

## BACKGROUND

Human land-based activities, such as agriculture, deforestation or river damming, alter element fluxes from land to sea and influence the natural structure of coastal ecosystems.

At a local level, coastal ecosystems are often under pressure from sewage disposal, destructive fishing practices, aquaculture or tourism. Other potential hazards are natural disasters and climate change.

The tropical and subtropical coastal ecosystems of the Asian-Pacific region are strongly affected by these substantial changes. They possess an enormous marine biodiversity, but suffer from a high population density, receive high inputs from some of

the world's largest rivers and are exposed to extreme climatic phenomena. Therefore, they are particularly suitable for studying land-sea interactions. China's coastal zones are a major part of these ecologically and economically important regions.

The tropical island of Hainan is located off the southern coast of mainland China. Its coast encompasses a notable diversity of habitats, including rocky shores, sandy beaches, mangroves, sea-grass beds and coral reefs. These habitats are key territories for the socio-economic development of the island. However, Hainan's coastal ecosystems are undergoing considerable changes under the impact of human activities and natural climatic events.



## RESEARCH AREA

Hainan is one of the biggest islands of China, with a coastline length of 1550 km. It is distinguished by a monsoon tropical climate. The studies are carried out on the east coast between Wanquanhe in the south (i.e. Boao) and Tongguling in the north, where several estuaries, mangroves, coral reefs and sea-grass beds are located in immediate vicinity. The adjacent offshore area hosts the second largest upwelling zone in the South China Sea.

## PROJECT GENERAL OBJECTIVES

The project LANCET has been developed in the framework of a cooperation agreement between Chinese and German partners with the aim of improving scientific knowledge about land-sea interactions in Hainan. The knowledge generated will contribute to the sustainable management of this unique region.

The study of ecological, biogeochemical and oceanographic processes in coastal and inland habitats and the adjacent ocean will give an insight into prevailing element and energy fluxes. Their impact on the resources and interdependency of selected coastal habitats will be assessed.

Ecological studies include the investigation of the status of mangroves and coral reefs as well as the composition of fish assemblages and their linkages to different shallow-water habitats. Human impacts are also tracked through the biogeochemical investigation of pollutant and nutrient fluxes, as well as the composition of natural organic matter. Oceanographic measurements and modeling studies will explore the effects of varying upwelling intensities on the physical, chemical and biological conditions in the coastal waters.



## THE SCIENTIFIC PROGRAM

### SUBPROJECT I Current status and regulatory functions of Hainan coral reefs

Once flourishing coral reefs of Hainan are coming under increasing pressure from sweeping coastal development. Understanding the response of corals to these pressures is crucial for predicting their resilience in the face of natural and anthropogenic disturbances. With this aim, measurements of photosynthetic performance, respiration and calcification will be taken.



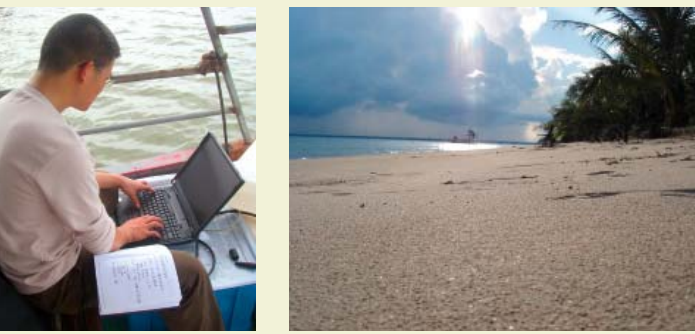
**SUBPROJECT 2 Status of shallow-water fish assemblages**

Tropical shallow-water habitats function as important nursery and feeding grounds for juvenile and adult fishes. Fishes move between different coastal habitats in close proximity, including mangroves, seagrass beds, sandy beaches and coral reefs. Knowledge about this connectivity is still rudimentary, especially in South-East Asia, although it is fundamental for the understanding of population dynamics and for designing effective conservation and management strategies.



**SUBPROJECT 3 Temporal and spatial variability of the upwelling close to the Hainan East Coast**

Upwelling is an oceanographic phenomenon that involves the flow of dense, cold, and usually nutrient-rich water towards the ocean surface, replacing the warmer, nutrient-depleted surface water. The water from the upwelling areas intrudes into the coastal zones and influences their physical, chemical and biological conditions. The strength and temporal evolution of this intrusion along the Hainan coast will be analyzed by a combination of data monitoring and modelling studies.



**SUBPROJECT 4 Estuarine modification of run-off and pollution fluxes**

Rapid economic growth in Hainan has led to increased discharge of both inorganic and organic pollutants. These pose a threat to the estuarine and coastal environment due to their potential toxicity to both humans and biota. These pollutants are mainly transported in association with natural riverine colloids and suspended particles. Analysis of pollutants along with selected natural carriers will clarify transport mechanisms to the coastal ocean and identify change processes occurring in the estuarine part of the system.



**SUBPROJECT 5 Fluxes and transformation of nutrients and organic matter from watershed to the coastal sea**

Human activities on land alter river water quality and the biogeochemistry of receiving coastal waters. Conversion of mangrove forests to aquaculture reduces the filter function of these areas and leads to increased release of sediments, nutrients and pollutants to coastal waters. Sewage effluents change the natural pattern of riverine carbon and nutrient fluxes. The goal of this study is to show how land-based activities and related riverine fluxes affect coastal habitats and their interdependency.



**CAPACITY BUILDING**

An important goal of LANCET is to build a platform for the exchange of scientific expertise between the partner institutions. Academic training activities include exchange visits by PhD and Master students to China and Germany. Periodic status seminars provide the opportunity for participants to meet and undertake an intensive scientific review of the results and current state of the project activities.



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