

Community-based climate change adaptation in Vietnam: inter-linkages of environment, disaster, and human security

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Abstract

Climate change is happening, and the impacts are being visible in different forms of natural disasters and catastrophes, which are impacting the lives and livelihoods of the people and communities in rural areas. Central part of Vietnam is observing significant change in rainfall pattern and cyclone path, which is causing unprecedented floods and affecting the agriculture, aquaculture and animal husbandry, which are the major livelihoods for the rural communities. This is the most prominent in Central Vietnam, which is affected by a series of typhoons and strong rainfall in 1999. As a long-term response to the climate change impacts, a Canadian NGO started a community based adaptation project with the involvement of local government. The project was conducted in close cooperation with the mass organizations, the leaders of which are regarded as the 'Change Agents' to disseminate the climate change information to the local communities. Efforts were undertaken to demonstrate pilot interventions through co-financing of the local governments. The main challenge of the project initiative was its sustainability after the completion, and the incorporation of the community based adaptation practices in the local development policies. The government-people linkage is considered as one of the key factor in this regard.

Introduction

Due to rapid industrialization and urbanization in different parts of the world over the past several decades, there have been serious effects on climate. Available observational evidences indicate that regional changes in climate, particularly increases in temperature, have already affected a diverse set of physical and biological systems in many parts of the world (Climate Change 2001). International communities have tried to respond to these changing phenomena by establishing high-level IPCC (Intergovernmental Panel on Climate Change). Numerous global treaties and protocols have been formulated on climate change in different countries. However, climate change impacts are found to be most severe in the grassroots-level community, in the form of natural disasters like droughts and floods, which affect the lives and livelihoods of people. The impacts of climate change are observed in the form of increasing poverty in rural areas. Although communities are equipped with traditional knowledge and wisdom, new practices and policies are required to enable them

to cope with the changing climate, thereby providing them with means to sustain their livelihoods.

Adaptation to climate change has the potential to substantially reduce many of the adverse impacts and enhance beneficial impacts, though neither without cost, nor without leaving residual damage. While climate change adaptation has been discussed over the past several years through organizational and adaptive responses, little has been focused on the community-level adaptation and integrating the adaptation methods in the policy perspective. Needless to say that international-level interventions are essential for the commitments and negotiations among the governments; however, at the community level, there is an urgent need to disseminate the impacts of climate change and its possible adaptation strategies.

As one of the worst sufferers of the climate change are the rural communities who depend on agriculture for their livelihoods, it is important to focus on the impacts of climate change on livelihoods, and re-establish the links between poverty, livelihood, and environment. However, focusing on the communities is not enough, and as long as the community initiatives do not become part of the government policies, it is difficult to sustain the efforts. Perhaps the most important pre-requisite for creating sustainable livelihoods, and for achieving sustainable development, is good and accessible government (Helmore and Singh 2001). Thus, the link between local, state, and national governments with the community is of utmost importance.

The link between environment and disaster is prominent in the area where natural and social issues merge, and this is specifically prominent in the rural areas where most of the communities depend on agriculture and natural resources for their livelihood. These issues are linked with the overall concept of human security. Climate change impacts are often regarded as the missing link between environment and disaster. However, the relationship is not clearly reflected in the national policies and international and local actions.

This paper describes the basic concept of human security and its relation with environment and disaster management through a field example from Vietnam to exemplify the linkage of environment, disaster, and development, encompassing the people and communities.

Human security

Human security is concerned with reducing and, when possible, removing the insecurities that plague human lives (Ogata and Sen 2003). The human development approach, pioneered by visionary economist Mahbub ul Haq (under the broad umbrella of United Nations Development Programme), has done much to enrich and

“At the center of sustainable development is the delicate balance between human security and the environment. Critical to this is the need to explicitly plan for improved environmental management and sustainable development to disaster prevention and preparedness.”

*Sadako Ogata and Amartya Sen in
“Human Security Now”, 2003*

broaden the literature on development. Human development is concerned with removing of various hindrances that restrain and restrict human lives and prevent them from blossoming. Human security is an idea that fruitfully supplements the expansionist perspective of human development by directly paying attention to what are sometimes called the 'downside risks'. Human security, like human development, highlights the social dimension of sustainable development's three pillars: environment, economy, and society (Khagram, Clarke, and Radd 2003).

The relationship between human security and the environment is most pronounced in areas of human dependence on access to natural resources. Environmental resources are critical part of the livelihoods of many people. When these resources are threatened because of environmental changes, people's human security is also threatened, and people move from the rural areas to the marginal lands, which leads to a decline in the household income. This relationship is captured in the promotion of sustainable development. Two other fields – environmental security and sustainable development – emerged and grew roughly during the same period as human security and human development. Although the environmental security focuses more on nature, increasing complexities in the subject have urged for a holistic view and synergy between natural and built environment.

Disaster management has a direct connotation to human security. Many of the natural disasters like flood and drought are directly related to the environmental degradation and climate change. These events affect the poor the most by affecting their lives, properties, and livelihoods. Therefore, by creating disaster-resilient communities, it is possible to enhance human security. Governments and other stakeholders are increasingly becoming aware of the relationship between ecological stability and human security. Civil society has mobilized strongly to promote sustainable development and increase awareness of its importance. The emphasis of the governments, however, is more on improved environmental management. There has been little concrete action at local level to ensure the participation of affected communities. Although some countries have taken pro-community measures to enhance environmental sustainability, thereby reducing the impacts of disasters, there is still a long way to go in the direction of synergy of community-based natural resource management and disaster risk management.

The concept of vulnerability is the key and a common concept for human security and environment and disaster management. Human security focuses on analysing who is vulnerable, how does action by local people in particular place and condition affect vulnerability, and what actions could be taken to reduce or mitigate vulnerability. Linking human security paradigm (Khagram, Clarke, and Radd 2003) with sustainable science framework and vulnerability analysis framework entails placing particular emphasis on the human conditions. It highlights the linkage between vulnerability and change in human and environmental conditions and interactions of hazards and exposures at different levels of place, region, and world (Figure 1). This is

closely linked to the sustainable livelihood framework (Moser and Norton 2001), where reliance and vulnerability are seen as counterpart of one another, and people's resilience depends largely on assets and entitlements that individual, households and, communities can mobilize and thus manage to face the hardship. Therefore, the higher the resilience, the higher the human security and livelihood security, and lesser the vulnerability.

Simply speaking, enhancing human security for environment and disaster management is like enhancing people's choices, and increasing their resilience to cope with the adverse impacts of the events. A good correlation is found in Vaux and Lund (2003), where the impacts of 2000 drought and 2001 earthquake of Gujarat, India, are described with specific focus on the livelihood security of rural women. To cope with the natural disaster impacts, the key focus area was to improve livelihood options. These livelihood options were enhanced through institutional development and asset creation, and were aimed at enhancing human security. Small-scale community-based institutions have helped in sustaining the efforts in longer terms.

