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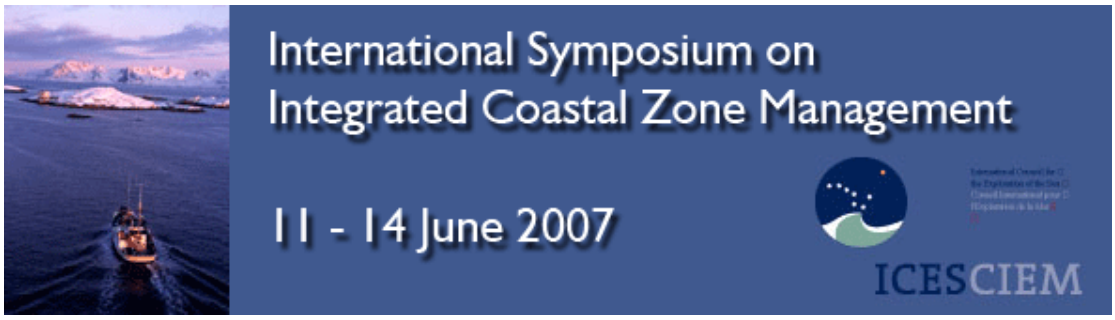

The International Symposium on Integrated Coastal Zone Management took place in Arendal, Norway between 11-14 June 2007. The main objective of the Symposium "Integrated Coastal Zone Management" was to present current knowledge and to address issues on advice and management related to the coastal zone.

This international multi-disciplinary conference intended to promote science and integration of knowledge for the sustainable management of coastal resources. It provided a venue for scientists, engineers, managers and policy-makers to discuss recent advances and innovative ideas, share experiences and develop networks. A total of 167 persons (including 19 students) from 36 countries participated in the symposium (Australia, Austria, Bangladesh, Barbados, Belgium, Brazil, Canada, Chile, Denmark, Estonia, EU, France, Germany, Greece, Guyana, Iceland, India, Indonesia, Iran, Italy, Japan, Latvia, Norway, Philippines, Polen, Portugal, Russia, Singapore, South Africa, Spain, Sri Lanka, Taiwan, Thailand, The Netherlands, UK, USA). The symposium offered financial support to 17 persons from 10 countries: Bangladesh (2), Barbados (1), Brasil (2), Chile (1), Guyana (1), Iran (1), India (4), Philippines (2), Russia (1), Sri Lanka (1) and South Africa (1).

During the Symposium, a total of 133 presentations (8 key-note, 55 oral and 70 posters) addressed issues within the following four themes:

- Coastal habitats
- Impacts on coastal systems
- Integrated Coastal Zone Management (ICZM)
- Coastal governance

Award for the best oral presentation were given to Carissa Klein, University of Queensland, The Ecology Centre, Australia: Title of presentation: “Integrated planning framework and decision support methods for biodiversity conservation and sustainable natural resource management in the coastal zone”. The award for the best poster presentation were given to Nibedita Mukherjee, B. Muthuraman and Kartik Shanker, Ashoka Trust for Research in Ecology and Environment, India. Title of the poster: “Bioshields and ecological restoration in tsunami-affected areas in India.”

Best oral presentation: Carissa Klein

Best poster presentation: Nibedita Mukherjee

Theme Reports

Theme 1 - Coastal habitats

The main results in this theme were:

- The importance of habitat integrity for the maintenance of diversity, productivity and fisheries.
- Importance of the evaluation of degradation and the restoration possibilities.
- Coastal zones receive impact from different areas, so the study scale can not be local. i.e. general circulation patterns must be considered.
- The importance to take advantage of long time series, or start building them.
- Need to develop network of observations, mapping of resources, inclusion of social values.

These were some of the recommendations about habitats that need to be included towards management.

Theme 2 - Impacts on coastal systems

To develop sustainable utilization of coastal resources, the major challenge facing us is to manage human activities, including conserving significant coastal resources such as tropical reefs, mangroves, sea grass etc. Dr. Støttrup looked at this from the viewpoint of three areas; goods, service and threats. She discussed the key coastal resources as they relate to these:

	Goods	Services	Threats

Reefs	Habitat	Biogeochemical cycles	Pollution
Sea Grass	Fish and shellfish habitat	Nursery Areas	Eutrophication, trawling

Many other resources are also under threat such as rocky shores, sandy shores. In general there is a major issue with habitat Deterioration as a result.

