Vietnam: a decade of Coastal Cooperation

from Vulnerability Assessment to Integrated Coastal Zone Management, from planning to implementation

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Contents

Summary

Vietnam has a highly dynamic coast. Its exponential economic growth, has left it critically vulnerable to the typhoons that regularly reach the coast. The projected impact of climate change makes the coast even more vulnerable. A decision-making process based on holistic ICZM provides a flexible approach to achieving more sustainable management in the interests of the population, economic development and the environment. Vietnam has made great strides in developing institutional mechanisms to developing such policies, simultaneously executing an ICZM programme at national and local level. Long-term international cooperation provides valuable experience to help cope with the present and prepare for adaptation to the potential future impacts of global changes.

This chapter describes the approaches adopted by the Vietnamese and the collaborative efforts with the Netherlands in preparing the framework and executing coastal projects during the last two decades. The success of these endeavours can be measured by the self-reliant and ongoing efforts of the Vietnam government to start the ICZM process in an increasing number of provinces, with the support of the Vietnamese Ministry of Natural Resources and Environment.

1.Introduction

Vietnam is a densely populated country with a long coastline. Half of the coastal zone is low lying, and 75% of the population live in provinces near the sea. Half of the major towns are situated in the coastal zone.
The Red River Delta in the north and the Mekong Delta in the south are fertile and important economic areas. The coastal plain of the central provinces is relatively narrow and bordered by high mountains.

Figure 1: ***Vietnam, its 3500 km long coastline and the three coastal VA and ICZM pilot provinces:***

1. *Nam Dinh, Red River Delta,*
2. *Thua Thien Hue, central part and*
3. *Ba Ria Vung Tau, Mekong River Delta.*
   (source VNICZM-Atlas, 2006)

Population and economics

The population density is unevenly distributed throughout the country: the highest concentrations of population (>3000 inh/km^2) are found in the two major delta areas. The population is growing steadily, at a rate of 1.2 % annually.
Vietnam is a dynamic country characterised by strong economic growth. Since the enactment of Vietnam's "doi moi" ('renovation') policy in 1986, Vietnamese authorities have committed themselves to increased economic liberalisation and structural reforms to modernise the economy and produce more export-driven industrial products, such as increasing oil-output.
The agriculture production increased in the same time to such an extent that Vietnam is now the second largest rice exporting country of the world, while in the early days Vietnam needed to import rice.
The economy grew since the middle of the 1990s annually with 6.8% and in 2007 even with 8.5%.
The shift away from a centrally planned economy to a more market-oriented economic model has improved the quality of life for many Vietnamese, the per capita income has been strongly rising since the beginning of the 1990s.

The contribution of the coastal regions to the GDP is more than 80% of the national GDP (VVA, 1996). The largest part of the capital investment occurs also in Vietnam's coastal region and was estimated to be 2.3 times GDP in 1995.
The total (State+ Non-State+ Foreign) investment in Vietnam is growing each year and increased with a factor 6 in the period 1994 – 2010, to a level of 400,000 Billion Dong (at a constant 1994 Dong value) in 2010 (GSO). The 2010 GDP of Vietnam is at 2010 current value: 2,030,000 Billion Dong equivalent with 104 Billion $US.

Accordingly, the capital investment in the coastal zone increased also very considerably. Hence the risk of flooding is strongly enlarged through strongly increased economic impacts of a flooding event in the low lying coastal and deltaic zones, as compared with the level of risk in the mid 1990s.

Political development and coastal legislation

The management of the coast of Vietnam combines both sectoral and territorial approaches. Ministries are charged with implementing nationwide policies and interests in the relevant sectors (fisheries, agriculture, forestry, industry, tourism). The Provincial People's Committees are responsible for the development of their Province. The responsibility for decision-making in the coastal provinces lies with three main bodies: the National Assembly, the Central Government (Ministries) and the People's Committees. The most relevant Ministries for coastal affairs are the Ministry of Resources and Environment, which has a coordinating role for environmental monitoring, Environmental Impact Assessment and maintaining and improving the quality of the water resources. The Ministry of Agriculture, Rural Development and Planning is responsible for water quantity management, flood protection and coastal defence and disaster management, and the Ministry of Planning and Investment for spatial planning and financing coastal infrastructure.

Several Laws, Ordinances and Decrees are important for coastal zone developments, such as the Law on Environmental Protection (1994 and 2005) and, the Decree on State Management of Investment and Construction (1994). The Decree on Comprehensive Management of the Sea and Islands (2009) developed by the government of Vietnam will be submitted to the parliament for approval in 2011.

Natural coastal habitats and biodiversity

An overview of coastal characteristics shows the large variety of coastal habitats. Coral reefs on rocky coasts alternate with the Red River and Mekong Deltas, dynamic sandy shores, dunes and tidal mudflats and mangroves At some locations sea-dikes are protecting the land. The coastal terrain is mainly low and flat in the two deltas and along the large Tam Giang lagoon in the central part of Vietnam. Coastal lagoons occupy about 5% of the coastline and vary in size from several hundred to more than 20,000 ha. The lagoons are separated from the sea by sandy beaches and dunes (up to 25 m high), they are connected to the sea by narrow inlets. These seasonally shifting inlets play an important role in the exchange of salt sea and brackish lagoon water. The residence time of the lagoon water, the water quality (salinity, pesticides, nutrients etc), the water and sediment balance influence nature conservation, fisheries, shrimp (cultures) and rice cultivation.

Tidal marshes in the north (75,000 ha) and in the south (205,000 ha) support 230,000 ha of mangrove forest (VVA 1996).

