

The Four Seas 四海

Memorandum on Sino-German coastal research

Dealing with Bo Hai and Huang Hai as well as Baltic and North Sea regions

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In the framework of the Sino-German Cooperation in Marine Sciences a Symposium "Coastal Oceans: Interdisciplinary Scientific Prediction and Management" was organized on October 20-24, 2014 in Qingdao, China. On that occasion the joint perspective of "the Four Seas" / "四海" was discussed.

Coastal Science as own research field

Coasts are those parts of the ocean which are significantly influenced by the neighboring land, be it in terms of currents, winds, temperatures, sea ice, salinity, suspended matter, specific species, and anthropogenic substances; but coasts are also that part of the land which is significantly influenced by the neighboring sea, be it opportunities for transport, risks related to flooding, tsunamis, storm surges, and where the points of departure such as shipping, tourism, and oil and gas extraction are found. Not surprisingly therefore, the science in coastal dynamics and management extends far beyond oceanography.

Certainly oceanography is an important component of the interdisciplinary mix of scientific efforts dealing with coasts, but other fields such as meteorology, coastal engineering, land use planning and management, freshwater hydrology and ecology, climate, sociology and cultural science are also needed for constructing holistic views of the subject of coasts.

What makes the issue of coasts special is not only the presence of the "other" counterpart, i.e., the sea versus land and land versus sea, but also the presence of an often dominant factor modifying or even

constructing the coast - humans who use the coasts in various ways, conditional upon temporally and culturally varying preferences, who make use of opportunities and try to deal with often great dangers. The German coasts, there is a saying according to which "God created the ocean, but the Frisians created the coast" (the Frisians are people living at the Dutch and German North Sea coast). Because of both, the culturally conditioned values and preferences, and the different geophysical, morphological and ecological set up, the various coasts of this world are very different, and face very different challenges, risks and opportunities. As a consequence coastal science is fragmented into regional research communities; in some quarters coastal sciences is considered as a mere variant of oceanography, and in others it is essentially coastal engineering, and in still others human geography.

The challenge is to bring together these different communities, disciplines, challenges and concepts together, not only within the scientific community but also in a trans-disciplinary effort by combining the real world, in which the coast is subject to competing practices and decisions, with the body of scientific knowledge.

We are convinced that a deepening and a sustainable cooperation between German and Chinese coastal scientists will hold the potential for significant progress in coastal sciences, not only in the two countries but also beyond. We expect synergistic progress, in terms of better understanding of processes, subsystems, the holistically framed system comprising natural dynamics and human interference, and perspectives conditioned by different societal values and preferences, when we consider in parallel, in particular in a comparative mode, the two North German marginal seas of the North Sea and the Baltic Sea, as well as the two Chinese marginal seas Bo Hai and Huang Hai.

This progress will also have a management dimension, an instrumental (monitoring) dimension as well as issues of the built environment (coastal defense, ports, shipping lanes, offshore activity)

Test case: 四海

We focus on the "Four Seas" (四海) not only because many of us are familiar with these seas after many years of scientific analyses, but also because of their societal significance with a broad range of important modes of uses, from oil and gas, nearshore aquaculture, offshore fishery, wind energy, shipping and other industrial activities to tourism and natural preservation. Both systems are made up of one sea which is more enclosed, and another one which is half open to the world ocean. In both systems major ecosystems have their home, but they also serve, or served, as dumping sites for onshore activities. A difference is the fact that the North European seas have many different national coasts while in case of the Chinese seas only a limited number of international partners share responsibility for the marginal seas.

We should also mention the emotional value of the Four Seas for the people living on their coasts – which certainly has an influence on the culture of the regions.

Within the "four seas" concept, we cover issues of hydrodynamics and ecology, of coastal climate of observational projects, the construction of monitoring systems, and the various dimensions of human usages (fisheries, oil and gas, natural reserves...). Other issues, which deserve attention deal with past

changes, possible future drivers in changes, the construction of scenarios, the challenge of detecting (changes beyond natural variations) and the attribution (of plausible mechanisms). A particular challenge will be to map similarities and differences of regional societal values, decision procedures and stakeholder networks. Finally, we welcome systematic efforts for assessing the body of scientifically legitimate knowledge and for describing to what extent this knowledge is based on agreement or is contested.

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