ICZM and the application of Geosciences in the Chinese coastal zone

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Chinese Coastal Area.
(source: Geological Survey of China)

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Summary

In recent decades, China's coastal area is being faced with large-scale urbanisation, industrial and harbour development. Subsequent user conflicts and increasing marine pollution led to the introduction of Integrated Coastal Zone Management (ICZM). Geo-scientific research plays an important role in the present planning of large-scale constructions, land reclamation, the creation of coastal eco-cities, and in future adaptation to the impacts of climate change. Information on water quality and coastal and sub-soil stability is very important for the development of the coast zone.
China is addressing the developments in a holistic way and making institutional ICZM arrangements. ICZM, integrated spatial planning and Environmental Impact Assessments are important tools to plan and implement large scale sustainable coastal projects.

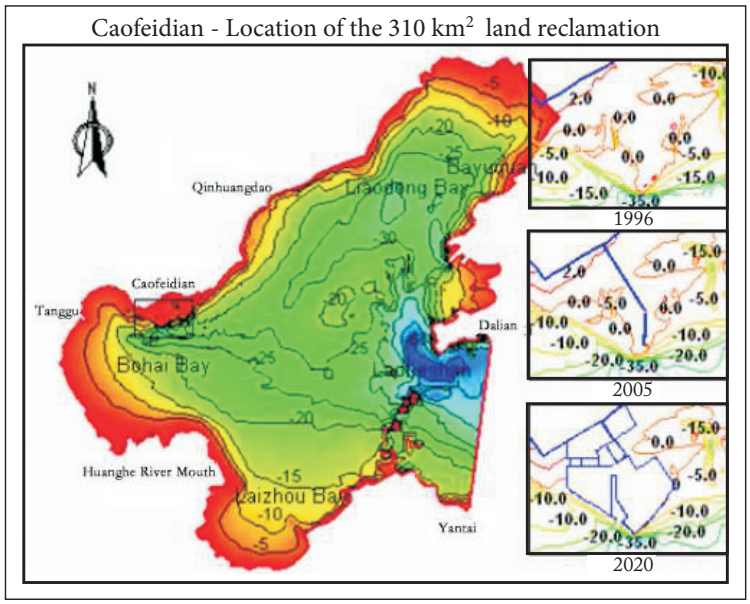
The contribution of Geo-science to ICZM is illustrated by three areas with rapid economic developments (from north to south):

The Caofeidian Island is located along the western coast of the Bohai Bay (Yellow Sea) and suitable for large deepwater ports and industries. The large scale land reclamation (310 km^2) and the Tongdao Sea Bridge Highway, are supported by studies on the tectonic stability and hydraulic coastal processes. Future large-scale drinking and industrial water abstraction will affect the wetland ecosystems. To compensate for the loss of wetlands, artificial wetlands will be constructed storing fresh water. Comprehensive analyses are undertaken to build a safe modern Eco-city of Caofeidian.

Yangtze River Delta area is one of the most intensely developing coastal regions in China, with the highest population density, a rapid urbanisation, and large-scale coastal infrastructure developments. Its impacts will affect coastal resources, living conditions and the environment. The Yangtze River Delta suffers from serious subsidence. Dam constructions upstream of the Yangtze River increase coastal erosion. Global warming and sea-level rise may increase the frequency of storm surges, floods, and the salt water intrusion.
The rapidly growing city of Shanghai is looking for secure fresh water supplies. The construction of a large fresh water reservoir on a island in the Yangtze River mouth and of a cross-sea Donghai bridge, two harbours and the Pudong Airport required detailed geo-scientific information of the tectonic and coastal stability, river water quality and marine sedimentary processes.

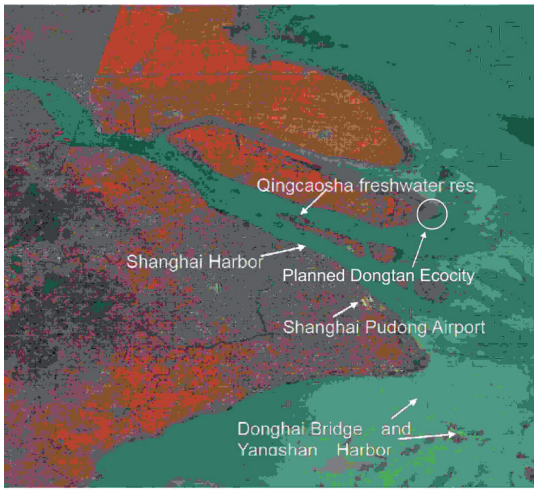
The Pearl River Delta has become one of the leading economic regions and a major manufacturing centre of China. The industrial activities caused the delta to become severely polluted. The sewage and industrial waste treatment facilities are unable to keep pace with the growth in population and industry. At the same time, practically no natural coastal landscape remains. The delta region is also exposed to natural disasters such as typhoons and tectonic movements.

Applied geo-science is delivering knowledge and understanding to the Chinese policy and decision makers and the construction companies. The Netherlands is sharing its coastal hydraulic and engineering experience with China specifically regarding coastal geo-science applications during the planning, design and execution phase of large-scale infrastructure projects.



Location of the stepwise land reclamation *(in blue – inset map) offshore Caofeidian. (After Lu Y.J., et al., 2008)*

A formal cooperation *between China Geological Survey and the Dutch Deltares has been signed on September 11th 2008 establishing the Dutch-Sino Centre for coastal Geology. (photo: Deltares)*



The location of the projects *in the framework of the Shanghai coastal zone development. Modified from satellite images. (After Jun FU & Ping YIN)*

The 32.5 km long Donghai Cross-sea Bridge*, for location see satellite image left. (photo: Zhang 2008)*