These tidal marshes support more than 60 species of fish, 140 molluscs, and 110 crustaceans, many water birds and mammals. Two thousand marine fish species have been recorded, 70% of which are demersal. The offshore coral reefs house many hundreds of species of marine algae and thousands of marine invertebrate species.

Land-use

The distribution of different land-uses in the Vietnamese coastal zone is one of the socio-economic indicators, required for a Vulnerability Assessment (VA) – study. Land-use maps have been made for the entire coastal zone of Vietnam, including the two deltas and are based on Landsat TM-5 images and produced with GIS.

From the 13 identified land-use classes : rice culture and forests, grassland and rural settlements in the north and south, are the most important, see the land-use map of the Mekong Delta region (Figure 4).

The threats

The coastal zone of Vietnam is vulnerable to flooding by rivers and sea due to typhoons and associated extreme rainfall events. Flooding has most serious consequences in the economically active areas such as the Red River and Mekong Deltas, as well as in the low-lying central coastal area. An average of six typhoons annually cross the coast of Vietnam, accompanied by heavy rainfall and extreme wind speeds, high waves and storm surges. The Northern provinces suffer the majority of these typhoon events (see Figure 2).

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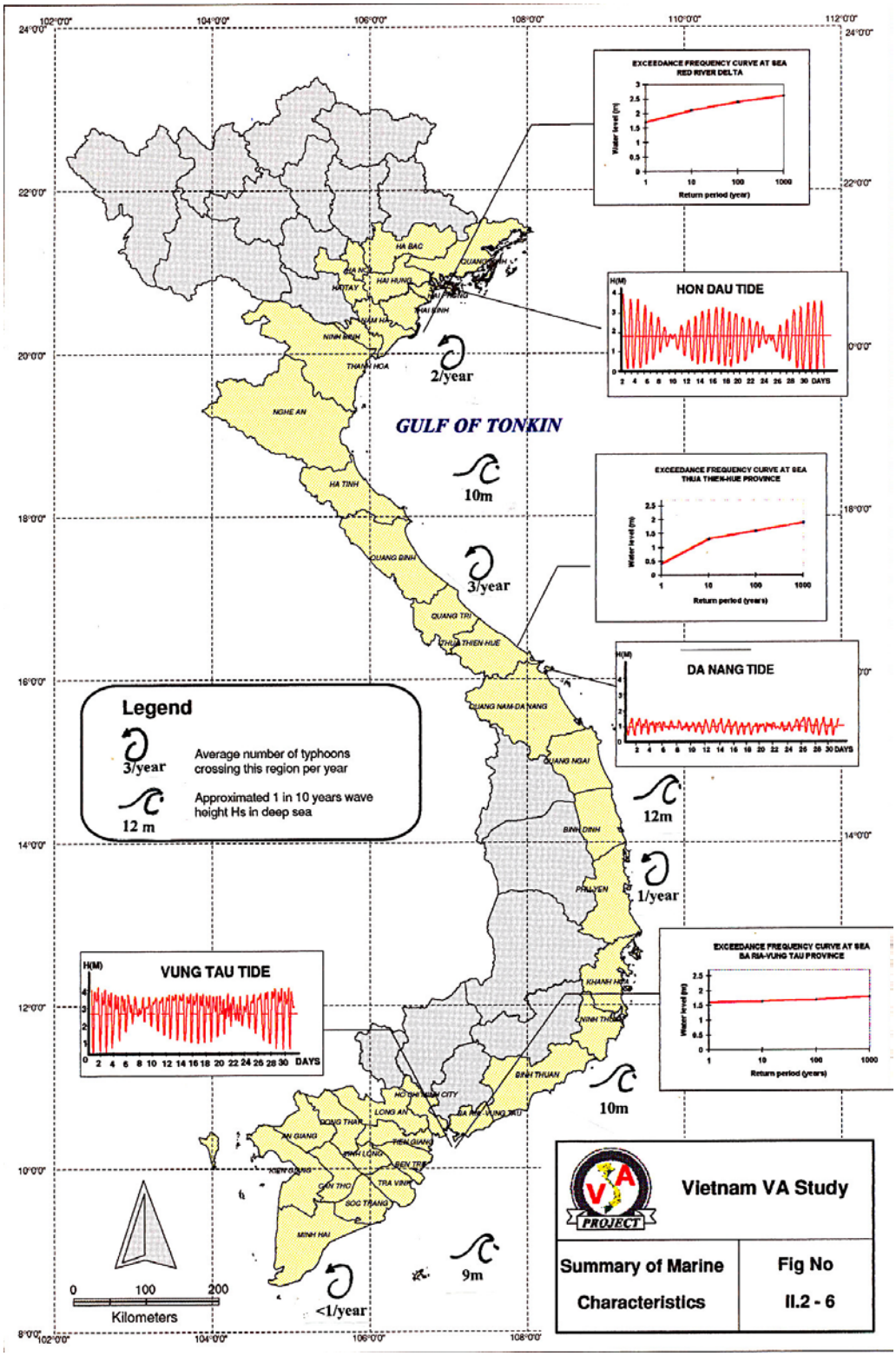

Figure 2: ***Marine, hydraulic characteristics of the coast of Vietnam****:*

- *Averaged number of typhoons ranging from 2-3 per year in the north to less than 1 in the south,*
- *High tidal amplitudes in the north and south (up to 4 m, in Hon Dau and Vung Tau),*
- *Large wave heights, between 9 - 12 m, during 1 in 10 year storm surge events.*

(source: Vietnam Vulnerability Assessment, 1996)

The combined effect of typhoons, the steady increase in population and strongly growing economic values has increased the pressure on the coastal resources, leading to unsustainable forms of resource exploitation, increase in environmental pollution and decrease in productivity of the resources. The main environmental threats to the sustainability of the coast and its resources are (Ministry of Natural Resources and Environment, MONRE 2006):

- Unsustainable use of natural resources (manifested by a decline of fish reserves, water resources and mineral resources);
- Degradation of ecosystems such as offshore coral reefs and sea grass meadows, and coastal mangrove forests. The natural value of these coastal wetlands, to protect the coast against storm damage and flooding, has strongly diminished during the last half century.
- Environmental pollution (water and soil) & natural and environmental disasters;
- Population pressure and conflict of interest between coastal stakeholders.