Internationally (eg. Convention on Biodiversity) and within the EU (eg. EC Habitat Directive), there are agreements and new legislation that address the issues related to habitat degradation and the sustainability of coastal resources. An important tool to apply to this is Spatial Planning that draws upon the new tools provided by Geographic Information Systems. In particular the ability to capture information on human activities, the protection provided for resources and the abundance and occurrence of unique resources. Spatial Planning helps address the scramble that occurs for space in the coastal zone. This approach should also draw upon the Fisher's knowledge of the area as well, since they often know a great deal about where the essential fish habitat is located. The ICES Fisheries Ecology Working Group has listed 5 key habitat types

1. Spawning grounds
2. Shelter/refuges
3. migratory corridors
4. feeding grounds
5. nursery grounds

In general fisheries management efforts focus on 1 and 4, however there is a need to put more focus on 5. The size and extent of nursery grounds is key to recruitment and survival of different species. Mapping of Nursery Grounds for some species is challenging though. For instance Cod nursery grounds in the North Sea may be difficult to map because of the wide dispersal of the juveniles. It can also be difficult to connect human activities and effects. For example attempts to link effects on Plaice and Beach Nourishment activities failed to establish strong correlations. The effect of asking the question though was beneficial as it got the institutions responsible for the beach nourishment to review their methodolgy. The real challenge will continue to be the balancing of human use and habitat conservation in a way that is both responsible and imaginative in approach.

Examples 1: Management of Fisheries in South Africa's largest lagoon, the Saldanha Bay, and possible effects on local fish stocks

The objective was to improve fish stocks through multi species management looking at biology, mortality and migration in Saldhanna Bay. This is an area used for iron or shipping, mussel production, military uses. The overall population is around 100,000 but growing at 6% per year. The fishing pressure is increasing rapidly in Commercial fishing, (mullet gillnet), recreational fishing and subsistence fishing. Research involves tracking fish movement and examining fish behavior and investigating the effect of marine protected areas on the fish stocks. The fishery is in the danger zone, partly a function of natural causes but also due to the fishing pressure. The results have shown that fish in and outside of the MPA are roughly

the same size. Fishers have complied with the MPA and stay outside. However many fish right at the boundary which may effect the success of the MPA. Future actions may require moving fishers further from the MPA boundary. The current level of exploitation is felt to be sustainable. However future growth will exceed the limits and it is expected that group conflicts will increase. The conclusion is that MPAs are not enough and that it will be necessary to implement catch and effort regulations. The MPA was established in 1979 so there was sufficient time to have seen a difference. However the commercial boats were having a large impact and it may be necessary to impose quotas on commercial boats.

Example 2: The population density and urbanization or the Northeast Baltic Sea, the time spatial analysis

This was a study in the North East Baltic Sera in the Gulf of Finland and Gulf of Riga. This is an area of high population density and urban growth in the past 50 years. Using Census data they have looked at population growth and urban spread. It has shown that population growth is particularly strong in the Helsinki area, the cities have grown at the fastest rate. Cities greater than 2 million have grown the fastest. The result of the urban growth has been high nutrient loads and habitat loss. In particular nitrate and phosphorous loads have increase dramatically. Runoff generated by conversion of 40% of the land area to impermeable surface has lead to large impacts. They have reached the conclusion that they will need to develop a socio- ecological approach in order to bring changes to the trends they have been experiencing.

Example 3: Searching for the European Water Framework Directive's "reference conditions"

The use of paleoecological indicators (forminifera) measures of long term change has provided a means of tracking major quality changes including reference to the Norwegian Pollution Control Authority's classification system. It has been found useful in tracking the initiation of hypoxia events in coastal waters.

Example 4: Protected areas as a measure to reduce coastal zone vulnerability in the Amazon region, State of Para, Brazil

The coastal planning involving 22 coastal municipalities in Brazil includes 16000 km^2 of coastline with stretches of highly sensitive coastal zone. They are experiencing expansion within Oil and Gas activities, tourism, infrastructure and fishing. The approaches using land use and occupational planning include the development of conservation units. Within the system there are over 3000 km^2 of mangroves. The development of the conservation areas that include about 21% of the total area have proven to be effective means for protecting the valuable mangrove systems particularly against coastal floods, and development pressures from the local population.

Example 5: Knowledge based management

Knowledge based management can only be based on high quality information on the ecosystems in question. This has been recognised by Norwegian politicians and in 2003 a national program for surveillance and monitoring of biodiversity was launched. The first period of the program (2003-2006) was used to develop cost efficient surveillance methods in close collaboration with local communities in three areas of regional government (South – Mid – Northern Norway). The work has been based on the Directorate for Nature conservations report on surveillance of biodiversity and habitats. Through the pilot period it has been developed further to include new habitats, organisation model for local participation and foundation of the work and a second generation tool for classification of habitats i.e. local, regional and national importance.

Theme 3: Integrated Coastal Zone Management (ICZM)

Among the central messages of the theme was the challenge of doing integrated coastal management in a responsible and open manner. There are so many different goals that participants in an ICZM process are pursuing, that finding effective ways of doing the "I" (integration) part of ICZM is a very demanding task, leading as well to the potential for increasing the conflict among participants. One core issue concerned protection of coastal zones. It was emphasized that protection is not necessarily in opposition to use. Protection may also be a prerequisite for use at it is a prerequisite for sustaining resources like fish stocks.

