



INTEGRATED COASTAL FLOOD RISK MANAGEMENT AS A MEANS TO BUILD RESILIENT COMMUNITIES

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ABSTRACT: There is a clear trend in the increase of damages and loss of lives and livelihoods in coastal areas as a result of rapid increase in coastal populations, and overall socio-economic development in coastal regions resulting in an increase in vulnerability of populations exposed to coastal floods and exposed infrastructure. Coastal flooding as a result of i.e. storm surges are difficult to predict and cannot be prevented, however there are means to apply integrated flood risk management approaches aiming to reduce the impact of coastal floods. A measure of the effectiveness of such approaches is the awareness and response of coastal communities to coastal flood risks. The paper introduces best practices and methods to lower coastal flood risk at the level of provinces, districts and the community level. This includes advances in coastal flood forecasting and early warning practices, improvement of institutional preparedness and integrated flood management practices as well as measures at the community level aiming to strengthen their resilience to coastal floods. The paper provides a showcase for the historical development and achievements to pave ways for the eventual implementation of a pilot project on integrated flood risk management in coastal areas in central Viet Nam.

Key Words: coastal flood management, communities, integrated flood management, resilience, Viet Nam

1. COASTAL ZONE DEVELOPMENT: TRENDS AND VULNERABILITY TO FLOOD HAZARDS

Population pressure in coastal regions remains unabated. In general, population densities in coastal regions are about three times higher than the global average and 23% of the global population lives in distances less than 100 km away from coast lines and below 100 metre above sea level (IPCC, 2007). Up to 50 percent of the population in northern Africa and in Bangladesh lives in coastal areas; along the Nile Delta, the population density reaches 500 to 1,000 people per square kilometre (Brown *et al.*, 2002).

On one side this has resulted in economic growth especially in developing countries in terms of industrial production, transport, agriculture, fishery, aquaculture and tourism, to name a few. But rapidly increasing population has also resulted in steep environmental degradation and an increased vulnerability of the coastal population, livelihoods and infrastructure to the effects of storm surges, tidal floods, floods in estuaries and deltas and – most fatally, the effects of tsunamis. These hazards are likely to be amplified due to climate-induced sea-level rise in many parts of the world.

Along with the population pressure and increasing economic activities, half of the world's wetlands disappeared in the 20th century, as did 50 percent of all mangroves (FAO, 2001, Burke *et al.*, 2001). And with these, buffers against storm surges vanished too, thus increasing the flood risk to populations in coastal areas.

In terms of damages, the Berlin-based Global Climate Forum states that “Coastal regions may face massive increases in damages from storm surge flooding over the course of the 21st century. According to a new study published in the Proceedings of the National Academy of Sciences, global average storm surge damages could increase from about 10-40 billion USD per year today to up to 100,000 billion USD per year by the end of century. In 2100, up to 600 million people (around 5 percent of the global population) could be affected by coastal flooding.” (Global Climate Forum, 2014)

2. CONCEPTS AND APPLICATION OF INTEGRATED COASTAL FLOOD RISK MANAGEMENT

With a view to balance economic development with environmental needs and within a framework to minimize impacts of natural disasters, increased human and economic pressure in coastal zones calls for the adoption of the concept of Integrated Coastal Management (ICM), which is an internationally accepted approach to managing resources allowing policy makers and planners to take population and economic issues into account when looking at the pressures, threats, and opportunities facing coastal areas. The ICM concept itself is based on the United States' 1972 Coastal Zone Management Act where the U.S. Congress recognized the importance of meeting the challenge of continued growth in the coastal zone by passing the Coastal Zone Management Act (CZMA) in 1972. The purpose of ICM is to maximize the benefits provided by the coastal zone and to minimize the conflicts and harmful effects of activities on social, cultural and environmental resources. In this respect, ICM is a process of governance that consists of the legal and institutional framework necessary to ensure that development and management plans for coastal zones are integrated with environmental and social goals, and are developed with the participation of those affected (World Bank, 1996). Over 100 nations have already signed up to this concept. However, coastal zone management and in particular coastal flood risk management needs to be linked to river basin management within the wider context of Integrated Water Resources Management (IWRM) and not treated in isolation from each other

In this regard, Integrated Coastal Management is a part of the concept of Integrated Flood Management (IFM) that is promoted by the Associated Programme on Flood Management (APFM), operated by the World Meteorological Organization (WMO) as specialized agency of the United Nations in cooperation with the Global Water Partnership (GWP) (WMO, 2009). The APFM facilitates the dialogue with governmental agencies and provides a platform for guidance on flood management policy, strategy and institutional development. The programme's objective is to promote the concept of Integrated Flood Management (IFM) as a new approach in dealing and living with floods. Amongst others, key objectives of IFM are:

- Sustainable development: balancing development needs and flood risks,
- Maximising net benefits: ensure livelihood security and poverty alleviation thereby reducing vulnerability,
- Minimising loss of life and livelihoods: in particular through preparedness planning for extreme events, and
- Environmental preservation: ecosystem health & services.

