

Chapter 8

Toward a Sustainable and Resilient Future

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Executive Summary

Based on the results achieved in Chapters 3, 4, 5, 6, 7, Chapter 8 is considered to be an orientation toward a sustainable development future which is resistant to the effects of climate change extremes in Vietnam.

With this purpose, this chapter presents the research on “Relationship between Disaster Risk Management and Sustainable Development”, “Integration of Short- and Long-term Responses to Extreme Events”, and “Relationship between Disaster Risk Management, Adaptation to Climate Extremes, and Mitigation of Greenhouse Gas Emissions”. These issues are the theoretical and practical basis to help policy makers in Vietnam define a more specific vision for future development.

Remarks drawn from these studies are:

- Conservation of natural capitals such as biodiversity and ecosystem services, applied science and technology play an important role in directing and harmonizing the nation’s socio-economic development goals;
- Integrating disaster risk reduction and climate change adaptation is an important issue in adjusting socio-economic policies and developing sectoral strategies, including connecting short and long-term activities through a synchronous implementation process, in order to bring about the highest efficiency for the present and future;
- Enabling economic and social development as well as maintaining environmental security are essential to the implementation of sustainable development goals while Viet Nam is facing challenges of water shortage, degradation of land resources and biodiversity;
- In Viet Nam, the impact of disaster risk and climate change are considered to be at the tolerant threshold, particularly concerning the vulnerability of affected populations, such as the poor, women, children and ethnic minorities as well as the most heavily affected industries such as agriculture and aquaculture, transportation and infrastructure; and
- The role and awareness of leaders at all levels, as well as the adoption of appropriate approaches, such as adaptive management, will contribute to promote social change in order to adapt more effectively to climate change and disaster risk reduction.

Based on the aforementioned findings, Chapter 8 provides directions for “Planning for Proactive, Long-term Resilience to Future Climate Extremes” and “Synergy between Disaster Risk Management and Climate Change Adaptation for a Resilient and Sustainable Future”.

From the practical disaster risk management and climate change adaptation in Vietnam, three lessons were summarized, namely: 1) Strong commitment of the Government towards disaster risk reduction and climate extremes in order to proactively adapt to climate change; 2) Awareness raising, capacity development associated with the mobilization of community participation in disaster risk reduction, extreme events and climate change adaptation; and 3) Coordinating and promoting national capacity and international cooperation.

8.1. Introduction

Based upon Vietnam's practical conditions, this chapter reviews the major contents on "Toward a Sustainable and Resilient Future" of the Special Report on "*Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*" (SREX) by the InterGovernmental Panel on Climate Change (IPCC, 2012). The structure of this chapter is as follows: Starting with reviewing the relationship between Disaster Risk Management and Sustainable Development (Section 8.2), reviewing the interactions over time between the present and the future (Section 8.3), assessing natural resources, environmental and social aspects related to sustainable development (Section 8.4), as well as analyzing the relationship between disaster risk management, climate change adaptation and emission reduction. (Section 8.5), in order to establish grounds for response measures and plans towards future climate extremes (Section 8.6), and concluding by emphasizing the synergy between disaster risk management and climate change adaptation, aiming at building a sustainable society (Section 8.7).

Section 8.2. discusses the relationship between disaster risk management and sustainable development, starting by clarifying the concepts (Section 8.2.1), reviewing the roles of ecosystems and biodiversity (Section 8.2.2), emphasizing the importance of awareness (Section 8.2.3), the role of technology (Section 8.2.4) and concluding by considering the challenges in decision-making (Section 8.2.5).

By concentrating on the time factor, Section 8.3 considers the integration of short-term and long-term objectives through the evaluation of efficiency of present operations resulting in future benefits (Section 8.3.1), reviewing barriers in combining short-term and long-term goals (Section 8.3.2), and recommendation of connecting short-term and long-term actions (Section 8.3.3).

Section 8.4 assesses natural resources, environmental and social aspects towards sustainable development, by analyzing available capacities and resources as well as limitations (Section 8.4.1), considering those who benefit and are affected at all levels (Section 8.4.2), and the possibility of affecting human security aspects (Section 8.4.3), and referring to the implementation of relevant international goals (Section 8.4.4).

