

PROJECT FICHE

-bilat BEL-VT R&D cooperation-

Projectcode BL/KBIN/V24

CLIMARCO

Project title : Development of a physical-ecological model system for the study of climate change and management of marine resources in Vietnamese coastal waters

(Geographic) study area (country/region) : North Vietnam, Hai Phong, Coastal zone of the Red River Delta and Ha long bay

Context and objectives

Vietnam is one of the most rapid growing economies in Asia with an annual growth rate between 7.0 - 9.0%. The Catba-Halong and Red River Delta coastal region is located along the northeastern coast of Vietnam. In the region there are several important marine resources not only on the Vietnamese but also on an international level such as Catba National Park - the World's Biosphere Reserve, Halong Bay - the World's Natural Heritage, Doson Beach - a well known tourist resort in Vietnam, the Red River Delta – one of the biggest deltas in Asia. By its richness in marine resources and an advantageous position in the northern focus of the economic triangle Hanoi - Haiphong - Quangninh the region has become attractive for economical development.

Halong Bay in the northern, the Catba islands in the southern and Baitulong Bay in the eastern part form a natural marine system, with an important potential for ecotourism (Tien, 2004). Halong Bay and the Catba islands are well-known for their unique tropical ecosystems with economically valuable resources such as coral reefs, mangroves, sea-grasses, more than 2000 small limestone islands, tidal wetlands and tropical forest. The area is also rich in marine biodiversity, counting 122 species of coral, 166 plankton, 208 zoobenthos, 11 sea grass and seaweeds, and 190 fish and shellfish. The Red River delta is the hub of all economic activity in the north of Vietnam, where the majority of the region's population is concentrated. The delta, which supports nearly half the country's rice production, is under threat due to its strategic position and unchecked population growth that is putting an increasing strain on resources and environment.

Activities, such as agriculture, aquaculture, fishing and tourist services are of great importance for the socio-economic development of the region. The increased economic activities represent, however, an imminent threat on the natural ecosystem. Examples are increased pollution due to shipping and tourism, excessive fisheries and agriculture activities causing a deterioration of water quality and a decrease of habitats and biodiversity. These threats and the predicted tendencies of climate change (see below), endanger not only the unique marine ecosystems but also the sustainable development of the region. In the context of the conflict between socio-economic development and environmental protection, scientists and administrators have agreed on the development and application of a general physical-ecological numerical model which can be used for studying the marine environment and resources of the Catba-Halong and Red River Delta, towards sustainable development of the region. The project will offer a valuable tool, firstly for the scientists for a better understanding of the complex ecosystem and, secondly, for administrators and managers to decide on policies for environmental protection, economical development and implementation of a climate management plan.

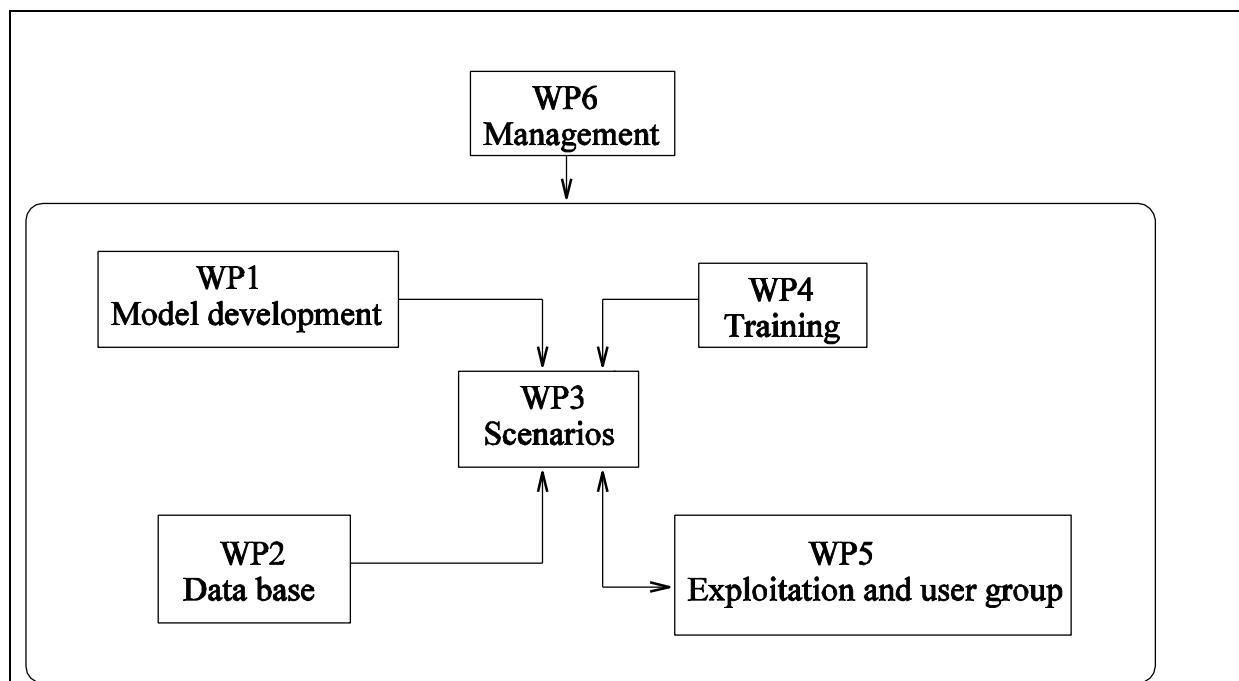
The project has the following objectives:

- The development and validation of a general physical-ecological model for the protection of the marine environment and resources of the Catba - Halong and Red River Delta coastal area towards sustainable development of the region.
- The establishment of a comprehensive data-base of observations and model results.
- The assessment of the impact of climate change and environmental risks by the design and simulation of realistic scenario studies.
- To define recommendations and strategies for an efficient exploitation of the natural resources and the planning of a global climate management plan for preservation of the unique ecosystems of the region in collaboration with local authorities and managers.
- The organization of training sessions for model users and hosting of Vietnamese experts.
- Establishment of an end-user group & dissemination of results to a wider scientific and management community.