This is achieved through a multi-disciplinary approach and using a best-fit mix of traditional flood management measures including structural measures; and non-structural measures including improved land-management and flood risk assessments such as through the development of flood risk maps and derived decision-making and management plans. Through the APFM-HelpDesk (www.apfm.info), a large number of publications in the form of Tools are available that can be applied for specific cases in integrated flood management.

Some of the central components of successful integrated flood management activities include:

- Improvement of the legal and institutional framework as a basis for flood management,
- Development of national or regional flood management strategies and action plans,
- Developing a “best-mix” of traditional and innovative integrated flood management solutions,
- Thinking in options and not single-best solutions,
- Improve forecasting and early warning services that are meaningful for recipients,
- Enabling management staff at all levels to understand the concept and applying it in actual flood management projects,
- Improvement of the legal and institutional framework as a basis for flood management,
- Improving communication and interaction between stakeholders including communities, districts, provinces and at national level, and
- Engage in fully participatory planning processes to achieve best possible sustainability of flood management actions.

Specifically with regard to coastal flood management, possible starting points are the assessment of the severity, frequency and duration of coastal flood risks including the present level of accuracy and timeliness of coastal flood forecasting services. In particular, recognizing the high vulnerability of coastal areas to storm surges and coastal inundation/flooding due to Tropical Cyclones in many parts of the world, there is a strong need for the development and implementation of comprehensive forecasting and warning systems (figure 1), which allow dedicated disaster prevention agencies to safeguard lives and mitigate damages to infrastructure in coastal areas.

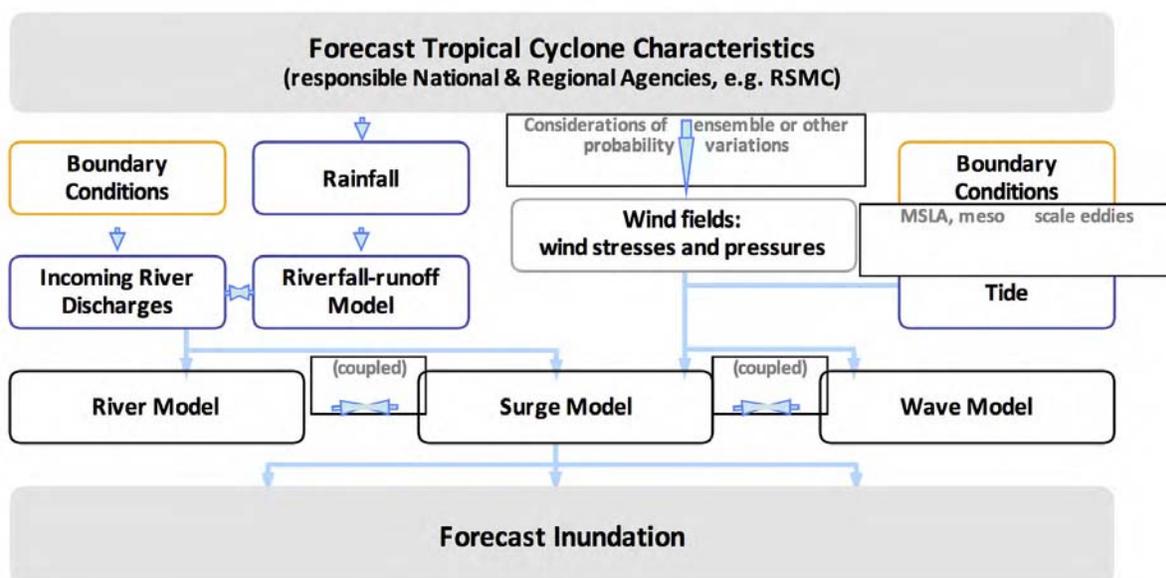


Figure 1: Forecasting concept of the Coastal Inundation Forecasting Demonstration Project

The goal of the Coastal Inundation Forecasting Demonstration Project (CIFDP) currently under implementation is to show how coastal inundation forecasting products can be improved and effectively coordinated with warning services provided by the National Meteorological and Hydrological Services (NMHSs). This project is undertaken by WMO Commissions in particular the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy), in cooperation with a consortium of experts and related institutions of excellence in the field of storm surge, wave and hydrological flooding (JCOMM, 2012).