Section 8.5 concentrates on the relationship between disaster risk management, climate change adaptation, and greenhouse gas emissions reduction, in which the limitations of resilient capacity are considered (Section 8.5.1), and considers the synergy and conflict between mitigation, adaptation and disaster risk management in urban and rural areas (Section 8.5.2).

Section 8.6 identifies the tools and plans to promote resilience to climate extremes and combine the adaptation, disaster risk management, and other policy goals, of which scenarios are established (Section 8.6.1), then emphasizing short-term and long-term implementation plans using analysis tools and models to improve disaster risk management and adaptation (Section 8.6.2), and finally making recommendations on promoting change (Section 8.6.3).

Finally, (Section 8.7), the chapter concludes by emphasizing the synchronous collaboration between disaster risk management and climate change adaptation in order to build a sustainable society.

8.2. Relationship between Disaster Risk Management and Sustainable Development

8.2.1. Concepts of Adaptation, Disaster Risk Reduction, and Sustainable Development and How They are Related

Sustainable Development is a concept that defines development in all aspects in the present while maintaining the ability to ensure continuous development of long-term future. In Vietnam, sustainable development has become the strategy, view and goal of development, and was manifested through the implementation of the "National Plan for Environment and Sustainable Development 1991-2000" (President of the Ministers' Council, 1991). The viewpoints regarding sustainable development was confirmed in Directive No. 36-CT/TW of June 25, 1998 of the Political Bureau on "Strengthening environmental protection during the period of industrialization and modernization of the country", and was re-affirmed at the 9th National Congress of the Communist Party of Vietnam and on Strategy for Socio-Economic Development 2001-2010, of which "Rapid, effective, and sustainable development, economic growth accompanied by the implementation of social progress and equality, and environmental protection".

More specifically, the sustainable development progress in Vietnam has been clearly reflected in the Strategic Orientation for Sustainable Development, in which "*The overall objective of sustainable development is to achieve full material life, spiritual and cultural richness, equality among citizens, the consensus of society and the harmony between human and nature; development should promote a strong, reasonable and harmonious combination of three aspects: economic growth, social advancement and environmental protection*" (Government of Viet Nam, 2004).

Disaster risks are losses of human life, properties, environment, living conditions and socio-economic activities caused by natural disasters, pursuant to Article 3 of the Law on Natural Disaster Prevention and Control (the National Assembly, 2013), this concept is also discussed in Chapter 1 and Chapter 2 (IPCC, 2012 page 32). Disaster risk management and disaster risk reduction are defined in this chapter as the processes of designing, implementing, and evaluating the strategies, policies, and measures to enhance the understanding of disaster risk, disaster risk reduction, disaster risk insurance, continuous improvement in disaster prevention, response, and recovery practices, with explicit objectives of increasing human security, well-fare, quality of life, and sustainable development (IPCC, 2012 page 34). Adaptation to climate change is reviewed exclusively in human and natural systems (IPCC, 2012 page 36), meanwhile the Ministry of Natural Resources and Environment (MoNRE, 2008) also introduced the concept of climate change adaptation and mitigation, of which the adaptation aspect is defined for both natural and human systems, whereas climate change mitigation are activities to reduce the level or the intensity of greenhouse gases emission.

The concepts of disaster risk reduction and climate change adaptation are also systematically presented in Chapter 1, Section 1.1.2. *Key concepts and definitions*. These concepts and contents are manifested in major policies of Vietnam, in chronological order, starting with climate change mitigation, limiting the detrimental impacts of climate change, natural disasters prevention and control, and constitute one among nine priority areas in the Strategic Orientation for Sustainable Development of Vietnam (Government of Viet Nam, 2004). Disaster prevention and control missions, which consist of prevention, response and recovery in order to mitigate losses caused by disasters, ensure sustainable development are expressively stated in the

National Strategy for Natural Disaster Prevention, Response and Mitigation (Government of Viet Nam, 2007). In the National Strategy for Climate Change (Government of Viet Nam, 2011a), natural disasters are assessed in the context of climate change impacts and climate change adaptation, of which climate change adaptation and greenhouse gases emissions reduction must be integrated in sustainable development, targeting towards a low-carbon economy. Recently, the concepts of natural disasters, natural disaster risk, natural disaster prevention have been reconfirmed and specified in the Law on Natural Disaster Prevention and Control (National Assembly, 2013), and disaster risk management must be implemented by industrial sectors and provinces based on the sustainable development standpoint.