The context of Vietnam

Situated in the tropical monsoon zone close to the typhoon centre of the western Pacific, Vietnam is one of the most disaster-prone countries in the Mekong region. It is directly affected by the Indo-Chinese sub-continental climate from the North and West and the two interstate river networks running North-west–South-east, the Red and Mekong Rivers, by the South China Sea from the East and South and the Indian Ocean to the West. At the same time, Vietnam lies in the biggest typhoon centres of the South China Sea, which is one of the five typhoon centres of the world. Due to the co-occurrence of the typhoon and rainy season in the narrow and low plains, high mountains, floods and typhoons have been very frequent during the past three decades, and seem to have a greater severity. Floods and typhoons have been a constant threat to the life and productivity of the Vietnamese people. Currently, 70% of the 73 million people of Vietnam live in disaster-prone areas, with the majority of the people residing in the Central region. These people's lives and livelihoods very much depend on the country's natural resources. Losing crops and homes in floods and storms keeps many rural Vietnamese trapped in a cycle of poverty. This has been intensified in the recent years with major floods occurring more frequently and catching the communities unawares. Given this, the vulnerability, resilience, and adaptability of the Vietnamese society, its ability to respond effectively to stress and change, which, in turn, is linked with the human security of the country, must also play a critical role in shaping the prospects of the future.

Vietnam, like the rest of the South-east Asia, faces significant environmental challenges. Threats are apparent at different spatial levels and timescales, ranging from local resource degradation and the adverse consequences of deforestation and other land-use changes through urban, air, and water

pollution to the emerging threat posed by climate change (Brookfield and Byron 1993). In broader terms, the environmental stresses facing the people of Vietnam are the product of over-exploitation and mismanagement of the resources, of the legacy of colonialism and war, and increasingly of global forces (Vo Quy 1997). Limiting the effect of environmental degradation on individual livelihoods and on broader prospects for sustainable economic growth by reducing vulnerability, enhancing resilience, and promoting adaptive strategies is urgent and critical for the well-being of the farmers, fishers, forest dwellers, and urban population of Vietnam (Adger, Kelley, and Nguyen 2001). Thus, the concept of human security in Vietnam is attributed to food security, livelihood security, and social security.

At the World Summit of Social Development in Copenhagen in March 1995, the Government of Vietnam defined its development strategy as 'for the people and by the people', aiming to 'place human beings at the centre of the development and to promote the potential of individuals and communities as well as of the whole nation'. According to Vietnam's Comprehensive Poverty Reduction and Growth Strategy (CPRGS 2002), addressing vulnerability to natural disasters is a key poverty reduction priority. Vietnam's National Strategy for Environmental Protection (NSEP 2000) emphasizes on continued institutional development, capacity building, and integration of environmental considerations into main economic planning and general decision-making. Vietnam's Climate Change Strategy (VCCS 2001) outlines its mandate in the light of the signing of the Kyoto Protocol; and Decision 178 in effect from 12 November 2001, which regulates the responsibilities of the households and the individuals with land tenure to encourage them to protect and develop forests, and make forestry a major source of income. Vietnam: Initial National Communication (VINC 2003), under the UNFCCC (United Nations Framework Convention on Climate Change), states that increase in natural disasters such as typhoon, storm surge, strong wind, and heavy rain would threaten the life of people in many regions, particularly in coastal, mountainous areas.

Vietnam signed the UNFCCC in June 1992 and ratified it on 16 November 1994. In November 1998, the Government of Vietnam signed the Kyoto Protocol and ratified it in September 2002. The Hydro-meteorological Service (HMS, presently known as IMH (Institute of Meteorology and Hydrology), in the newly formed Ministry of Natural Resources and Environment – MoNRE) has been designated by the government as the national authority for the focal point for country's activities relating to implementing of the UNFCCC and the Kyoto Protocol. Since signing the Convention, Vietnam has carried out a large number of studies and other activities relevant to the national response to climate change issues.

Climate change issues in Vietnam

Most of the disasters in Vietnam are related to the weather conditions and climate change. Their frequency and intensity have seasonal variation. Annually,

the storm, flood, drought, and other disasters cause heavy casualty to the humans and damages to the property and infrastructure. According to the third assessment report of IPCC, the temperature in this century will increase by 4-5°C and the average sea level globally will increase from 9 to 88 cm (centimetres). This will lead to more harsh natural phenomena such as flood and drought (IMH 2005).

Climate change and its direct impacts on Vietnam are predicted as follows (IMH 2005).

- The temperature is estimated to increase by 2.5 °C by year 2070. Inland temperature (mainly that of the highlands) will increase by 2.5 °C, meanwhile the temperature of coastal area will increase by 1.5 °C.
- Annual average temperature and the absolute minimum temperature would also increase; the number of days with temperature higher than 25 °C will increase too. This will affect the ecosystem and farming season.
- The North and the South areas are affected by the South-west monsoon but the seasonal rainfall amount decreases in July and August and increases in September, October, and November. In the Centre, rainfall would increase in the rainy season by about 19% in the year 2070.
- Due to increasing temperature, the evapo-transpiration rate will also increase. Because rainfall would concentrate in the rainy season, rainfall in the dry season will decrease by year 2070 in the Central Vietnam and drought would occur more frequently.
- Sea level in Vietnam has increased by 5 cm during the past 30 years. Sea level would rise by 9 cm in 2010, 33 cm in 2050, 45 cm in 2070, and 1 m (metre) in 2100.
- Over the past few years, the typhoons hit Vietnam in August in the North, in October in the Centre, and in November in the South, which seems to be significantly different from the usual typhoon pattern.
- The climate change would lead to an increase in sea surface temperature in higher latitude region of Pacific Ocean. It will lead to more typhoons in the North-west Pacific Ocean. They will have more effect on Vietnam.
- In the next decades, the sea surface temperature, which maintains wind speed in typhoon, is predicted to increase. So, the typhoon intensity would be stronger, especially in 'El Nino' phenomenon year.

Nguyen, Hoang, Tran, *et al.* (2001) stated that El Nino is clearly recognized as a factor that should be considered in the disaster management by Vietnamese government. This recognition largely resulted from El Nino predictions in early 1997 that were presented to the government. There were preliminary awareness in the government; however, the 1997–98 El Nino phenomena response was through the existing government system. The broad effect of El Nino on the climate of Vietnam is established, but detailed impacts require more studies. In general terms, the main effects on the seasonal climate of Vietnam are that during El Nino years, cloud cover decreases and rainfall levels are lowered; temperature increases as do radiation and evaporation. The impact is generally most evident during winters, with effects usually developing towards the fall of the year when El Nino warming in the central equatorial Pacific Ocean becomes

evident. Though the whole country gets affected, the effects are clearly visible in the south of Vietnam and parts of the central region. The frequency and other characteristics of the tropical cyclones hitting Vietnamese coast are strongly affected by El Nino. Generally, fewer but more intense storms are experienced during El Nino years and frequencies are highest during the earlier part of the cyclone season.

Kelley, Hoang, and Tran (2001) also pointed out the tropical cyclone impacts as El Nino and La Nina phenomena. They urged the importance of public awareness and involvement, commitment, communication among different stakeholders and anticipation of events, monitoring and evaluation, and duplication or redundancy to cope with the increasing effects of unusual disaster events. In longer terms, Vietnam faces the pervasive threat of long-term climate change and any related rise in sea level induced by the changing composition of the atmosphere (Tran and Nguyen 1999). Tropical cyclone characteristics may well be affected as sea surface temperature plays an important role in determining whether or not tropical disturbances form and intensify.

Several studies showed that climate change will impact not only the climatic variability, but also the frequency and intensity of extreme events that definitely will harm the long-term sustainable development of the country. The Vietnamese people have a thousand year of tradition of confronting and coping with the natural disasters. But identifying adaptation options to long-term human-induced climate change is a new concept. Despite its priority to achieve accelerated economic growth, the government acknowledges that controlling and reducing the consequences of disasters are also key priorities, and it has developed an action plan for disaster mitigation as well as the Vietnam's National Agenda 21.