Furthermore, the development of integrated coastal management plans requires the assessment of flood risk of the population, infrastructure and assets that are potentially threatened by coastal floods. This includes the use of various flood mapping tools (WMO, 2013b) and the assessment of the resilience of coastal communities such as using approaches as presented in the Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards (IOTWS, 2007).

The definition of a framework for Integrated Coastal Inundation Management provides a pathway how socio-economic benefits can be derived from the situation-oriented application of Integrated Flood Management tools such as:

- ❑ Guidelines on Flood Mapping,
- ❑ Storm surges and coastal flood scenarios development,
- ❑ Land management decision-making support,
- ❑ Legal, social and environmental case studies, and
- ❑ Real-time disaster response support.

In the context of the CIFDP project, figure 2 shows the linkage between improved forecasting and warning systems and making these forecasts relevant for decision making in policy and management.

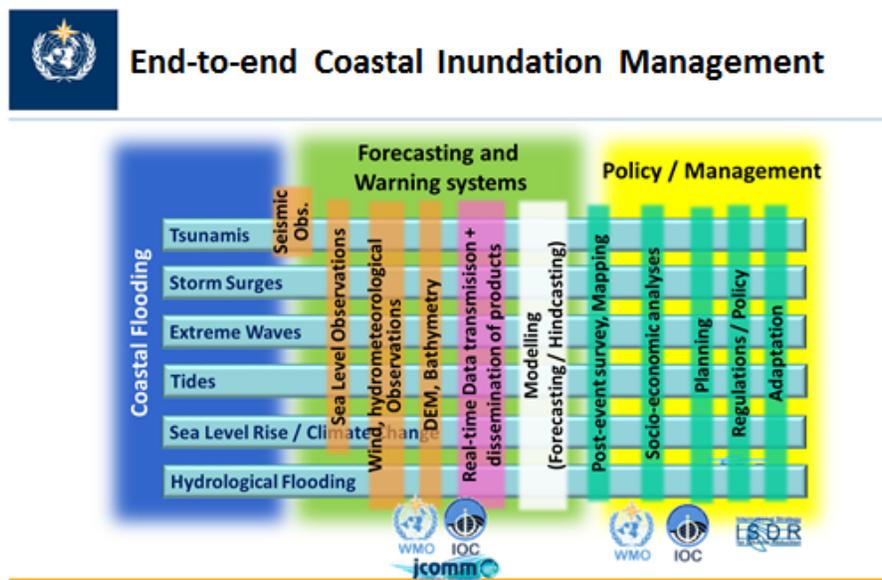


Figure 2: Linking forecasting and warning systems with the policy and management domain in coastal flood management (WMO, 2013a)

Being of a multi-disciplinary nature, coastal flood risk management is best undertaken through a step-by-step approach as shown in figure 3 below. It needs to be highlighted that the development of a continuously updated (dynamic) Coastal Risk Information System is the key component for policy definition and decision-making bearing in mind, that policy and decision-makers need a choice of options that allows a balanced approach between investment, impacts (consequences) and beneficial returns of measures undertaken in addition to acceptance by the population at risk.