Besides these natural en socio-economic pressures, the envisaged impacts of climate change are an ongoing concern.

2. Vietnam Vulnerability Assessment to Sea Level Rise (1994 – 1996)

Introduction

A first exploration of the potential impacts of climate change, such as sea level rise, on the coastal zone of Vietnam, was presented at the World Coast Conference by Nguyen Ngoc Huan (1993). The vulnerability of the coast of Vietnam to Accelerated Sea Level Rise (ASLR) due to human induced climate change was assessed using the UN-IPCC – Common Methodology on Vulnerability Assessments (1991).

The Vietnam Vulnerability Assessment (VVA, 1996) thoroughly analysed the institutional setting, socio-economic developments and changes in hydraulic conditions of the coastal zone. Three scenarios were assessed for the base year 1995, the year 2025 (with 30 years of socio-economic development) and effects of a 1 m sea level rise. Central in the assessment were:

- The GIS analyses: digitised land-use and topographic data were used to determine the areas flooded in two cases (no SLR and with 1 m ASLR);
- The Flooding and Flood Risk analysis: using the GIS input, risk and loss calculations for categories: 'areas', 'people' and 'capital value invested' were performed;
- The Geo-Management System: to store, view and manage the large amount of diverse data of all the coastal units.

A full Vulnerability Assessment (VA) was conducted in 18 months (1994-1996). During this period, the technical capacity of the Vietnamese partners was strengthened through workshops and GIS training courses. These included the application of the tools facilitating decision-making, which were demonstrated through on-the-job training not only in the capital Hanoi, but also in local pilot study areas with different coastal problems. Seven technical reports were produced by a dedicated and large group of Vietnamese, Dutch and Polish experts funded and supported by the Vietnamese and Dutch Government (Ministries of Foreign Affairs, and V&W/CZMC-C). The Vietnamese hosting institution: HydroMeteorlogical Service / Marine Hydrometerological Centre was responsible for the execution of the VVA, with support of WL | Delft Hydraulics/Deltares, Frederic R.Harris and the CZM-Centre (The Hague) and the Institute of Hydroengineering of the Polish Academy of Science (Gdansk).

The VVA socio-economic scenarios cover the period 1995 – 2025. Socio-economic predictions over a 30-year period are difficult to make. However, with hind-sight, the scenarios used in 1995 are very good, when compared with the 2008 values of the General Statistics Office (GSO-Vietnam, 2008): Population, Gross Domestic Product (GDP) and Capital Value invested. This provides confidence in the results of the VVA.

Results of the Vulnerability Assessment:

Sea level rise is certainly not the only impact of human induced climate change effecting coastal zones. However, other important impacts such as changes in storm/typhoon regimes and rain intensities were not sufficiently quantified at the beginning of the 1990s to enable analysis to take place. Some of the main findings on the impacts of 1 m Accelerated Sea Level Rise (ASLR) and 30 years of socio-economic development (2025) scenario, in the event that no adaptive measures are taken, were:

- The Population at risk of annual flooding would rise by about 60% due to the effect of 30-year (scenario 2025) population growth. The effect of a 1 m ASLR on the population would result in annual flooding affecting up to 17 million people who might need to be moved. Over 14 million of those coastal inhabitants potentially affected will be located in the Mekong Delta provinces.

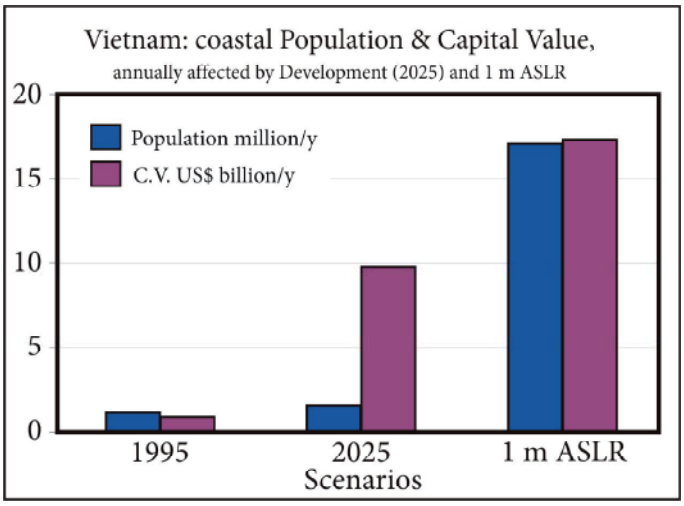

Figure 3: Millions of people and Capital Value (C.V.) in the coastal zone *will be annually affected due to 30 year socio-economic Development scenario (1995 – 2025) and to the effects of a 1 metre Accelerated Sea Level Rise (ASLR) , in case no adaptive measures are taken. (source: Global Vulnerability Assessment - 1993, adapted by R. Misdorp)*

- Capital Value (C.V.) at risk of annual flooding would increase by about a factor 10, due to the effect of 30 year of socio-economic development. The impact of 1 m ASLR on the Capital Value to be lost due to annual flooding will increase to 17 US$ billion, a significant proportion of the GDP (Figure 3).