Disaster issues in Vietnam

In a country located in the South-east Asia, which is usually affected by disasters, the government and the people of Vietnam always bring into focus the long-standing disaster prevention traditions. For generations together, Vietnamese people have made efforts to strengthen dykes, to build flood protection structures, and to apply appropriate measures for disaster prevention in order to minimize disaster damage. In response to the Resolution of the United Nations General Assembly, the Government of Vietnam decided to organize the National Committee for the International Decade for Disaster Reduction (IDNDR), in which the CCFSC (Central Committee of Flood and Storm Control) is increasingly strengthened so that it plays an important role in co-ordinating and consulting different ministries in the government in the field of disaster prevention with the following tasks (Nguyen 2000).

- The CCFSC co-ordinates with other agencies, mass organization, related social organizations, and science and technology research institutes to

develop programmes, plans, and carry out the disaster reduction measures in Vietnam.

- The CCFSC directs the implementation of the activities for disaster reduction in Vietnam.
- The CCFSC co-ordinates with international organizations to increase the co-operation in the field of disaster reduction in Vietnam.

Based on the geographical and climatological features and the disaster conditions of all types of the country, the Government of Vietnam made decisive policy for each zone.

- *For northern part of Vietnam* The policy is to strengthen dyke system and flood retardation and diversion structures, to improve flood-resistant coefficient of constructions, and to protect essential population and economic areas against flood.
- *For central part of Vietnam* Central Vietnam is narrow and topographically complicated, frequently affected by storms, and flooding results from concentration of rainwater. The decisive policy is to supplement active measures for flood prevention and mitigation.
- *For the Mekong River Delta* The decisive policy is to prepare measures for living with floods, to minimize damage caused by floods as well as to make use of the advantages of the floods for sustainable development.

Thus, in the northern region, the emphasis is more on '*positively prepare for and prevent flood*', while, in the Mekong region in the south, it is more on the '*co-exist with flood (living with flood)*', and in the central part, it is on '*positive preparedness, mitigation, and management*'.

Besides the achievement of the past 10 years, there are still some problems that need to be further improved. However, with the direction of the government, the CCFSC co-ordinates with other branches at all levels, and also with the mass organizations to carry out the action programme for disaster prevention in the decade to minimize disaster damage. The CCFSC also acts as a consultant for the government in terms of disaster preparedness, disaster response, overcoming disaster consequences, and switching disaster prevention activities from defensive to offensive. Therefore, when disasters occur, the disaster-response activities as well as the disaster-damage assessment will be actively taken up and the disaster consequences will be rapidly overcome.

Based on the experiences gained from the process of disaster prevention, response, and mitigation inside as well as outside the country, a few lessons were derived (Nguyen 2000).

- Improve the gathering activity of disaster forecast information and timely organize the warning activity as well as provide mitigating measures to disaster-affected localities.
- Mobilize all forces from all social strata for disaster prevention; the armed forces in particular should be considered as a core body in all construction-related activities as well as in search and rescue operations. Mobilize the '*mutual affection and mutual love*' spirit of the community to help disaster-affected people in overcoming the disaster consequences.

- Regularly learn from experiences after disasters strike so as to promptly adjust and supplement appropriate measures as well as to strengthen steering machinery to obtain high efficiency. Strengthen the information system from central level to local level; strictly stipulate the regime of information dissemination to serve the disaster prevention and mitigation career.
- Enhance the community disaster awareness activity; diversify communication appearances so that all people can understand disasters well and are able to respond to every kind of disaster.
- Extend the research to all types of disaster to find out the appropriate measures to minimize disaster damage, and to improve the efficiency of the guideline of 'four on-the-spots': 'directions on-the-spot, forces on-the-spot, materials on-the-spot, and logistics on-the-spot', particularly in rehabilitating flood and storm control structures, to mobilize the role of the military force, and the close direction of the local authorities.
- Develop frame strategy for disaster mitigation for the whole country, based on each disaster zone.

For disaster preparedness, response, and consequence overcoming, the Vietnamese people always receive encouragement, new technologies, and equipment support for disaster prevention from the international community and UN (United Nations) agencies. Relying on this, the CCFSC and local committees for flood and storm control can improve their steering capacity for disaster control. Humanitarian aid relief from international community, governments, and NGOs (non-government organizations) as well as benefactors in the world has eased the losses and grievances of Vietnamese people (Nguyen 2000).

Characteristic of Central Vietnam

The central region of Vietnam consists of 14 provinces with an area of 97 000 km² (square kilometres), and population of approximately 18 million (IWRP 2001). Relatively higher rainfall combined with topographical and concentrated population at selected places make these provinces vulnerable to natural disasters every year. Thua Thien Hue province is located in Central Vietnam, with a variant geography of mountains and coastal plains. Thua Thien Hue offers very diversified and beautiful landscapes. Nature and human beings create a harmonious beauty with Bach Ma (White Horse) National Park and other attractive beaches such as Thuan An, Lang Co, and Canh Duong. The province provides a well-balanced blend of royal heritage and folk culture.

The central provinces are subjected to severe climatic hazards such as typhoons, floods, droughts, and forest fires. Climate change has caused these conditions to worsen in recent years, causing devastation in the entire province, notably vulnerable rural populations in mountainous areas and along the province's coastal zone. Increased severity and duration of these natural hazards have had disastrous effects. In 1985, a typhoon hit the central provinces, destroying

homes and public infrastructure, causing death of hundreds of people and economic loss worth millions of US dollars.

In November and December 1999, two floods – considered to be the largest in last hundred years – occurred in the central region (NDMP 2002). From 1 to 6 November, due to the cold front in combination with a tropical convergence and a tropical depression, cyclonic rain occurred in large areas of this region, causing severe flooding (the first flood). According to the reports of the CCFSC and HMS (Hydro-meteorological Services of Vietnam), some areas of the region received twice their mean rainfall in just three or four days (Hoang, Shaw, and Kobayashi, in press). Flood water inundated large areas in nine provinces, resulting in loss of life, extensive physical damage, and severe economic losses. Only four weeks later, due to similar rainfall, from 3 to 8 December, another severe flood occurred in six provinces of the region. Unfortunately, provinces of Thua Thien Hue, Da Nang, Quang Nam, Quang Ngai, and Binh Dinh were heavily affected by two floods in one month. The cost of physical damage in the region was estimated to be more than 340 million dollars (CPI-Partnership 2000), which is about two per cent of the national GDP (gross domestic product) (CCFSC 1999). The most affected were the poor (10–12% of the area's population) having per capita GDP less than 220 dollars (World Bank 1999). Thus, the recovery process after the floods was extremely long, continuing beyond 2001 (NDMP 2002). Consequently, the region's development was set back and affected communities had to go through a lengthy recovery process.

A holistic flood risk management programme of the region will require substantial understanding of the issues and problems specific to the region which include: nature of the region and flood, reasons of extensive damages, flood preparedness and awareness issues, and roles of stakeholders to implement the government strategy of 'positive preparedness, mitigation, and management' (MARD 2001).

Community-based climate change adaptation

Background

Following the 1999 flood, many international donors started assisting the Vietnam government to create a partnering strategy and prepare disaster-resistant investment projects for sustainable development of Central Vietnam through Natural Disaster Mitigation Partnership (NDMP 2002). Most of the internal assistance was ad-hoc, which ended over a period of two to three years from 1999. However, it was not just 1999 flood reconstruction, the key need was to raise awareness at different levels, from policy makers to communities, on the increasing risk of climate change. Since the climate change mitigation is beyond the control of the local governments and local communities, the immediate need was to look at the climate change adaptation in a more proactive form, and to take actions at local level.

