



*Strengthening local capacity
in the economic analysis
of environmental issues*

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How Can Vietnam Adapt to Flooding and Climate Change?

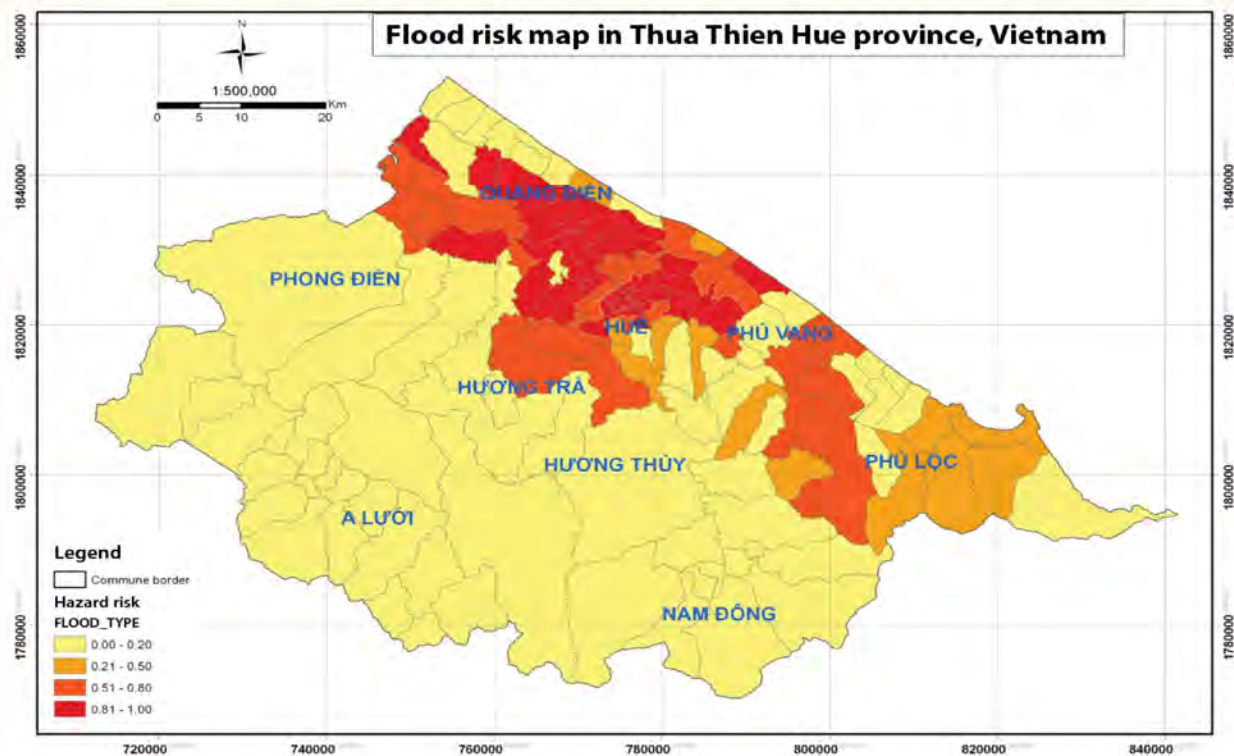
A Cost-Benefit Analysis

Floods are one of the most frequently occurring natural disasters to affect Vietnam. Every year, they cause serious damage to both communities and households in low-lying, coastal regions. There has been an increase in both the frequency and intensity of floods in the country in the last 30 years and the situation will only get worse due to the effects of climate change. A wide range of projects have been put in place to try and deal with this challenge. However, most of these have been in response to the floods rather than attempts to adapt to or mitigate their impact.

A new EEPSEA study looked at the costs and benefits of a proposed flood adaptation project in one of the country's most flood-prone areas, the An Xuan tributary in Thua Thien Hue province. The study, which is the work of Bui Dung The and Bui Duc Tinh from Hue University's College of Economics, found that upgrading the flood defenses and drainage systems along the entire An Xuan tributary dike system would bring a wide range of economic and social benefits at both the household and community levels. It also found that the value of these benefits would far outweigh any costs. It therefore recommends that the government invest in this project.