The expected impacts of a 1 m ASLR on the increase of Population at risk is severe; the 30 years socio-economic development is particularly enlarging the value of Capital Investment at risk

- Coastal wetlands lost due to a 1 m ASLR could be as much as 60% of those present in the reference year 1995. The most threatened areas will be Minh Hai and the Vung Tau – mangroves near Ho Chi Minh City in the Mekong Delta and the Xuan Thuy Ramsar site at the Red River mouth. These coastal wetland losses will be difficult to prevent because there is no room for them to migrate landward.
- About 40,000 km2 of the Vietnamese coastal zone will be subjected to annual flooding in the case of 1 m ASLR. Over 90% of this area is located in the very flat and low-lying Mekong Delta, which will be almost completely inundated annually (Figure 4).

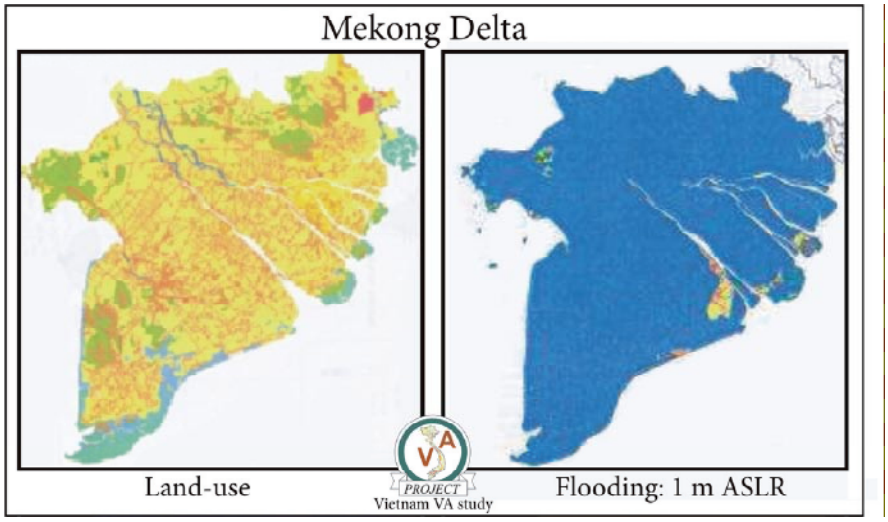

Figure 4: ***Mekong Delta – Land-use and Flooding:***
Land-use: dominant rice cultivation (yellow), rural-urban settlements (red/orange) and mangrove belts (blue green); Flooding: the Mekong Delta will be annually flooded under a 1 m ASLR scenario (in blue) in case no adaptive coastal protection measures are taken. (source: Vietnam Vulnerability Assessment, 1994 – 1996)

- Rice production loss: the Global Vulnerability Assessment (GVA, 1992) revealed that the coastal rice production of Vietnam is very vulnerable. About 15% could be lost as consequence of 1 m ASLR. This potential loss of rice production is the highest of all Asian rice producing nations investigated.
- Protection against flooding: is one of the three adaptive types of coastal responses identified, the other two are: Retreat and Accommodate (IPCC,1992). Raising all river dikes and low-lying houses in the Mekong Delta, strengthening coastal defences, installing additional pumping capacity and beach nourishment are all measures to help protect and considerably reduce the level of risk to the population and capital value. According to VVA estimates in 1996, the construction and maintenance costs of protection against the effects of a 1 m ASLR are very high: several percentages of GDP.

In summary (VVA 1996): the overall vulnerability of Vietnam to a 1 m ASLR, is critically high when considering the values that could be lost and those at risk, and the cost of adaptive measures. Vietnam is in many ways comparable, in terms of vulnerability, to the small island states of the world.
Integrated Coastal Zone Management is one of the effective adaptive responses to the potential impacts of climate change.

A more recent workshop on impacts of climate change in Vietnam
The importance of analysing the impacts of Climate Change, assessing the vulnerability of Vietnam and identification of adaptive response options has been confirmed during an MONRE workshop in Hanoi (MONRE/ICEM/IIED, 2007). This workshop discussed the major risks caused by climate change in the coastal region of Vietnam and the need to integrate adaptation measures in the development planning process. One of the outcomes was to focus on an analysis of the vulnerability to sea level rise, storm surges and flooding on the most affected districts and communes. The above VVA 1996 results could serve as a well-established methodological base for further detailed vulnerability assessments, integrated management, and identification of adaptive, no regret responses.

3 The Vietnam Netherlands ICZM project (VNICZM, 2000-2006)

The Vietnam-Netherlands Integrated Coastal Zone Management project (VNICZM project) was conducted under the leadership of the Vietnamese Ministry of Environment and Natural Resources (MONRE). The project aimed at strengthening long-term ICZM capability in Vietnam, focusing on advising the Vietnamese Government in the planning and development of a Vietnamese sustainable coastal zone strategy.
From the Netherlands: Royal Haskoning - leading partner of the Dutch NEDECO-consortium (website: Royal Haskoning Vietnam) , which consisted of WL | Delft Hydraulics/Deltares (website: Deltares) DHV consultants (website DHV-Group), UNESCO-IHE (see website) participated, as well as experts from the Dutch Ministry of Transport, Public Works and Water Management (CZM-Centre/Min.V&W, see website Netherlands Ministry of Infrastructure and the Environment). The Netherlands Embassy in Hanoi provided much appreciated financial support and guidance.