One significant initiative was that of CECI (Canadian Centre for International Studies and Cooperation), a Canadian NGO, and was funded by CIDA (Canadian International Development Agency), under Canada Climate Change Development Fund (CECI 2004). The CACC (Community-based Adaptation to Climate Change) project was a three-year joint effort. The purpose of the project was to 'strengthen capacity to plan and implement community-based anticipatory adaptation strategies through disaster preparedness and integration of risk reduction and mitigation into local development planning'. The project was implemented in partnership with the People's Committees of the province and districts as implementing partners (Figure 2). The Province of Thua Thien Hue is in the central region, one of the most disaster-prone areas of Vietnam. At the level of the Vietnamese government, the project comes under the general framework of the NDMP, which works to develop mechanisms to coordinate international development assistance for disaster mitigation and promote information exchange in the communities. The project aimed to increase awareness at the national and provincial levels regarding viable options for community-based adaptation to climate change as a contribution to programme and policy development in the sector of disaster mitigation and climate change adaptation.

Major problems of the area

Thua Thien Hue is a sunken region. Its terrain varies greatly from mountains in the West to the sea in the East. The western mountains have peaks of 500–1000 m, and the terrain then drops quickly down to the plain, which is only 20 m above sea level and only about 50 km away from the mountains. As a result, 54% of the province is on land with a tilt of over 25°. Due to this topography, all the rivers in the region are short and abrupt. Consequently, when heavy and prolonged rains fall at the sources of the rivers, immediate floods will occur in the downstream areas (CECI 2004).

Floods in Thua Thien Hue can be classified into the following four types (CECI 2004).

- *Winter floods (main floods)* occurring from the month of October to November or to the beginning of December (equivalent to the 9th, 10th, and 11th lunar months, respectively). They often reach a very high peak and great magnitude, lasting long and often happen consecutively.
- *Late floods* last floods of the years occurring at the end of December or early January (12th lunar month) and never exceeding the second emergency level.¹
- *Early floods* occurring mainly during May to June (the fourth lunar month) and accounting for 30% of the total annual floods (they rarely occur in seventh and eighth months). These floods are shorter, lasting for one to three days.

¹ There are four alarm flood levels in Vietnam—I: possible flood condition, II: dangerous flood condition, III: very dangerous flood condition, and IV: extreme and emergency flood condition. Of these, I and II are more common.

- *Summer floods (Tieu man flood)* occurring from mid-July to mid-September (late in the fifth month to early in the sixth month), with moderate peak and magnitude.

Data collected since 1948 shows that major floods occur most often during the winters. The data demonstrates the increased incidence of major flooding since 1978. The data also demonstrates the increased incidence of late flooding in recent years, which interrupts the livelihood of the local population. Before 1983, no big late flood was recorded (in November and December); however, within two years (1998 and 1999), three big floods occurred.

Floods, typhoons, droughts, cyclone, severe cold, frost, and land erosion are hazards identified as imposing negative impacts on the lives of people living in Central Vietnam. The feeling is that although typhoons are very strong and can have devastating consequences, their timing (after crops are harvested) and low frequency means that they incur little damage to peoples' crops. Typhoons mainly affect people's houses in the coastal region. The main (winter) floods often occur at the end of a farming season, and so with advance notice farmers can prepare for the floods and quickly harvest crops, minimizing potential damages. Of more concern are the severe floods, like the one that occurred in 1999, which are sudden, thus overwhelming local people's ability to take precautions to minimize damages, leading to more severe consequences. The less severe summer floods are considered more of a hazard because they often appear during the growing season, resulting in the destruction of the crop. With respect to aquaculture, summer floods cause a sudden decrease in salinity, leading to the death of cultured shrimps. The time between summer and winter flood (June to September) and between winter and next summer flood (December to April) is the core time for agriculture in Central Vietnam. However, in recent years, it is observed that the summer and winter floods are shifting, and thus affecting the crops in the field, and livelihood of the people. The sudden big late floods also affect both agriculture and aquaculture.

While too much water in the form of floods is a serious concern for local population, too little water (droughts) can be just as devastating. Droughts occur in conjunction with South-west winds, which take water from rivers and lakes. This South-west wind also increases the salt concentration in rivers by reducing the amount of water. As a result, droughts decrease the productivity of rice and crops. With respect to aquaculture, droughts cause an increase in salinity, which adversely affects the freshwater fish culture. In 2002 drought (August), the salinity increased by 12.2% in some rivers, causing significant damages to fishes. Increase in salinity not only causes damages to fishes, but may also cause diseases in tiger shrimps, and can create slow growth of shrimp. Finally, droughts also greatly reduce the amount of water available for human consumption.

Severe cold also decreases the yield of rice, other farm products, and aquaculture. A further environmental issue in the area is erosion, which occurs in the villages next to the Bo River and the lagoon. The erosion of the river bank

affects the homes of people living along the river's edge. A survey of the people's perception reveals that they are more worried about the main flood, and they are not aware of the increasing effect of the late floods or drought. This is not reflected in the policies of the local governments. Thus, there is a strong need to document past disaster trend, and raise awareness among different stakeholder groups through on-site project implementation and training.

Project locations

The CACC project assisted communities in the two districts, Quang Dien and Phu Vang, to plan and implement adaptation strategies to reduce vulnerability to the adverse impacts of climate change. The project covered four communes² and a total of eight villages. Quang Dien district of Thua Thien Hue province has a territory of 163.07 km², a population of 920 000 people, and a population density of 558 people per square kilometre. It consists of 10 communes and a township, situated along the banks of the Bo River and Tam Giang lagoon. Of these 10 communes, seven are located along the lagoon (major livelihood being fishing and aquaculture), and three along Bo River (major livelihood being agriculture). The district is situated in a lowland area of the province, which is prone to disasters due to its vulnerability to flooding. There are three to four floods every year, accounting for approximately 30 days of flooding per year. These floods have negative impacts on the whole district's production activities, including the serious disruptions to the transportation and communication systems in the district.

The other district is Phu Vang, another coastal lowland district of Thua Thien Hue province. It has 20 communes and a township. Its territory is 282.5 km², including 205.497 km² of land and 77.003 km² of lagoon. It has a population of 170 000 people with a density of 600 per km². According to local partners, the communes are divided into three groups: communes at coastal sand dunes, communes on the lagoon, and inland communes. The coastal and lagoon communes rely on the resources of the lagoon and the sea for livelihoods such as fishing and aquaculture. The inland communes are considered the rice basket of the district. However, the production of rice in these communes has faced many difficulties due to flooding and drought, especially at the end of winter–spring and at the beginning of summer–fall harvests. Because the district is located downstream from Huong, Dai Giang, and Nhu Y Rivers, which are flooded frequently, floods and flashfloods are very common. This flooding can have far-reaching negative impacts, from loss of life to crop failure and transportation blockages. In addition, typhoons, cyclones, and epidemics remain very real threats. Sanitation and epidemic prevention have been in the focus in recent years, but there are still problems with lack of clean water and waste disposal. The typhoon in 1985 and the flood in 1999 caused enormous loss of life as well as material damage in the district. More than 100 lives were

² In Vietnam, each district consists of several communes, which are similar to wards in other countries. The commune population may vary from 5000 to 20 000 or more. Each commune consists of several villages (usually 6-10 villages). Commune has its own government structure and its People's Committee, which reports to the district-level government. It has its own development budget too.

lost in the 1985 typhoon, and another 83 people were killed during the 1999 floods. Additionally, tens of thousands of houses were either damaged or destroyed as a result of these disasters.