Nevertheless, making trade-offs between conflicting uses and between protection and use is a demanding task. As an example, small and poor coastal communities see tourism as a way to increase the income of the residents (as well as the tax base). Tourism can be eco-friendly, but when done rapidly for immediate gain, it can lead to lower environmental conditions in the coastal waters as well as in the coastal ecosystems themselves. Similarly, protecting the biodiversity of the coastal waters means for some advocated that local fishers should be restricted in pursuing commercial fishing -- even thought this pushes long-term residents out of a job. Repeatedly the term "coastal squeeze" was applied during the session. Many of the problems of watersheds, urban developments, and ocean waters are squeezed together and the papers in this session highlight how diverse regions had tried to cope with (or, had failed to recognize) these challenging problems.

Another theme that ran through many of these papers was that the poorest of the poor were the persons who were more likely than others to pay a very large share of the costs of developing coastal areas. Those who benefit from knowing that biodiversity is saved rarely need to earn their living from fishing or they have not established very small huts along the shore for living. While tourism frequently creates jobs and can be done in a way that enhances the overall social-ecological coastal system, if the interests of poor residents of a region are not well represented in the planning of new policies, they may be the ones who end up losing livelihoods and long-term links to a local community.

The role and forms of information in the decision process was also emphasized. The theme hence included papers focusing on stakeholder perceptions, scenario development and

modeling. The participatory dimension of information development and information evaluation was emphasized both in the presentations and in the debate that followed.

Theme 4: Coastal governance

The keynote defined governance as encompassing the values, mores, policies, laws, and institutions by which a society defines a course of action or addresses a set of issues. Governance probes the fundamental goals, the institutional processes and the structures that are the basis for planning and decision making. It spans the formal and informal arrangements, institutions, and values that structure and influence:

- How a resource or an environment is utilized
- How problems and opportunities are evaluated and analyzed
- What behavior is deemed acceptable or forbidden
- What rules and sanctions are applied to affect how natural resources are distributed and used

The processes of governance are expressed through the institutions and arrangements of markets, government, and civil society.

Several speakers pointed out that coastal governance is informed by science but is only sometimes science-driven. It was stressed repeatedly that coastal governance makes it imperative to integrate information and knowledge from both the social and the natural sciences. The diversity of contexts from which the speakers drew in their papers underscored the crucial importance of the condition of the ecosystem, the pre-existing traditions of governance and the spatial scale of a project or program in determining how best to tailor the processes of governance to a specific place and set realistic goals within a given time period. The CHARM project in Thailand, illustrated the challenges of coastal governance in a context where social, political and ecosystem changing is occurring very rapidly and where a natural disaster like the 2004 tsunami can radically alter priorities. This contrasts to the more stable and structured situations described by speakers drawing upon governance at a similar spatial scale in Europe. Governance of the Large Marine Ecosystems (LMEs) in the Wider Caribbean offer a quite distinct set of challenges and opportunities. Despite such wide differences in context the session reaffirmed the importance of achieving nested systems of governance in which the fundamental goals and processes integrate with one another across a range of spatial and temporal scales. This is increasingly urgent as trends in current patterns of human activity reduce the capacity of coastal ecosystems to generate goods and services and become more brittle. The need to construct resilient coastal governance systems that will in turn encourage resilient socio-ecological systems was another issue in this theme. The paper suggested that there is a world-wide need to strengthen such capacity particularly at the municipal and linked watershed-to-estuary scale.

Several papers identified and reaffirmed broad, universally applicable principles that are emerging as useful in guiding coastal governance at a time of accelerating global change. They emphasized the need to set realistic goals and to structure initiatives to overcome the widening “implementation gap” between issue analysis and planning and the effective

implementation of a plan of action directed at selected social and environmental issues. Many urged that those funding and practicing and evaluating coastal governance initiatives accept the diversity and the complexity that is a defining characteristic of both coastal systems and their governance.

The Key Note speaker Dr. Ostrom spoke on topic of "Beyond panaceas: understanding the role of context in affecting institutional choice and performance". In her address, Dr. Ostrom spoke of the importance of putting people and ecology together, and on how difficult it is to achieve. She criticized universities for keeping people and ecology apart by compartmentalizing them into widely separate disciplines, often in different Faculties or Schools. This lack of interdisciplinarity makes it difficult to bring about a true understanding of the nature of interaction within complex ecosystems, of which humans are an integral part. Overcoming this challenge is essential for understanding dynamic systems. Dr. Ostrom laid out a number of challenges for dealing with the assessment of complex socio-ecological systems, including:

- The need to overcome the "panacea" trap, namely the notion that scientists and scholars can come up with simple models to predict outcomes and produce the ideal solution to resource problems; there is no simple panacea to solve such problems.
- The need to accept and embrace complexity rather than reject it.
- The need to approach solutions in the form of multi-year frameworks and multi-user scenarios.
- The need to build nested theories that reflect complex systems rather than single theories that reflect an unrealistic view of real life.