8.2.2. Ecosystem Services in the Context of Disaster Risk Management and Climate Change Adaptation

According to the Millennium Ecosystem Assessment (MEA, 2005), Ecosystem services include direct or indirect benefits which human enjoy from the functions of ecosystems, including: (i) supplying services (food, fresh water, and materials etc.); (ii) regulating services (watershed area protection, flood protection, climate regulation etc.); (iii) cultural services (aesthetic values, recreation and eco-tourism, science and education etc.); and (iv) support services (soil formation, nutrient conditioning etc.).

Reducing human pressures on ecosystems and managing natural resources more sustainably can create favorable conditions for climate change mitigation efforts and reducing vulnerabilities caused by extreme climate phenomena. The degradation of ecosystems is undermining their capacity to provide products and services upon which human livelihoods and societies depend (MEA, 2005; WWF, 2010), and reducing their ability to respond to disaster risks. The coastal and marine ecosystems play an important role in regulating "the health of the oceans and coastal areas", however they are very vulnerable to the effects of climate change (Nguyen Chu Hoi et al., 2013). If well preserved, ecosystem services will bring many benefits to social and economic development such as those in the Mekong Delta (WWF, 2012).

Ecosystem can act as natural barriers against extreme climate events to reduce natural disaster risks. However, in case of strong impact (shock) of extreme climate events, the ecosystem conditions can be changed and these changes depend on its resilience capacity (IPCC, 2014 page 445). For instance, the role of mangroves is studied with regard to protecting coastal areas, fighting erosion, limiting salinization and promoting alluvial process (Phan Nguyen Hong et al., 2009a), restraining the damage of tsunami (Phan Nguyen Hong et al., 2009b), reducing the impact of waves during typhoons, protecting sea dyke (Phan Nguyen Hong et al, 2008), absorbing wave energy (Nguyen Thi Kim Cuc, 2013) as well as protecting the environment, especially the highly diverse forests with high plants density (Trương Thị Nga, Võ Thị Trúc Hà, 2009).

The rising of sea level will exacerbate the issue of salinization, affect important coastal wetland areas and significantly impact various freshwater species in the sanctuaries ecosystems, including national parks and nature reserves in the Mekong Delta, especially the U Minh Thuong National Park and Bac Lieu Nature Reserve, affect the conservation of wildlife and rare species (Ministry of Agriculture and Rural Development, 2013). Lagoon ecosystems have been severely affected by flooding and the rising of sea level, resulting in changing the salinity of the lagoon, destroying fisheries infrastructure, affecting aquaculture and fishing activities (Cao Lê Quỳnh, Nguyễn Chu Hối, 2009). Coastal ecosystems are also affected by natural disasters,

such as degradation and destruction of coral reefs under the effects of tropical storms and bleaching phenomenon in Con Dao (Nguyen Huy Yet, Vo Si Tuan, 2009). Climate change also affects the biodiversity of wetlands and nature reserves in the Mekong Delta (Le Anh Tuan, 2010b).

The impact of climate change on natural ecosystems have been reviewed in details in Chapter 4, Section 4.3.2. The impact on natural ecosystems and practical experiences in biodiversity conservation for the purposes of reducing the risks of extreme climate events impact on society and human are reviewed in Chapter 5, Section 5.3.3. Land use and ecosystem protection.

Ecosystems and ecosystem-based approaches can also facilitate adaptation to the change in climate conditions, reducing the pressures and impacts on water supply, forest conservation of carbon sinks (IPCC, 2012 page 445). In Vietnam, several recent scientific studies have examined the mutual relationship between climate change and ecosystems (CRES, 2013), especially coastal ecosystems (Phan Nguyen Hong and Tran Thuc (Lead author), 2009) as well as wetland ecosystems (CRES, 2011). In Vietnam, scientific basis and the application of ecosystem-based approaches for natural resources management and climate change adaptation has been summarized (Truong Quang Hoc, 2013), especially the application of ecosystem-based approach for wetlands (Shepherd and Ly Minh Dang, 2008). Previously, the ecosystem-based approach was applied for natural resources management at Cuc Phuong National Park and Na Hang Nature Reserve as pilot models by the Center for Natural Resources and Environment Studies (Truong Quang Hoc and Vo Thanh Son, 2008). In recent years, research programmes on climate change adaptation have adopted ecosystem-based approach in improving resilience, adaptation capacity as well as addressing the consequences of climate change in the coastal cities such as Da Nang, Quy Nhon and Can Tho (NISTPASS, 2011), in the planning of biodiversity conservation in Vietnam, and accumulation of experiences in strengthening resilience to adapt to climate change in three urban areas of Vietnam (Hanoi, Dong Hoi and Can Tho) (World Bank, 2012).