Mass organizations as change agents

Mass organizations (which are party organizations) are established in pursuant to their own legislation. They are deemed 'part of the political system of the Socialist Republic of Vietnam' (Law of the Vietnam Fatherland Front of 1999). Examples include Women's Union, Farmers Association, Youth Association, Fisherman Association, Veteran Association, etc.

The Fatherland Front co-ordinates the mass organizations to take part in disaster relief. Usually, rescue, relief, and rehabilitation for disaster are not incorporated in the official responsibility of these organizations. However, during 1999 flooding, members of Veteran's Association led evacuation, rescue, and recovery operations. Following the 1999 flood, this organization had established 55 Flood Rescue and Relief Pioneer Clubs with 3000 members in Central Vietnam. Member of Women Union were mobilized to assist with relief in the 1999 flood, particularly for ensuring food and water supplies to the flood victims through household visits and organizing community support (James 2000). The Youth Union plays an important role in mobilizing young people to assist in the clean-up following disasters. In addition, these mass organizations, along with other organizations and government offices, successfully conducted campaigns to collect monetary and in-kind donations nation-wide. In short, the 1999 flood in the central region has resulted in significant changes in the roles of mass organization and the other stakeholders in natural disaster mitigation and preparedness process.

To disseminate the information to the communities, and to raise awareness of the communities and people, it is of utmost importance that these mass organization leaders act as the key change agents. For this reason, these leaders were targeted for the training programmes, and TOT (training of trainers) was conducted with them.

Project components

The project components and the flow of the activities are shown in Figure 3. Three major steps were adopted.

Step I Assessment: producing a scenario

Step II Planning: produce a plan

Step III Implementation: conducting actions as sub-projects.

During the assessment step, the key focus was the hazard, vulnerability, and capacity assessments. These were done through historic profiling, mapping, timeline, ranking, focus group discussion, interviews, and questionnaire survey. The purpose was to identify issues and priorities through participatory discussion. Key focus of the hazard assessment was historic profile of disasters (past disaster events), trends of natural disasters for future (based on climate

change predictions), and community's perception of disaster events. Vulnerability assessments included geographical location, transport, communication, shelter, water, sanitation, health, and livelihood issues. Capacity assessments identified existing disaster management plans, coping strategies of the communities, role of people in mitigating disaster impacts, and proposed adaptation measures. The institutional mapping was also done to identify the roles of different institutions for disaster reduction. Combining all these, a climate change scenario was prepared.

In the planning step, the main focus was participatory planning. Before planning, structured training programmes were conducted on climate change issues, CBDRM (community-based disaster risk management), building code improvements to cope with flood and cyclone, agriculture improvement, and aquaculture improvement. The target groups of these training programmes were leaders of the mass organizations, commune and district government officers, and selected community members. These training activities were considered as one the major vehicle to disseminate important climate change information to wide range of stakeholders. After the training, the planning process started with the leadership of these change agents. Two types of plans were formulated. One was safer village plan, which outlined specific measures to ensure the safety of the people and infrastructure of the community. The other plan was safer production plan, which was aimed to secure livelihoods, targeting agriculture, aquaculture, and animal husbandry. These plans were developed in close co-operation with the commune and district governments, so that these plans were officially approved by the governments to be part of the development plans. Also, prioritization of actions was made in close cooperation with local governments, and selected items were recommended for implementation as sub-projects with co-financing from the project fund and the fund from the local governments.

In the implementation step, selected sub-projects were implemented (Figure 4). Some of the examples included construction of inter-commune roads, construction of multi-purpose school as emergency shelter, construction of sanitary latrine, safe drinking water provision, provision of alternate crops and alternate species of shrimps and fishes, provision of relief and rescue equipments, provision of early warning equipments, and conducting of educational programmes in the schools for the children.

The characteristic of the sub-project implementation was the co-financing from the local government (commune-level) and individual funding from the beneficiaries. This process was able to create a strong ownership for the local community, and thus ensured the sustainability at grassroots level. Since the safer village plans and safer production plans were developed based on the close consultation with local governments, the implementation in the longer term was ensured through incorporating the plans in the local development activities.

Conclusion

As evidenced from the above description of the project, as well as climate and disaster issues of Vietnam, climate change adaptation is required at local level to reach the wider part of the communities. The worst sufferers of the climate change impacts are the communities and people in the rural areas. In most parts of Asia, rural livelihoods depend on agriculture. Vietnam is no exception. Thus, to reduce the climate change impact or to adapt with it, the first and foremost is livelihood security.

The first part of the paper describes the relationship between human security, environment, and disaster. Under the overall umbrella of human security, the key focus is vulnerability reduction, through reducing environmental degradation and enhancing disaster resilience. In many places, environmental degradation as the cause and disaster as the effect are observed, while in other places, the opposite correlation is noted. While climate change is regarded as environmental issue, its impacts are seen in the form of disasters (flood, cyclone, drought, severe cold) and sea level rise. Many of the disasters also occur from deforestation, soil, land, and river erosion. On the other hand, disasters as events also cause severe environmental problems with waste issues, affecting the local flora and fauna, and also the built environment. Thus, the important issue is to look at the environment and disaster issues in a more synergic way, and incorporate these elements in the vulnerability reduction approach of human security.

The CACC project of CECI demonstrates a unique way of vulnerability reduction through enhancing capacities of local people and communities. This can be considered as people and community dimension of human security, which should include livelihood security, environmental security, social security, self-security, and information security (Figure 5). This concept is nicely demonstrated through different forms of project activities. Livelihood security is the first and the foremost priority, where improvement of life-style is desired through income generation in different options: agriculture, aquaculture, fishing, animal husbandry, etc. Environmental security is the second dimension, and is found to be important in many rural areas (including the project site of Central Vietnam), where natural resource management by the community is the key issue. Social security is the third dimension, which ensures different social benefits to the people, and enhances people's choice for social services like health, education, etc. Self-security is the fourth dimension in which people and communities are engaged in self-help and co-operation, therefore increasing their degree of freedom. Social security and self-security are closely related to each other. The fifth dimension is the information security, in which right to information to people and community is of extreme importance to take the right decision and action. Needless to say, there are other dimensions of human security; however, these five dimensions are strongly focused in the project activities.

Kurukulasuriya (2004) provided short- and long-term climate change adaptation measures. According to his analysis, farm responses to increasing resiliency, small-scale agriculture insurance, and migration can be regarded as short-term responses. On the other hand, changing crop type and location, development of new technology and modernization, improving water management, and permanent migration are the key issues of long-term migration. Three specific recommendations are provided: incentives to be incorporated in project design, dynamic adaptation to be promoted by international agencies, and policies to be incorporated in sustainable development.

To enhance human security at people and community level, the government–people linkage is of utmost importance. People’s activities are more related to their lives and livelihoods, which get affected by climate change impacts. For local government, it is more on policy, plans, and extension services, the effectiveness of which can reduce the climate change impacts. For central government, it is more on policy, strategy, and international negotiation. Thus, where climate change adaptation is concerned, the activities in the field (demonstration projects, training activities, awareness raising activities) need to be reflected in the local government policies and programmes to make it more sustainable. Thus, a strong partnership between people and government is extremely important. Civil society and academic play an important role in strengthening this partnership, and ensuring its long-term sustainability through policy integration. Self-governance and local governance are the key factors in ensuring policy integration.