The VNICZM project was implemented in the context of the Vietnamese vision of an effective integrated coastal programme: "An ICZM programme should simultaneously be executed in the capital Hanoi and in coastal provinces according to the Vietnamese conviction of positive, holistic approaches and gradual decentralisation". Therefore, it was put in operation in Hanoi, Nam Dinh, Thau Thien Hue and Ba Ria Vung Tau provinces.

The Vietnam-Netherlands Integrated Coastal Zone Management (VNICZM) project contained different components. These included strengthening vertical integration (from river to coast and from national, provincial to community level); horizontal integration between research institutes and policy makers; strategies and action plans for ICZM at national and provincial level; institutional structures, legislation for ICZM; capacity building; stakeholder participation and dissemination of knowledge on coastal processes. These are all the first steps of any ICZM cycle.
An overview of legal frames and institutional developments related to ICZM is provided in MONRE&MA, 2007.

3.1 Some of the results at the national level:

A National frameweork CZM Strategy and Action Plan (SAP) was produced and adopted by the Ministry of Natural Resources and Environment (MONRE) and formed the basis for the Vietnamese ICZM Strategy.
The framework strengthened institutional cooperative arrangements and helped screen Socio-Economic Development Plans dealing with coastal investment projects.

The need for ***a CZM Centre*** for Vietnam has been identified through a Definition Study. The Ministry of Natural Resources and Environment (MONRE) is establishing incrementally a unit for ICZM. An ICZM Division, within the Vietnam Environmental Protection Agency of MONRE was formed in 2003. This paved the way for the establishment of an ICZM and Planning Centre within a newly established Vietnam Administration of Sea and Islands (part of the MONRE), and provides support for all ICZM Projects in Vietnam.

Improved accessibility of databases & GIS
A GIS framework for ICZM has been established for national use and in the three pilot provinces, based on implementation of the MONRE GIS Standards. A GIS meta-database has also been established (> 450 layers) and linked to the VNICZM project website. Training courses in GIS have been conducted in Hanoi, in the three provinces and in the Netherlands. Vietnam Coastal Zone Atlases (2006), have assisted the national level and provinces in producing the zoning plans as a part of the ICZM Strategy and Action Plan.

Dissemination, capacity building and awareness raising.
Capacity building was undertaken in different ways. A series of workshops and training courses were held in Hanoi and the three pilot provinces during the lifespan of the project. Missions to the Netherlands for high level Vietnamese (Vice Minister, DG and Vietnam project Director and Coordinator) of the hosting MONRE and other relevant Ministries were held annually to discuss the progress and coordination, with the Netherlands Ministries of V&W and Foreign Affairs. The development and practice of the Netherlands coastal management was demonstrated to many Vietnamese project colleagues. Their coastal knowledge was also increased by intensive training courses, and MSc education in the Netherlands training and water education centres (IHE-UNESCO, ITC, WL | Delft Hydraulics/Deltares, TUD, see alsoCCC II-8-5 and 8-6).
Awareness raising efforts on integrated water and coastal zone management and sustainable development were also undertaken at Vietnamese national and provincial levels, involving coastal experts, stakeholders, NGO's and school teachers.
VNICZM newsletters were distributed regularly as a hard copy among the coastal provinces and institutions, and also published on the VNICZM Project website, an essential instrument for the dissemination of the ICZM concepts and the products of the VNICZM project.

Evaluation of VNICZM project

Several evaluations of the projects were undertaken by independent experts. The last evaluation was performed during a public meeting, where the results of the VNICZM project were presented and discussed with scientists and NGOs under the guidance of the Deputy Minister of MONRE. During this final workshop, the provincial authorities expressed their eagerness to continue with the ICZM processes and have made allocations from state budgets. They also requested the Royal Netherlands Embassy consider a new project, which would not only further strengthen the introduction but also support the provinces with implementation of ICZM and harmonisation of coastal resource issues between neighbouring provinces (Vietnamnews, April 2006).

3.2 A number of VNICZM results at provincial level:

The VNICZM project operated in three coastal provinces, cooperating and involving Provincial People's Committee's, provincial departments, coastal districts and communes, NGOs, Universities and stakeholders. Many ICZM activities were carried out, such as:

Nam Dinh Province - Red River Delta:

- ICZM Strategy and Action Plan was produced and approved by the People's Committee of Nam Dinh Province ;
- Nam Dinh Pilot Study - Sea Dike: coastal erosion threatening coastal villages. The sea defence study for the Hai Hau District addressed immediate solutions for this pressing problem in the province;

*Figure 5**: Cover page of ICZM Strategy, Nam Dinh 2003.** (source: VNICZM, 2003)*

*Figure 6: **Nam Dinh Province**: salt panning behind the sea-dike in a polder; ongoing coastal erosion and flooding; eroded and flooded & ruined village with remnants of church towers; sea-dike toe erosion. (photos: Hans Pos, VNICZM project)*

- A review framework was provided for wetland management issues of the RAMSAR site at the Xuan Thuy reserve and the land reclamation issues near the Nan Co River mouth;
- Master planning was undertaken for accreted new land in the Nghia Hung district, Nam Dinh;
- Ecotourism potential at Xuan Thuy National Park was explored.

Thua Thien Hue province: central Vietnam

- The Provincial People's Committee of Thua Thien Hue province adopted the ICZM Strategy and Action Plan produced by the stakeholders. A strong ICZM base was established by intense participation of stakeholders focused on producing an ICZM Strategy Document. In the preparation of the Strategy, the Peoples Committee of TT Hue province chaired the process of dialogue, which uniquely brought together Departments, local consultants and stakeholders in detailed discussions of problem issues, strategies for the future and potential action plans for solutions.