Climate change network of non-Governmental organizations (CCWG) is implementing activities to build CCA models applying ecosystem-based approach such as project in Thanh Hoa implemented by CARE (SRD, 2011), studying the adaptation of mangrove ecosystems in coastal areas under the impact of sea level rise in the Red River Delta (Nguyen Thi Kim Cuc, 2011) and other models of climate change adaptation in agriculture and forestry in Nghe An (Nguyen Thi Huong Giang, 2013) and the model of community-based climate change adaptation in Bac Lieu (Tuong Phi Lai, 2013).

The Government of Vietnam has soon developed policies and applied pilot payment model for forest services, by devising a specific plan, including practical research, a review summary and the integration and development of policy through implementing activities and pilots in several provinces. The issuance of Government's Decree No. 99/2010/ND-CP on the payment policy for forest services, which was adopted throughout the country, has been highly commended by international community (Ministry of Science and Training (MoST), 2012b). The development of payment policy for forest services in Vietnam is a positive example of associating the biodiversity conservation policy with the reduction of greenhouse gas emissions policy (IGES, 2011). Mainstreaming ecosystem services into the planning process, especially for wetlands, is being implemented and has achieved initial results in the Mekong Delta (Kim Thi Thuy Ngoc, 2011).

8.2.3. The Role of Awareness-raising in Shaping Responses to Disasters and Extreme Events

Values and perceptions affect actions in response to climate extremes, and they can be part of sustainable development. Indigenous knowledge, cultures and experience in dealing with natural disasters play a very important role in climate change and disaster risk adaptation, especially at the community level. The development of Vietnam was built on wet rice civilization along the rivers and deltas. To ensure economic development and social welfare, generations of Vietnamese have built a massive system of dykes along major rivers such as the Red River and its tributaries for flood prevention purpose which is a disaster and extreme phenomenon related to climate and climate change.

The World Bank (World Bank, 2011a) evaluated the social aspects of climate change adaptation in Vietnam, and has emphasized poverty, the dependence on climate-sensitive resources, the vulnerability of ethnic minorities, women and children, migration issues, all of which are related to natural disasters and extreme climate events. (Bingxin Yu et al 2012) evaluated Vietnamese farmers' adaptive behavior to climate change through their adjustments of inputs in agricultural production to respond to the changes in rainfall and temperature. Another social aspect such as gender issue has been studied and analyzed regarding the vulnerability of women and children in agricultural activities, which is the sector highly vulnerable to the impact of extreme climate events and natural disasters (Oxfam and UN-Viet Nam, 2009).

Raising awareness of climate change for the leaders, Governments, ministries as well as organizations, unions and local communities about climate change is important. Resolution of the Communist Party (The Central Committee of the Communist Party, 2013) on "Actively respond to climate change, enhance natural resources management and environmental protection" is the highest policy framework to guide, lead, and direct the climate change response, natural resources management and environmental protection in Vietnam. Law on Natural Disaster Prevention and Control (National Assembly, 2013) emphasizes information, communication and education on natural disaster prevention and control through the websites of Ministries, Governmental and local agencies and other means of mass communications, communications materials, especially materials from the ministries such as Ministry of Information and Communication (MIC), Ministry of Education and Training (MoET), Ministry of Agriculture and Rural Development (MARD). The Environmental Law (National Assembly, 2014) also included a chapter on climate change response, which emphasizes mainstreaming response into the strategy and the economic-social development planning.