One advantage of focusing on the local scale is that it does allow the development of demonstration policies and initiatives that could be introduced at wider spatial scales. This does not mean that such local sustainability means self-containment or isolation. Rather it involves ‘the development of local–global relationships conducive to sustainability’ (Gibbs 2002). In addition, it is required to bear in mind the dual nature of localities, as both places and sites of everyday life and as nodes in a global network of flows and interactions. While policy may be focused on the former, the interdependent nature of places must be considered.

Climate change adaptation should be looked upon as community development process, through multi-stakeholder partnership. Green and Haines (2002) made interesting classification of community development models. Three models are proposed: self-help approach (where the key concept is to help people to help themselves, and practitioners’ role is that of facilitator or educator), technical assistance approach (where the key concept is to help people with technical expertise and information, and practitioners’ role is that of advisor or consultant), and conflict approach (where the key concept is to help people or community members to be more powerful, and practitioners’ role is that of organizer or advocate). Of these three concepts, the current approach of community development and climate change adaptation in this paper can be looked upon as the combination of first and second one, where the outside

agencies like the civil society bodies (here, CECI and its partners) help the communities with appropriate technical expertise and information, and equip them to be self-sufficient. The political system may be driven by financial interests, and individuals may have little control over bureaucratic institutions (like corporation, educational system, the government), but the community offers a place for people to learn the value of co-operation and civic virtue. Participation, like any other skill, must be learned through experience. It occupies a central place in development thinking and practice. Governments, funding agencies, donors, and civil society actors have all arrived at a near consensus that development cannot be sustainable and long-lasting unless people's participation is made central to the development process (Kumar 2002).

Shaw and Okazaki (2003) made an analysis of sustainability of community-based initiatives through case studies in six countries in the Asian region, and concluded that following factors are important to enhance sustainability

- Promote and strengthen, a 'culture of coping with crisis'.
- Enhance people's perception on vulnerability.
- Recognize motivation of community initiative.
- Increase community participation and empowerment through institutionalization.
- Focus on need-based training approaches.
- Involve diverse stakeholders based on the needs and objectives in both formal and/or informal ways.
- Promote tangible and intangible accumulation of physical, technological, and economic assets as the project outputs.
- Promote the integration of community initiatives into regular development planning and budgeting to ensure sustainability.

The major challenge of the community-based climate change adaptation is sustainability and up-scaling of activities. While it is necessary to sustain the efforts in long-term, it is also required to disseminate the pilot intervention experiences to wider places. It has been a common notion that grassroots initiatives or community initiatives are the responsibilities of the NGOs (Shaw 2004). NGOs have been the leading actors in this field for several years, and have contributed to the development of this field (Jegillos 2003; Murshed 2004; Delica-Wilson 2005). However, many of the NGO activities face the problem of sustainability over a longer period of time, especially once the NGOs withdraw from the field. Continuation of community activities over a longer period of time needs a policy environment at local level, as well as local institutions to continue the activities. Thus, even though the initiatives are started with the NGO interventions, it is important to link them with the local government activities, and incorporate them into policies. Thus, the major challenges of the community based adaptation are: (1) sustainability of the efforts in the community level, and (2) incorporation of the community-based issues in the policy level. To be effective and to create sustainable impact, the application of the community-based adaptation must go beyond the initiatives of the communities, NGOs, and a handful of local governments. As part of an

advocacy for more responsive and effective governance, national and state-level governments should look at integrating community-based adaptation in their policy and implementing procedures.

There has been an increasing awareness in the international level for the need of community-based adaptation. GEF (Global Environment Facility) is getting pro-active in funding community-based adaptation projects worldwide, and also encourages the country governments to undertake community-based approaches. CoP (Conference of Parties) every year is also attracting more attention on community-based adaptation. This has also been a strong focus in UNFCCC's (UN Framework on Convention of Climate Change's) recent activities. Many bilateral donors like DFID (Department for International Development), CIDA, EU (European Union), and the Netherlands government have been pro-active in funding international projects on community-based adaptation. Thus, community-based climate change approaches are getting recognition as one of the important climate change impact reduction measures. To understand the ground realities and strengthen the people-government partnership, more demonstration projects are required to be implemented in the field. Continued efforts at different levels will help to enhance human security through environment and disaster management.

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References

- Adger W N, Kelley PM, and Nguyen H N. 2001
Vietnam and environmental change: environment, society and precipitous change
In *Living with Environmental Change, Social Vulnerability, Adaptation and Resilience in Vietnam*, pp 3–18, edited by W N Adger, P M Kelley, and H N Nguyen
Routledge Publisher, London, 314 pp
- Brookfield H and Byron Y (eds). 1993

Southeast Asia's Environmental Future: the search for sustainability

Tokyo: UNU Press, 156 pp

CCFSC (Central Committee of Flood and Storm Control). 1999

Report on Flood Damages in the Central Region

Government of Vietnam, Hanoi, 57 pp

CECI. (Canadian Center for International Studies and Cooperation) 2004

Community Vulnerability Assessment Report of Canadian Center for International Cooperation and Studies

Hue, Vietnam: CECI, 53 pp

Climate Change. 2001

Impacts, Adaptation and Vulnerability: Contribution of Working group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change

UNFCCC, Bonn, 512 pp

CPI (Central Provinces Initiative)-Partnership. 2000

Finding of the Multi-Donor Mission, Multi- Donor Mission Report

Government of Vietnam, Hanoi, 47 pp

CPRGS (Comprehensive Poverty Reduction and Growth Strategy). 2002

The Comprehensive Poverty Reduction and Growth Strategy

[Approved by the Prime Minister Phan Van Khai at Document No.2685/VPCP-QHQT]

Government of Vietnam, Hanoi, 142 pp

Delica-Wilson Z. 2005

Community based disaster risk management: local level solutions to disaster risk

Tropical Coast **12** (1): 66–73

Gibbs D. 2002

Integrating economic development and the environment: future prospects for local areas

In *Local Economic Development and Environment*, pp 139–150

Routledge Publication, London, 173 pp

Green G P and Haines A. 2002

The role of assets in community development

In *Asset Building and Community Development*, pp. 3–18

Sage Publication, London, 251 pp

Helmore K and Singh N. 2001

Sustainable Livelihoods. Building on the Wealth of the Poor

Kumarian Press, Bloomfield, 128 pp

Hoang H V, Shaw R, and Kobayashi M. In Press
1999 Disastrous Flood in the Central Region of Vietnam – Lessons Learned for Positive Preparedness, Mitigation and Management

IMH (Institute of Meteorology and Hydrology). 2005
Climate Change Impacts on Water Resources and Adaptation Strategies in Huong River Basin

[Project concept note]

IMH, Hanoi, 15 pp.

