier - CP 41, 75231 Paris Cedex 05, France  
 phone: + 33 1 40 79 80 40; fax: + 33 1 40 79 80 45  
 E-mail: [secretariat@diversitas-international.org](mailto:secretariat@diversitas-international.org)  
 Website: <http://www.diversitas-international.org>

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

#### 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.

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.

*All dates are also available on our website:*  
<http://www.loicz.org/calender/index.html.en>



### Publication details

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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](mailto:loicz.ipo@loicz.org) or visit the LOICZ website [www.loicz.org](http://www.loicz.org) for article requirements.

If you have a project you would like to affiliate to LOICZ please go to [www.loicz.org](http://www.loicz.org) and click on research for detailed information.