Many technical guidelines have been compiled such as Disaster Risk Management and Climate Change Adaptation within the framework of the Strengthening Institutional Capacity for Disaster Risk Management project in Viet Nam, particularly the risks related to climate change (UNDP-MARD, 2011), a guide to community-based disaster risk assessment within the Community Awareness Raising and Community-Based Disaster Risk Management project of the Government (MARD, 2014), and training materials on disaster prevention organized by Vietnam Red Cross (Vietnam Red Cross, 2000).

The training of professional in climate change areas was held at the universities, specifically the Vietnam National University in Hanoi has developed Master's degree programme in Climate Change since 2011, with knowledge on climate change, its impacts on sectors and industries, and measures to respond to climate change including adaptation and reduction of greenhouse

gas emissions. The Vietnam Institute of Meteorology, Hydrology and Environment has developed a PhD. programme on “Climate change and Sustainable Development” since 2014. Many social organizations, international and national non-Governmental organizations have organized programmes and projects on raising awareness for local people in climate change adaptation and disaster risk management such as the “Capacity building on climate change for civil society organizations” project (SRD, 2011). The Government has developed and implemented the “Community awareness raising and community-based disaster risk management” project (Government of Viet Nam, 2009) with the objective to raise community awareness and effectively organize the model of community-based disaster risk management; to minimize fatalities and property loss and contribute to ensure sustainable development.

Many documents have been developed to promote awareness raising and education on climate change. The documents, research results, projects on climate change and the impacts of climate change in Vietnam, technical guidelines serving national, sectoral and local response activities against climate change, such as the Reporter Handbook (Nguyen Duc Ngu and Nguyen Trong Hieu, 2009), basic knowledge of climate change for the community (Truong Quang Hoc and Nguyen Duc Ngu, 2009), training-of-trainer materials on Climate Change (Truong Quang Hoc, 2011; Nguyen Duc Ngu and Truong Quang Hoc, 2009), basic knowledge on climate change (IMHEN and UNDP, 2012).

8.2.4. Technology Choices, Availability, and Access

Science and technology play significant roles in disaster prevention and climate change adaptation and are clearly manifested in the legislation and policy systems of Vietnam. Science and technology are specified in the Strategy for Science and Technology Development 2011-2020 (Government of Viet Nam, 2012b), science and technology to prevent and mitigate disasters are defined in the Law on Natural Disaster Prevention and Control (National Assembly, 2013) and on the National Strategy for Natural Disaster Prevention and Control (Government of Viet Nam, 2007). Certain demands on science and technology in monitoring climate and adapting to climate change have been identified in the National Strategy on Climate Change (Government of Viet Nam, 2011a). Changing towards environment-friendly technologies and reducing greenhouse gas emissions are identified in the National Strategy for Green Growth (Government of Viet Nam, 2012d). Researching new science and technology not only helps reducing greenhouse gas emissions but also provides timely, proactive response to climate change processes, reducing negative impact on socio-economic life, and taking advantage of the favorable opportunities for developing new economic sectors stemming from the environment (National Agency for Science and Technology Information, 2008).

The traditional methods to respond to natural disasters and adapt to climate change such as building dykes, canals, flood regulating and diverging works, etc. actively exploited (Tran Thuc and Le Nguyen Tuong, 2010); conservative technology of crop varieties and indigenous animal breeds, hybrid of crop varieties and animal breeds which have high productivity, high resistant to drought and salinization etc. are also being researched and deployed. Many modern technologies have been successfully applied in climate forecast, constructing climate change scenarios and sea level rise such as detailed statistical method, AGCM/MRI model, PRECIS model and SDSM, SIMCLIM softwares (MoNRE, 2011). This is an important part in the work of natural disasters prevention and climate change adaptation.

The recent climate change adaptation strategies will change the concept of adaptation from passive response to proactive prevention, considering the potential impact of climate change as

an important guide for policymakers (Tran Thuc and Le Nguyen Tuong, 2010). From that perspective, Vietnam has constructed, issued policy documents, normative act, standards, all of which gradually established a legal corridor and policy environment for the prevention and mitigation of natural disasters, response to climate change, in which technology is an important solution among those of social-economic development in general, and adaptation to climate change and extreme events in particular. Various technical standards and technical guidelines in planning, designing, building infrastructure systems of agriculture, rural areas towards enhancing climate change adaptation are being developed and adopted (Chapter 6, Section 6.5.2.1. *Technology Application and Infrastructure-Based Approaches*). The choice of technology to serve economic growth and social services towards "green growth" as part of the policy of sustainable development, are showed in the National Strategy for Green Growth (Government of Viet Nam, 2012d), however the initial barrier of Vietnam is the lack of fund, lack of trained human resources to access and develop advanced technologies.