Methodology

Six work tasks are defined to meet the objectives of the project:

- The first tasks to be performed are the construction of the integrated model (**WP1**) and the setup of a complete database for the area (**WP2**). These tasks will be started in the beginning of the project.
- Numerical scenarios conducted with the model are defined and analysed in **WP3**.
- Training sessions and exchange of personnel are organised in **WP4**.
- Establishment of an end user group of local authorities and managers and dissemination of project result (**WP5**).
- Reporting , publications and management issues (**WP6**).



Scientific Results

A 3D validated model with spherical coordinates and a grid resolution of 0.01° is developed for the Catba - Halong and Red River delta coastal zones. The program is composed of a physical core & an ecological component. A validation & a sensitivity study are performed in the framework of this package. A 2D nested model for the Halong bay area with its many small lime islands is developed. A detailed user manual of the latest version of coherens is made available (Luyten 2001), a document describing the code of the ecological module was also developed. Geographical and meteorological data, water temperature and salinity, river discharge, sea level data, harmonic constituents of the tides, nutrient concentrations and biological data were collected. A comparison and completeness check and quality control took place. Additional field surveys: 2 surveys (dry and rainy season) at 9 river stations, 3 points characteristic for the region and 30 spatial points were surveyed for nutrients and plankton. Temperature rise and sea level change scenario's as developed by IPCC and adapted by scientists to the Vietnamese situation, were performed and analysed. The model's performance for typhoons was tested on the historical Kathy typhoon of 1971. The impact of Hoa Binh reservoir on the hydrodynamics of the Red River Delta coastal area was studied and analysed.

Two scientists from IMER (Vu Duy Vinh and Cuong Chu The) stayed at MUMM from 14th of May 2010 till 10th of June 2010. One week training course took place at IMER from 18th of October 2010 till 22nd of October 2010. After the kick off meeting a seminar was organized by IMER. Invited guests were academics and a representative of the ministry of fisheries and resource of the Vietnamese government. An end user meeting took place on the 18th of January in Hai Phong, Vietnam.

Luyten P.J., 2011. COHERENS — A Coupled Hydrodynamical-Ecological Model for Regional and Shelf Seas: User Documentation. Version 2.0. RBINS-MUMM Report, Royal Belgian Institute of Natural Sciences.

Products and services

- K. Baetens, P. Luyten, T. Tran Anh and V. Vu Duy. The development of a physical model system for the coastal waters of the Red River delta in Vietnam: validation and sensitivity. IMUM 2011 - The 10th International Workshop on Multiscale (Un-)structured Mesh Numerical Modelling for coastal, shelf and global ocean dynamics, AWI Bremerhaven (Germany), August 22-25, 2011.

- K. Baetens, P. Luyten, T. Tran Anh and V. Vu Duy. A study of the historical typhoon season of 1971 in North Vietnam. IJonsmed 2012 Brest (France), May 21-24, 2012.

- K. Baetens, V. Vu Duy, T. Tran Anh and P. Luyten(2011). The influence of surface wind on the salinity distribution and circulation of the coastal waters of the Red River delta, Vietnam. Ocean Dynamics (Submitted).

- K. Baetens, V. Vu Duy, T. Tran Anh and P. Luyten(2011). The development of an DNPZ model for the subtropical coastal waters the Red River delta, Vietnam. (In preparation).

- V. Vu Duy, K. Baetens, T. Tran Anh and P. Luyten(2011). Nutrient dispersion in the subtropical coastal waters the Red River delta, Vietnam. (In preparation).

----- Ideas for future research-----

Vietnam is one of the most affected countries regarding climate change and the resulting sea level rise and temperature change. Aquaculture and mining are of high economic importance for the region. Therefore it becomes important to have sufficient knowledge about sediment transport and plankton/nutrient behavior. These features are affecting the population safety and the further development of aquaculture in the region.

Execution

Period: 01/01/2010 –01/03/2012

Laboratory/network) :

Belgium:

BMM/MUMM/UGMM, Katrijn Baetens and Patrick Luyten
Gulledelle 100
1200 Brussels
k.baetens@ mumm.ac.be
+32 2 773 21 45
P.Luyten@ mumm.ac.be
+32 2 773 21 38

Vietnamese partners:

Tran Dinh Lan (coordinator)
Tran Dinh Lan
Deputy Director
Institute of Marine Environment and Resources (IMER)
246 Da Nang Street, Hai Phong City, Viet Nam
Tel#: 84 31 35 65 026/35 64 892
Fax#: 84 31 37 61 521
Email: lantd@imer.ac.vn
Vu Duy Vinh
vinhvd@imer.ac.vn

Discipline

Oceanography

Hydrology

Ecology