Figure 7: ***Coastal erosion Thuan An, TTHue Province, due to the November 1999 typhoon.*** *(photo: R.Misdorp)*

- TTHue Pilot Study on Lagoon management, aimed to prevent flood impacts, overfishing and water quality problems. The concept of carrying capacity for the TTHue Lagoon was introduced and defined as the 'load' that an ecosystem can 'carry' before 'breaking'. 'Load' is the 'impact' of functional uses on an ecosystem The ecosystem can 'carry' these 'loads' because of the intrinsic natural potential for neutralising impacts. A lagoon monitoring system, measuring some of the carrying capacity indicators, was set up by Coastal Cooperative Programme (see hereunder and CCC II-8-4) as a first step to quantify the carrying capacity of the Lagoon.

Ba Ria Vung Tau province: northern part of the Mekong Delta

- Key ICZM issues were inventoried: conflicting pressures of tourism, nature (mangroves), industrial developments and coastal erosion. Dialogues were held across a wide group including the People's Committee, Departments and coastal Districts.
- A Guideline for ICZM Strategy and Action Planning was well received.

Figure 8 : ***Severe erosion at Loc An shore*** *with damaged coastal vegetation, after sever storm surge, Ba Ria Vung Tau. (photo: Hans Pos)*

Figure 9: ***Beach tourism in Thuy Van,*** *Ba Ria Vung Tau Province. (photo: Hans Pos)*

- Commune level evaluation and participatory studies at Loc An and Phuoc Tinh have been conducted where estuarine water quality and dike erosion problems cause degradation of living standards and safety.
- Subsistence fisheries continue to play an important role in coastal communities: examples from the Vung Tau pilot area were investigated in relation to the mangrove's vitality and industrial developments.
- Need for oil spill contingency planning in the HCMC–Vung Tau corridor, was identified as a critical issue, a project outline was produced, which will be submitted for donor funding.

The three VNICZM pilots have completed the three steps of the first ICM cycle including preparing, initiating and developing adaptive response options and sustainable resource management in the Vietnam coastal zone (MONRE & MA 2007).

4. Coastal Cooperative Programme (CCP, 2002 – 2005)

The Vietnam Netherlands Coastal Cooperative Programme (CCP) was an extra-support to the VNICZM project.
The VNICZM project provided the long term "over-arching" strategic framework, while CCP focused on more "practical" coastal issues to be implemented at provincial level (Global Studio, 2002).
The Coastal Cooperative Programme was an inter-ministerial programme between the Vietnamese Ministry of Natural Resources and Environment (MONRE) and the Netherlands Ministry of Transport, Public Works and Water Management (CZM-Centre/Min.V&W/Min.I&E), and Ministry of Foreign Affairs (Royal Netherland Embassy – Hanoi) . It was formalised during the visit of the Netherlands Vice Minister of V&W to Vietnam, October 2001.
CCP's main aim was to contribute to a better understanding of the natural and socio-economic processes in the coastal zone of TTHue province and to strengthen the decision making process. A detailed work plan with thematic activities was agreed and carried out.

An overview of results of the seven thematic Coastal Cooperative Program activities:

Strengthening the ICZM - Government to Government relation at a national level by regular exchanges between high level governmental officials of MONRE and Min.V&W, and Netherlands Embassy, and supportive preparations for a CZM centre in Hanoi.

Platform discussions at local level: involving authorities and stakeholders at provincial, district and commune level for identifying present and future coastal problems and solutions. Three consultative Platform discussions with heads of districts, farmers, fishermen, aqua-culturists, representatives of women leagues, were held in Thuan An, one of the main fishery towns on the shores of the Tam Giang lagoon, TTHue Province:

Coastal problems were prioritised and the number one problem was the quality of drinking water, followed by sanitation, typhoons causing flooding and coastal erosion, and the conflict of interest between rice farming, fishery and aquaculture.

Solutions were discussed including using rainwater instead of pumping brackish lagoon water; developing self-supporting home sanitation units (see CCC III-3-3-6); improved typhoon early warning systems; ceasing to build houses/ hotels/tourist infrastructures in the highly dynamic, active eroding and accumulating zone of the beach and in typhoon-flood prone areas (see Figure 7 and also CCC-II-8-2).

Wetland management and restoration: training in the Netherlands and on-the-job;

Five Vietnamese VN-ICZM and CCP colleagues from Hanoi, Thai Binh, Hue and Ba Ria Vung Tau participated in two intensive, 4 – 6 weeks, international training courses on Wetland Management and Wetland Restoration, in Lelystad (RIZA/Min.V&W), the Netherlands. The knowledge gained during these courses was used to create an integrated vision on the functions, resources, management and development of Vietnamese wetlands: e.g. the northern part of the Tam Giang lagoon in TTHue Province (see Figure 10). This lagoon is one of the world's largest coastal lagoon systems, about 70 km long and covering almost 22,000 ha.

Figure 10: ***View on the northern part of the Tam Giang lagoon system – Thua Thien Hue Province****, enclosed between the present and ancient, inland series of white, beach ridges, with the delta of the Bo river and its wetlands in the north. (photo: Google Earth: ©2011 Cnes/Spot Image Image ©2011 TerraMetrics Image©2011 GeoEye Data SIO, NOAA, U.S.Navy, NGA, GEBCO)*

Awareness raising at schools in TTHue Province on the role of water as a friend and a foe, involving children, parents and teachers. This activity began with a drawing competition (see Figure 11) covering a wide range of issues: flooding, irrigation, water cycle, sustainable development and integrated management of rivers and coasts. This was followed by the production of an Introductory Booklet: "The role of water" and followed by a comprehensive Training Manual:" Where Waters and Land meet" for school teachers. The Booklet, translated in Vietnamese language, was distributed among all the 5000 teachers of primary and secondary schools in the TTHue Province. Both products are available in this CCC Internet publication (see CCC V-1-2 and 3).