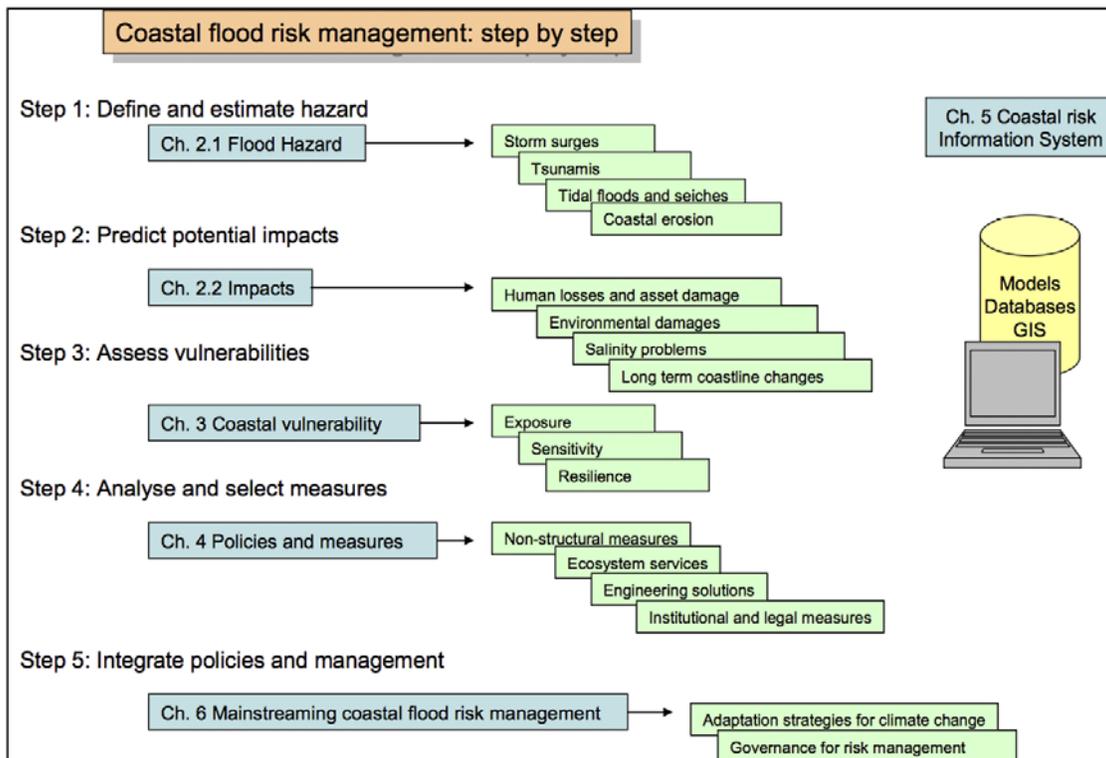


Figure 3: Flowchart of the stepwise implementation of coastal flood risk management plans. The steps relate to specific chapters in the APFM Coastal and Delta Flood Management Tool (JCOMM, 2013)

3. DEVELOPMENT OF A PILOT PROJECT ON INTEGRATED COASTAL FLOOD RISK MANAGEMENT IN VIET NAM

Initiated by the government of Viet Nam and in cooperation with WMO, a workshop was held in Hanoi, Viet Nam from 28 October to 1 November 2013. The aim had been to identify current needs and requirements for integrated coastal risk management in Viet Nam. The immediate objective had been to define a pilot project to validate the applicability of the integrated coastal flood risk management approach. This is seen as an important contribution towards the improvement of coastal management practices related to floods. The project will focus on Quang Ngai province and two neighboring provinces in the coastal region of central Viet Nam.

The background for this workshop has been a report (World Bank, 2009) of the Global Facility for Disaster Reduction and Recovery (GFDRR), where Viet Nam is listed as one of the most disaster-prone countries in the Asia-Pacific region. People are affected mainly by floods and storms, which accounted for

about 91% of the total natural disasters with a total annual average damage of nearly US\$ 2 billion. The 2011 Global Assessment Report of UNDP and ISDR (GAR, 2011) on impacts of floods and storms indicated that Viet Nam suffered an estimated annual economic loss equivalent to 1.3% of GDP or USD 3.85 billion. According to this study, the coastal areas, especially those in the central part of the country, were severely affected with high fatalities and economic damage because these provinces are extremely exposed to annual typhoons storm, associated storm surges, flash floods and associated landslides. During the period 2007 to 2011, more than 500,000 houses were damaged or destroyed in the provinces of Quang Binh, Thanh Hoa and Ha Tinh in Central Viet Nam.