A summary of EEPSEA Research Report No. 2014-RR5: 'Cost-Benefit Analysis of Flood Adaptations in the An Xuan Tributary Basin, Thua Thien Hue, Vietnam' by Bui Dung The and Bui Duc Tinh, College of Economics, Hue University, 100 Phung Hung, Hue City, Vietnam. Tel: +84 543529435. Email: buidungthe@yahoo.com, bdtinh@yhoo.com.sg.



The An Xuan tributary

The flood risk map of the entire Thua Thien Hue province (top) reveals that Quang Dien is one of its lowest delta areas and that it has a flood risk of the highest level. The An Xuan tributary is the lowest-lying area in the Quang Dien district. In the flooding season, the An Xuan tributary is often inundated for long periods of time causing serious health problems (including epidemic and water-borne diseases) among the locals.

The An Xuan tributary is a very poor region. Agricultural production (mainly rice production, livestock rearing and aquaculture) is the dominant source of income. Alternatives to agriculture are very limited. This makes the locals' livelihood very vulnerable to flooding (and sea level rise) as their fields are often covered by floodwater.

The annual floods in the region also cause massive amounts of damage to property and infrastructure. Vast numbers of houses are inundated and damaged every year. This places a massive financial burden on both the households

and the local government. Many households have been pushed into debt by floods and, as a result, have become trapped in a vicious cycle of poverty and floods.

As said, climate change will, in all likelihood, make this situation worse. It is projected that under a 'medium' climate change scenario, flooding in the region will increase in both frequency and intensity (in combination with rising sea levels). This means that, if no proper action is taken, households will be exposed to even greater flood risks and will suffer more damages in the future.

What should be done to adapt to floods?

To find out what should be done to help the people in the An Xuan tributary adapt to floods, the study undertook focus group discussions (FGD) and key informant interviews (KII) with representatives from both the community and government. Secondary data was also collected from various government agencies at both the provincial and district levels. These included the Thua Thien Hue Hydrometeorology Centre, the provincial government's

Department of Agriculture and Rural Development and Department of Environment and Resource Management, and the district Agricultural Production and Rural Office, among others.

This research showed that there are many potential flood adaptation options that could be put in place. It resulted in a final shortlist of two project options. The first shortlisted option would involve upgrading a critical section of the dike in the An Xuan tributary. The second option would involve upgrading the entire An Xuan tributary dike's flood defense system.

Of these, the second option was the most popular and considered to be the most promising. It was also felt that this option would be more likely to get funding from the central government as it is in close alignment with the national flood prevention strategy. For this reason, the study chose to look at the costs and benefits of this 'full upgrade' option.

The chosen proposal

The activities involved in this upgrade project (which was designed by experts from Consultancy and Construction for Irrigation Ltd.) would include: dredging and removing the sediment from the bottom of the whole An Xuan tributary; upgrading and reconstructing the dikes along its two banks; upgrading the An Xuan sluice; building eight new open drains; building 10 ring drains for irrigation purposes; diverting a 300 m meander; and building a bridge over Nga Tu tributary.

The project was designed to both contain floodwater and pump it away, so avoiding flood damage to rice production, aquaculture, properties and communities. In the drought season, the project would also ensure that irrigation water would be pumped into rice fields more effectively. In terms of health, upgrading the entire An Xuan tributary flood defense system as planned would significantly improve sanitation conditions in many communities. Overall, it is clear that the 'full upgrade' option would help farmers (and the commune government) to actively manage water and that over 4,100 households would benefit.

Data gathering

To collect the data necessary for the cost-benefit analysis, a household survey was conducted to record the respondent-households' demographic characteristics, resources, livelihoods and living conditions, flooding experiences, adaptations done, and the damage caused by the different types of flood experienced. In order to get more information on the likely value of the chosen adaptation project, the researchers also asked households in the An Xuan tributary about their willingness-to-pay (WTP) for the proposed upgrade project. In all, 548 questionnaires were completed. Most of the respondents had lived in An Xuan tributary for over 30 years; it was therefore assumed that they had a good awareness of the impact that floods have had on their lives.