Figure 11: ***One of the winning drawings*** *of the primary school drawing contest: "The role of water" as a friend = playing with the rain and sometimes as a foe. (source: CCP 2002)*

Remote Sensing (RS) application for TTHue province involved transferring knowledge from Netherlands and national Vietnam Remote Sensing institutions to the TTHue province, through two hands-on training courses of each two weeks in Hue with each 40 – 50 participants. Applications of RS were demonstrated: typhoon flooding sensitivities of low lying areas, land-use mapping, soil erosion mapping in mountains effecting the lagoon and coast, fishery developments, meta data base management - see for more information CCC II-8-2.

Impacts of developments in the river basin on the coastal zone: demonstrations and analysis by the GIS water balance model STREAM (CCC III-3-2-6). Spatial outputs of the validated and calibrated STREAM model are generated including water availability in the form of monthly river discharges (m3/sec, Figure 13) for the river basins of the TTHue Province. The free of charge input data are elevation (Figure 12), soil, slope maps, various socio-economic developments and climate change scenarios. Using IPCC scenarios e.g. future rainfall & temperature values for this region, STREAM showed the potential for higher future evapotranspiration rates. The impact of climate change suggested a decrease of 10 to 35% in monthly run off during the peak flow period (September – December). These outputs are valuable for integrated lagoon modelling and provided directions for policy preparation.

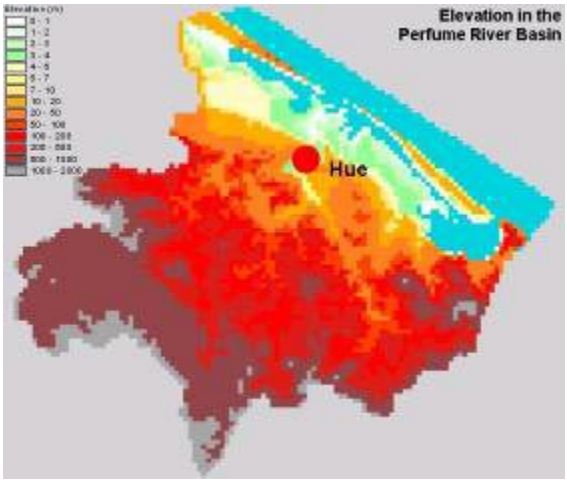

Figure 12 ***: One of the inputs for STREAM****:*
GIS digital elevation map. (source: CCP 2002)

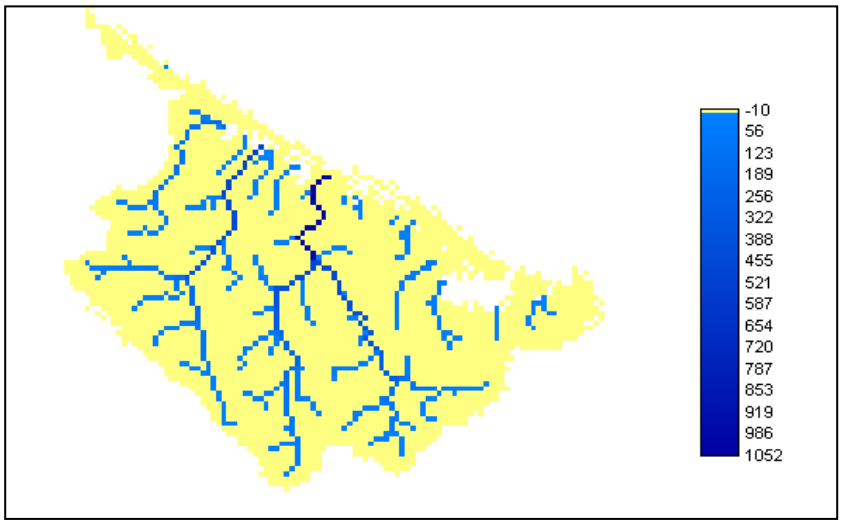

Figure 13: ***Two STREAM-outputs:*** *Simulated drainage pattern of TTHue Province and river discharges in blue colour (m^3 per second) for the month November 1999, during which typhoon "Eve" hit the province. (source: CCP2002-Task6, October 2002)*

Integration of modelling and monitoring of environmental lagoon quality, coastal dynamics – TTHue Province.
The results of the CCP monitoring and STREAM model runs were inserted in an integrated ecosystem model focused on the carrying capacity of the Lagoon. This integrated modelling was presented and finalised during one of the hands-on Remote Sensing CCP training courses. Effects of socio-economic development (e.g. aquaculture) on the coastal zone of TTHue province, particularly on the Lagoon water quality, were demonstrated in relation to the intrinsic neutralising capabilities of the lagoon system and its wetlands (see CCC II-8-4).

The CCP 2002 Programme was evaluated on its effectiveness by an independent consultant (Global Studio, 2002). The main findings were:

- Satisfaction about the CCP performance was expressed at the Vietnamese national and provincial level. Almost all the CCP-2002 objectives were reached at in a effective manner;
- Different concepts of coastal cooperation were simultaneously executed. The VNICZM project focused on the 'high level' – strategic, institutional issues, the CCP addressed the more 'down to earth' aspects of management. The Vietnamese and Netherlands key officials and experts stated that this division of labour was successful in the execution of the ICZM programme at a provincial level.