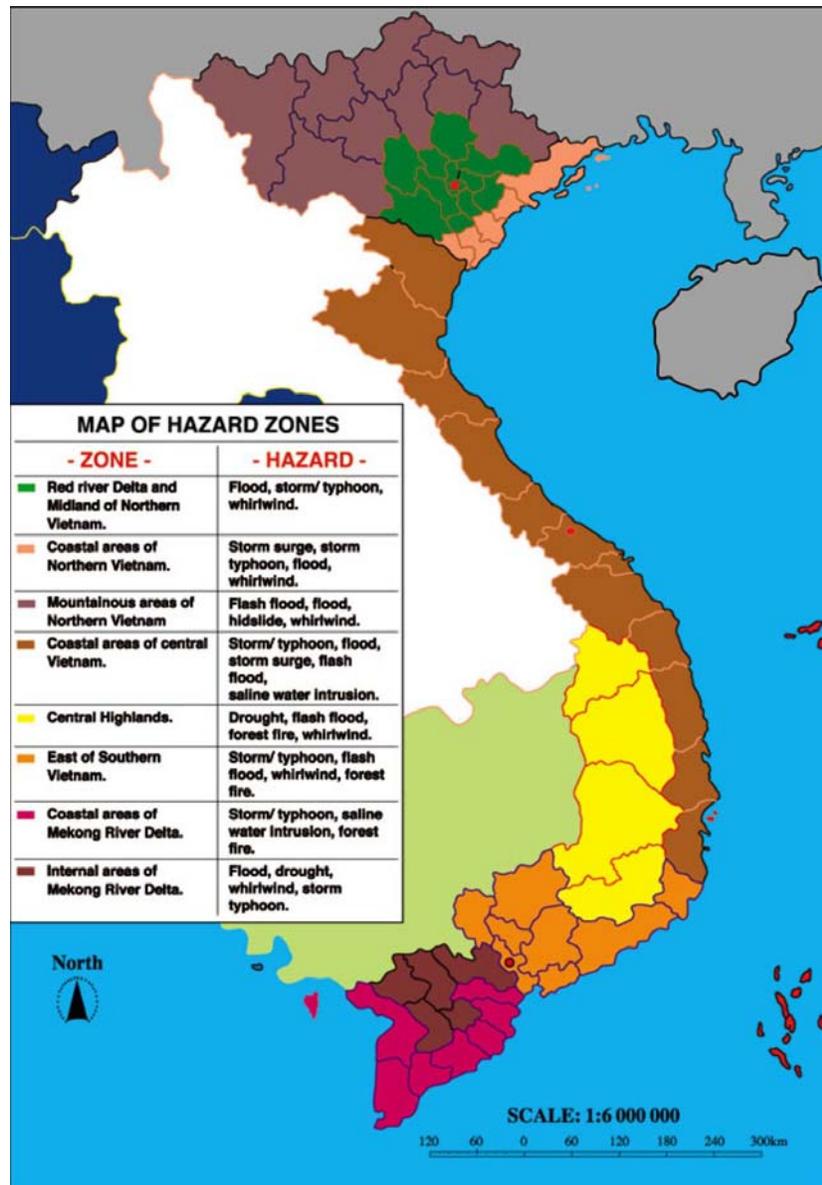


Figure 4: Map of delineated provinces and hazard zones in Viet Nam (SRVN, 2004)

Integrated Coastal Flood Risk Management (ICFRM) is a new concept in Viet Nam, especially for the coastal areas where this concept is urgently needed to ensure sustainable economic growth in the affected areas as well as sustainable socio-economic development of the country as a whole.

The overall objective of the planned project is to build on past developments and achievements in the field of disaster risk reduction so as to improve the disaster risk management capacity for coastal areas of Viet Nam in an integrated manner. Specific objectives are:

- To develop and apply a proto-type model for integrated coastal flood risk management and information for selected areas of the Quang Ngai Province, for possible replication in other provinces in Central Viet Nam,
- To develop a set of guidelines for practical decision-making on integrated coastal flood risk management, and
- To raise awareness of provincial leaders and other senior officials of the agencies concerned in Quang Ngai Province in collaboration with two other coastal provinces on integrated flood risk management.

The expected outcomes of the project are listed below:

1. A proto-type coastal flood risk management and information system is in an applicable stage,
2. Options for adaptation measures to mitigate coastal flood risk have been provided,
3. Provincial decision-makers and community leaders are enabled to make use of the guidance provided,
4. A proto-type model on integrated flood risk management for coastal districts in Quang Ngai province with recommendations for action and possible replication in other provinces is in an applicable stage; this includes the flood hazard and risk maps for coastal areas,
5. Guidance materials for decision-support in ICFRM can be used by decision-makers at provincial and district levels,
6. Through local workshops and training courses decision makers are enabled to develop and implement ICFRM action plans,
7. A Final Report will include recommendations for the replication of ICFRM approaches in other coastal provinces of Viet Nam.

4. CONCLUSIONS

There is an unabated exponential growth of population and economic activities in coastal areas. The result of this development is an increasing risk of loss of lives, livelihoods and infrastructure due to coastal flood hazards that is amplified by climate change. The improved management of coastal areas is therefore a high priority issue that demands political will and action by all stakeholders. Guiding materials and tools have been developed for coastal zone management and - within the scope of this paper – in particular to integrated coastal flood risk management. Good practices are available that can be applied for the development and implementation of coastal flood risk management plans in a fully participatory manner with the beneficiaries of such measures. An important benchmark criteria in this approach is the balance achieved between the positive effects of coastal zone development and risk minimization of disastrous impacts due to coastal flooding as a result of different causes. A pilot project building on particularly past related developments and achievements in the country is under planning to validate the concept and applicability of ICFRM practices in central Viet Nam. The long-term vision is to replicate the approach and results in other regions in Viet Nam and other countries affected by coastal floods such as Bangladesh.

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