IWRP (Institute of Water Resources Planning). 2001
Summary Report on Flood Planning Direction of the Central Region
IWRP: Hanoi, 63 pp

James C C. 2000

Empowerment of Communities that Live with Floods

[Project VIE/98/012 of UNDP, Vietnam]

UNDP, Hanoi, available at: <http://www.undp.org.vn/ndm-partnership/reports/fmr-attachment5.htm>

Jegillos S R. 2003

Issues and policy

In *Sustainability in Grass-Roots Initiatives: focus on community based disaster management*, pp. 11–17, edited by R Shaw and K Okazaki

UNCRD, Kobe, 103 pp

Kelley P M, Hoang H M, and Tran V L. 2001

Responding to El Nino and La Nina: averting tropical cyclone impacts

In *Living with Environmental Change, Social Vulnerability, Adaptation and Resilience in Vietnam*, pp. 155–181, edited by W N Adger, P M Kelley, and H N Nguyen

Routledge Publisher, London, 314 pp

Khagram S, Clarke W C, and Radd S F. 2003

From the environment and human security to sustainable security and development

In *Human Insecurity in a Global World*, pp. 108–135, edited by L Chen, S Fukuda-Parr, and E Seidensticker

USA: Harvard University Press, 278 pp

Kurukulasuriya P. 2004

Climate change and agriculture: impacts and adaptation

In *An Adaptation Mosaic*, pp 83–98, edited by A Mathur, I Burton, and M V Aalst

World Bank, Washington DC, 129 pp

Kumar S. 2002

Methods for Community Participation

ITDG Publication, London, 333 pp.

MARD (Ministry of Agriculture and Rural Development). 2001

Second National Strategy and Action Plan for Disaster Mitigation and Management in Vietnam – 2001 to 2020

Vietnam: MARD, Hanoi, 63 pp

Moser C and Norton A. 2001

To claim our rights: livelihood security, human rights and sustainable development

London: Overseas Development Institute (ODI), London, 79 pp

Murshed Z. 2004

Community based disaster risk management in Southeast Asia: concept and framework

In *Proceedings, Third Disaster Management Practitioners' Workshop for Southeast Asia*, pp. 1–7

Asian Disaster Preparedness Center (ADPC), Bangkok, Thailand, 10-13 May, 2004

NDMP (Natural Disaster Mitigation Partnership). 2002

Report of Fact Finding Mission of NDM – Partnership to Central Provinces of Vietnam for short-list priority projects for possible funding by the Royal Government of Netherlands, Government of Luxembourg and UNDP

UNDP, Hanoi, 30 pp

Nguyen N T. 2000

Report on Disasters and Activities Related to Disaster Preparedness and Mitigation of Recent Years in Vietnam

[ADRC Workshop, Kobe, Japan (16-17 January, 2000, ADRC)]

ADRC, Kobe, 78 pp

Nguyen N H, Hoang H M, Tran L V, Tran T Q. 2001

Vietnam country case study: impacts and responses to the 1997–1998 El Nino event

In *Once Burned, Twice Shy?*, edited by M H Glantz, pp. 211–214

UNU Press, Tokyo, 294 pp

NSEP (National Strategy for Environmental Protection). 2000

The National Strategy for Environmental Protection, for the Period of 2001–2010

NSEP, MoSTE (the Ministry of Science, Technology and Environment) (later renamed as MoNRE (Ministry of Natural Resources and Environment), Hanoi, 83 pp

Ogata S and Sen A. 2003

Human Security Now

NY: Commission of Human Security. 159 pp.

Shaw R. 2004

Community based disaster management: challenges of sustainability
In *Proceedings, Third Disaster Management Practitioners' workshop for Southeast Asia*, pp 113–117

Asian Disaster Preparedness Center (ADPC), Bangkok, Thailand, 10-13 May, 2004

Shaw R and Okazaki K. 2003

Sustainability in Grass-roots Initiatives: focus on community based disaster management

UNCRD Publication, Kobe, 99 pp.

Tran L V and Nguyen N H. 1999

A preliminary study of the impacts of climate change and sea-level rise on the coastal zone of Vietnam

Current Topics in Wetland Biogeochemistry 3: 161–174

Vaux T and Lund F. 2003

Humans security of working women: response to crisis

In *Human Insecurity in a Global World*, pp 137–161, edited by L Chen, S Fukuda-Parr, and E Seidensticker

USA: Harvard University Press

VCCS (Vietnam Climate Change Strategy). 2001

VCCS, the MoSTE (Ministry of Science, Technology, and Environment) (later renamed as MoNRE (Ministry of Natural Resources and Environment))
Hanoi, 78 pp

VINC (Vietnam Initial National Communication). 2003

VINC, MoNRE (Ministry of Natural Resources and Environment), Hanoi, 102 pp

Vo Quy. 1997

Vietnam: environmental challenges and solutions

[Paper presented at the EUROVIET-III Conference, Amsterdam, The Netherlands, July 1997]

World Bank. 1999

Vietnam: Attacking Poverty

[World Bank Report]

World Bank, Hanoi, 168 pp

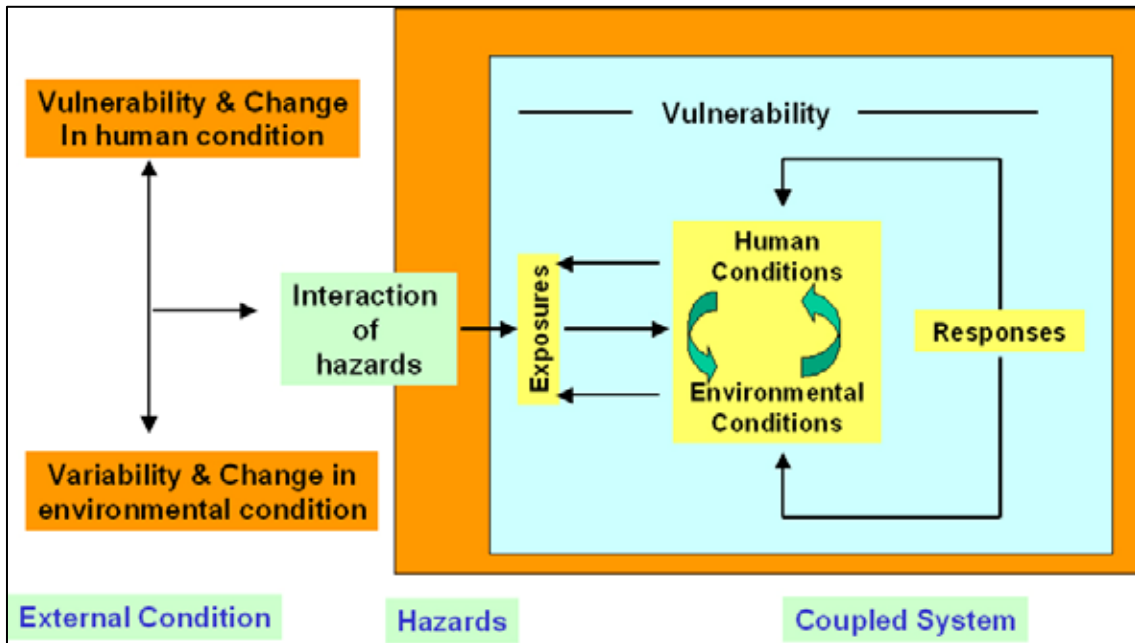


Figure 1. Sustainable Science Framework as a vulnerability reduction tool (adopted from Research and Assessment system for Sustainable Program, <http://sust.harvard.edu/>)



Figure 2. Map of Vietnam showing the location of Thua Thien Hue province and project locations in the coastal districts of Quang Dien and Phu Vang.