This positive evaluation resulted in a continuation of the CCP programme supported by the Netherlands Ministry of Infrastructure and the Environment (former Ministry V&W) in close coordination with the Netherlands Embassy in Hanoi, in order to strengthen the ICZM efforts in Vietnam.
During the extension period 2005 - 2009, CCP focused on the planning of resource use and local community livelihood (MONRE&MA, 2007).

5. ICZM updates and outlooks

In 2006 the Ministry of Natural Resources and Environment published the document ''Vietnam's ICZM Strategy 2020 and Orientation up to 2030''. This document is the result of a participative Vietnamese process, achieved through continuous consultative procedures in which a wide range of stakeholders from relevant Vietnamese authorities at national as well as provincial level worked together, both at technical and managerial level.
Future Vietnam ICZM activities will be based on the principles outlined in the ICZM approach that has been worked out and tested by MONRE (amongst others by the VNICZM Project). According to this approach, ICZM should be implemented through ICZM strategies and action plans at provincial, district and commune level.
The 2030 aim is to develop and manage the coastal zone of Vietnam in a sustainable way through integrated coastal zone management, to preserve its role as an equitable source for peoples' livelihood, safety and economic prosperity for all present and future generations.
The overall 2020 objective: to implement the Vietnam ICZM Strategy 2020, to reach out to all coastal provinces, by creating sustainable inter-sectoral, interagency and inter-governmental coordination and cooperation mechanisms, working together in harmony with the stakeholders.
The strategy has been drafted as a long-term policy and covering the period 2006 –2020. The strategy will be reviewed and if needed reformulated and adapted every 5 years.

Building on the success of the preceding ICZM endeavours in Da Nang city (ICM demonstration project) and ICZM pilot projects in Nam Dinh, Thua Thien Hue, Ba Ria – Vung Tau, Quang Nam provinces, the Vietnamese government has planned and is executing a national Vietnamese ICM work programme 2008 – 2013. This programme will strengthen the ongoing ICZM efforts, while in 17 other coastal provinces new ICM programmes will start (MONRE&MA, 2007).

International cooperation in the future

In the Netherlands, the government approved a new policy document, the 'National Waterplan 2010-2015' (December 2009). The main issue is to be prepared to cope with future's challenges relating to water. One chapter of this plan is dedicated to cooperation with a number of deltas in the world. One of these deltas is the Mekong Delta. The aim is to cooperate in tackling the unfavourable consequences of climate change.

The Dutch and the Vietnamese Governments are preparing a document, in which they agree to cooperate for10-20 years in identifying solutions to the struggle against the impacts of climate change, such as sea level rise, more intense rainfall, droughts etc. Integrated coastal zone management will be one of the key ways of identifying problems and solutions to the impacts of climate change. This cooperation will boost the ongoing ICZM-efforts in Vietnam."

An example of strengthened bilateral cooperation is the preparation of the Delta plan to protect Ho Chi Minh City against flooding in the future. The deputy mayor Nguyen Trung Tin of Ho Chi Minh City and alderman Alexandra van Huffelen of the city of Rotterdam signed an Memorandum of Understanding to make Ho Chi Minh City climate-proof in 2011 (see Royal Haskoning, 2011). The two cities are going to work closely together over the next few years to create a delta plan for the further development of Ho Chi Minh City and the extension of its harbour. In this "Ho Chi Minh City Moving Towards the Sea with Climate Adaptation" action plan, various authorities, the harbour corporation and other parties involved, will work closely together on a long term development strategy and measures for the city. This strategy anticipates the tremendous effects of climate change on Vietnam, and in particular on Ho Chi Minh City and the Mekong Delta, as analysed in detail by the preceding VVA, VNICZM and CCP programmes.

6. Conclusions

Vietnam has a high economic growth as well as being one of the critically vulnerable coastal countries to the effects of accelerated sea level rise (one of the impacts of climate change).

The ICZM concept is attractive for Vietnam because it supports a holistic view on management and development, including the application of horizontal and vertical integration in policy preparation, and the willingness to strengthen a more decentralised policy- and decision-making process all within the limits set in the Constitution of Vietnam.

Simultaneously executing ICZM activities at national and provincial and district/communal levels requires coordination, which can be expensive in time and money. However, it has been a successful endeavour, as illustrated by the products produced at the provincial and district levels in the pilot ICZM Provinces, and the enthusiasm expressed by the many other coastal provinces eager to join the ICZM process. The Vietnamese government emboldened by the results of the ICZM evaluations is determined to reinforce the future Vietnamese ICZM efforts and the gradual decentralisation of decision-making.

Experience with the systematic application of ICZM in the Vietnamese provinces, proved that it is the best management tool to help the provincial authorities to reach sustainable development in the coastal zone.

In conclusion, three periods of 'working' resulted in recognised products:

- 1993 : first Vietnam VA steps presented at the World Coast Conference,
- 1994 – 1996 : a full VVA and
- 2000 – 2006 : VNICZM & CCP Programmes.

These periods were preceded by others when nothing seemed to be happening. However, finding the right partners (ministerial partners, knowledge institutions, consultancies) in both countries, ensuring funding, making work plans, all requiring full agreement between the Vietnam and the Netherlands' initiators that took time, almost as much as the actual 'working' time of the projects themselves.

ICZM is a long-term endeavour, but it is worth the effort, helping provide improved economic development and sustainable functioning of the coastal system.

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