Dr. Ostrom made reference to Garret Hardin's "Tragedy of the Commons" and his First Law of Ecology that "you cannot do only one thing", stressing the need for institutional diversity in managing the complex realities of socio-ecological systems. Tim Smith who presented a multi-authored paper entitled "Managing coastal vulnerability: new solutions for local government". In many ways, Mr. Smith's paper build on Dr. Ostrom's argument by stating that effective coastal governance requires recognition of uncertainty, complexity, and interactions between various components of complex, dynamic systems. This poses a great challenge for local governments, which often do not have the training and resources necessary to take such an approach. Mr. Smith addressed the need to provide support to local governments so that they can build their capacity to manage change and uncertainty. One key aspect is to provide the capacity to turn information into knowledge by recognizing uncertainty and embracing a multi-disciplinary systems approach. Science is value laden and we need to be highly participatory in our approach. By taking a systems approach, we move from being disciplinary to multi-disciplinary, and from being reductionist to being holistic. He emphasized the need to link science and the community, and to present information in a way that can be understood and utilized by local governments. The Australian National Climate Change Adaptation Programme, through the Australian Greenhouse Office is helping to build capacity for adaptation and assisting coastal governments to reduce their vulnerability to climate change.

The final speaker of the conference was Joseph Arbour, and his topic "The evolution of governance mechanisms for the Eastern Scotian Shelf Integrated Management (ESSIM) Initiative" covered the development of an Integrated Oceab Management Plan over for one

of the Large Ocean Management Areas (LOMAs) under Canada's Oceans Action Plan. Mr. Arbour spoke about the challenges of developing governance mechanisms for such a large area (over 325,000 square kilometers), covering multiple resources and uses, and involving multiple levels of government (federal, provincial, municipal, First Nations) and a wide range of stakeholder groups and communities. In additional to the governance challenges, there was also the problem of deriving the scientific data and information necessary to support informed decision-making within the area. The completion of this first phase has put in place a model for a governance structure that has the potential for addressing the complex human, resource, and environmental aspects of managing ocean and coastal systems.

All three speakers spoke to the difficulties of managing complex systems, the importance of incorporating the human element into the ecosystem approach, and the need to recognize and incorporate complexity, uncertainty, and change into the management models. All of this emphasizes the challenges of developing effective governance structures and mechanisms that can cope with the inherent complexities and vagaries of coastal and ocean systems. There is no simple solution to integrated management, but while it challenges our traditional methods of governance, progress is being made towards more effective approaches.

The Symposium proceedings

The Symposium proceedings (Editors: E. Dahl, E. Moksness and J. Støttrup) will be published by **Blackwell Publishing**. http://www.blackwellpublishing.com/. Papers including those based on poster presentations, will be considered for publication following peer review. The proceeding will be restricted to 440 pages, this will allow approximately 30 papers (max 5000 words each) to be included. Those that meet the deadlines and pass the review process will be included in the symposium volume. The Publishing Date is estimated to November 2008. The preliminary content of the book is as follows:

Chapter 1 – Introduction - **Peter Ricketts (Canada)-** State of Fear or State of Oblivion? What coastal zones are telling us about global change and why we need integrated ocean and coastal management on a global scale?

Section 1: Coastal habitats

Chapter 2: **Josianne Støttrup (Denmark)** – The challenge of establishing sustainable utilization of our coastal resources

Chapter 3 - 6 Case studies

Section 2: Impacts on coastal systems

Chapter 7: **Alan Pickaver (EUCC)-** – EU Indicators to monitor the progress in ICZM(keynote address)

Chapter 7-10 Case studies

Section 3: Integrated Coastal Zone Management (ICZM)

Chapter 11: **Svein Jentoft (Norway)** – Future challenges in Environmental Policy relative to ICZM

Chapter 12-15 Case studies

Section 4: Coastal governance

Chapter 16: **Stephen Bloye Olsen (USA)** – Management or Governance, Environment or Ecosystem; What are the Differences and Does It Matter?

Chapter 17 - 20 Case studies

Participants at the International Symposium on Integrated Coastal Zone Management, Arendal, Norway, 11-14 June 2007.

170 participants from 35 different countries are gathered in Arendal to discuss coastal zone management. From left: Mohammad Siddique (Bangladesh), Erlend Moksness (research director at the Institute of Marine Research) and Victoria Isaac (Brasil). Photo: Anne Karin Andersen, (Agderposten, 12 June 2007).