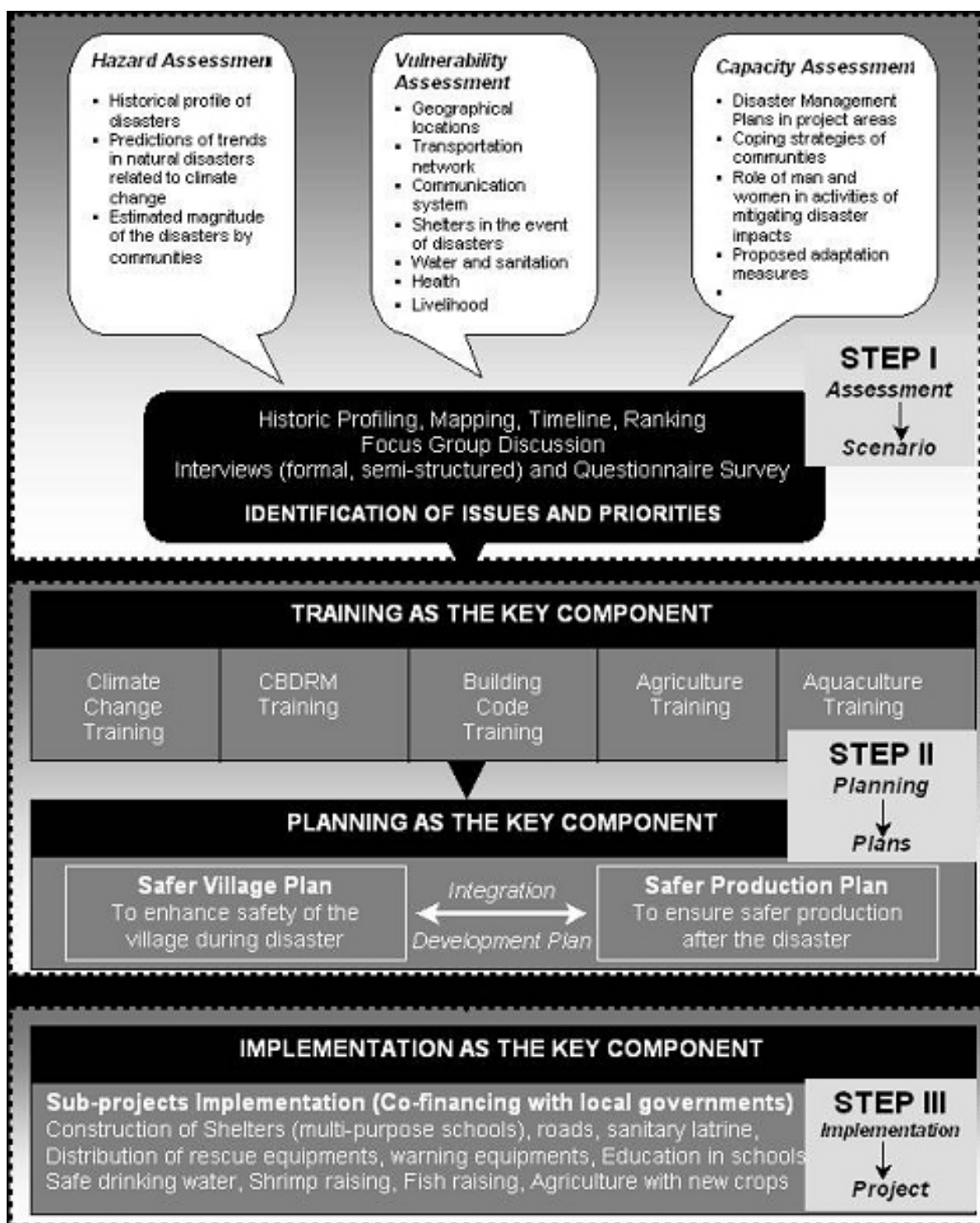


Figure 3. Project components and flow of project activities. The project activities include three steps: Step I: assessment, which provides a climate change scenario, Step II: planning, which provides safer village and safer production plans, and Step III: implementation, which incorporates the sub-projects.



Figure 4. Community based interventions: a) school building as the new flood shelter, b) raised latrine as sanitation measure, c) change agent providing training on climate change issues, and d) mass organization leaders discussing common issues.

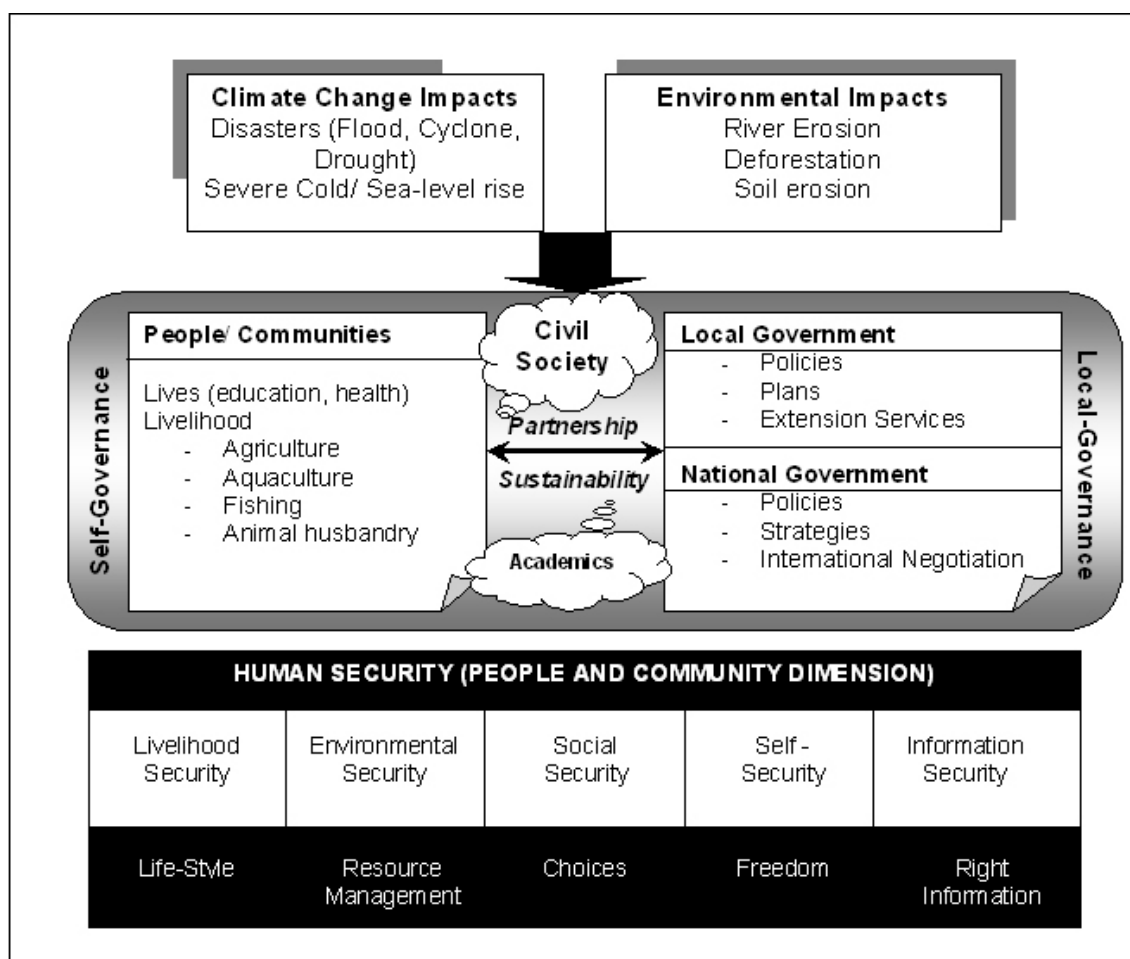


Figure 5. Climate Change Adaptation Model focusing on People and Community dimension of Human Security. The key point is to enhance partnership of people/ communities and government to ensure sustainability of different activities. Five dimensions of human security is discussed: livelihood, environmental, social, self and information.