The study found that there are four main types of floods that often occur in the An Xuan tributary area. These are Tieu Man floods (May), early floods (September), main floods (November to early December) and late floods (late December and January). On average, about 2.6 floods occur annually in the An Xuan tributary. These floods have a range of

different impacts on crops and households depending on when they occur during the agricultural cropping cycle.

Assessing key costs and benefits

The study found that the key costs of the proposed adaptation project were linked to its construction, maintenance and operation. The total investment cost of upgrading the entire An Xuan tributary flood defense system was calculated by the technical consultants who designed the project; it was also verified by FGDs and meetings between local communities, government representatives and the researchers.

To assess the benefits that the adaptation project would bring, the study looked at how it would reduce flood damage to agricultural land and assessed the value of the positive impact this change would have on agricultural productivity. Similar value assessments were then made on how the project would reduce: flood damage to houses, other property and infrastructure; medical costs for the treatment of injuries and disease; and funeral costs.



Flooding at Thua Thien Hue province after Typhoon Ketsana in 2009.

These benefit calculations used the market-based pricing method and were based on household survey data and FGDs. All these calculations took into account the probability of floods happening in the future, the potential impact of the chosen adaptation project, the impact of different types of flood, the useful lifetime of the project, and the time value of money.

Results of the cost-benefit analysis

Without the adaptation project in place, it was found that the current total cost of flood damages in the study area at the household level was about VND 2.29 million/household per year. At the community level, total cost of flood damage in the An Xuan tributary area is about VND 4,349 million/year; damage to agricultural production and houses make up the biggest part of this cost.

With the adaptation project in place, it is expected that the value of avoided damage and cost to households will be about VND 1.27 million/household per year. This translates to VND 5,330.19 million total damages avoided per year at the household level for the whole study area.

At the community level, total damage and cost avoided will be about VND 1,734.9 million/year. It was also found that the project would lead to total annual gains in net benefits of VND 14,021 million from rice production and VND 2,500 million from aquaculture (Table 1).

Why it makes sense to invest in flood defense

The study found that the total investment cost of the adaptation project would be VND 40,000 million in the first

Table 1. Value of the project's key benefits

Key Benefits	Million VND
Expected avoided damage and cost to households per year	5,330.19
Expected avoided damage and cost to communities per year	1,734.9
Increase in the net return from rice production per year	14,020.5
Increase in the net return from aquaculture production per year	2,500.0

year of construction and VND 60,469 million in year 2. The cost of operating and managing the project would be zero in year 1. This would increase to VND 708.5 million in year 2 and would be VND 1,417 million/year from year 3 to year 30. When the findings are adjusted to show their present value, the study finds that over the lifetime of the adaptation project, its total cost would be VND 97,819 million and it would produce benefits worth VND 176,740 million.

The study also found that households would be willing to pay VND 496.1 thousand/quarter per household for the project to be put in place. Based on this finding, the total estimated value of the project would rise to VND 204,481 million (this is the sum of peoples' WTP and the value of avoided damages at the community level).

It is clear from these findings that upgrading the entire An Xuan tributary flood defense system will generate significant economic benefits to the local community in the long-term. In addition, it will also significantly contribute to sustainable water management and improve sanitation conditions. It is also clear that, although the investment costs of the project are relatively high (about VND 97,819 million) they are low in comparison to the potential benefits the project would bring.

Given the likelihood that climate change will make floods and rises in sea level more frequent and more extreme in the future, it is clear that if nothing is done, the communities in the An Xuan tributary will be even more seriously affected by floods in years to come than they are now. This makes it even more worthwhile for the government to invest in the proposed adaptation project, which will help make both agricultural production and socio-economic development in the region more sustainable.

MALAYSIA: WorldFish headquarters, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang
Tel: +60 4 626 1606
Fax: +60 4 620 2263

PHILIPPINES: WorldFish Philippine Country Office, SEARCA Building, College, Los Baños, Laguna 4031
Tel: +63 49 536 2290 loc. 196

Email: admin@eepsea.net

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