8.2.5. Trade-offs in Decision-making

There are different definitions of trade-offs within different sectors, cultural and social contexts, however trade-offs can be defined as the exchange/optimal choice/wise use/rational use (CRES, 2007). Trade-off does not merely mean gaining - losing, it is defined as the choice of management to change the diversity, function and services provided by ecosystems over space and time (ACSC, 2007). Trade-offs may also arise through resolving conflicts between economic development and risk management (IPCC, 2012 page 448) or between the conservation of biodiversity and socio-economic development, as in the case studies of conservation policies of Vietnam (Hoang Van Thang et al., 2010). Trade-offs, in a positive way, are linked to the concept of sustainable development, the harmony between conservation and development, or the balance between conservation and development, which are concepts interpreted on the common "mutual benefit"/"win-win" approach .

Other aspects of the trade-offs have been considered, especially regarding the difficulties in decision-making between socio-economic development and environmental protection, agriculture production, water resources management, biodiversity and ecosystem services (Le Dien Duc, 2009), trade offs between economic benefits and environmental protection, especially in the sectors of pollution and human health, immigration issues and impacts on forest resources, between protecting mangroves and shrimp farming (PanNature, 2008) as well as challenges arising from economic growth and degradation of natural resources (Consultative Group for Vietnam , 2010). Thus, the essence of the tradeoff is to achieve harmony between the different objectives, especially when resources (natural, economic, human) are limited, while solving disaster management and climate change adaptation problems have always had conflicts over space and time, between short-term and long-term objectives, between investment for disaster risk management and investment for development.

However, there are currently not many researches conducted on trade-offs related to choosing solutions among disaster risk management, climate change adaptation and socio-economic development in Vietnam; meanwhile the conflict between economic development and environmental protection objectives has become more and more exacerbated in the context of climate change. For example, in the Mekong Delta, the increasing air temperature, the seasonal and territory change in precipitation, the abnormal natural disasters and the danger of sea-level rise due to global warming (Le Anh Tuan and Suppakorn Chinvano, 2011) could affect agriculture production, aquaculture and biodiversity (Le Anh Tuan, 2010a, 2010b, 2013).

8.3. Integration of Short- and Long-Term Responses to Extreme Events

8.3.1. Implication of Present Responses on Future Well-Being

Vietnam is evidently and strongly affected by climate change and the Government is strengthening the implementation of response solutions, which requires integration of short-term and long-term solutions so that it not only ensures the benefits of current development but also strengthens the long-term response capacity to the increasing impact of climate change, especially the extreme events.

Vietnam determines that responses to climate change include activities of climate change adaptation and mitigation, through the integration of climate change into development plans in order to adjust, supplement these plans, including guidelines, policies, mechanisms and institutions involved in mitigating the effects of climate change, short-term and long-term extreme climate events (IMHEN, 2012a). Vietnam has developed and implemented many policies, strategies, and socio-economic development plans towards sustainability, disaster prevention, climate change response. Vietnam Agenda 21 (2004) identified climate change as a factor which should be taken into account for sustainable development, and proposed priority activities to limit harmful effects of climate change, prevent and control disasters.

The Five-year National Project (2001-2005) VIE 01/021 "Supporting the development and implementation of Vietnam National Agenda 21" was led by the Ministry of Planning and Investment (MPI) accompanied by technical assistance and financing of UNDP in sectors such as watershed management, agriculture, forestry, industry, energy, urbanization; the and sustainable development policie have been focused on building long-term visions towards sustainable development goals, provided scientific basis and international experience to design specific actions at different levels of industrial and sectoral development. The comprehensive and clear proposals on climate change response is reflected in the Vietnam Sustainable Development Strategy for 2011 – 2020, especially in the National Strategy for Climate Change and the National Target Programme to respond to climate change.

The results of different studies have confirmed the urgency of the climate change impact assessment and integrated into strategies and development plans for short-term and long-term responses at different levels (countries, industries, sectors, villages, communities) (Tran Thuc, 2009; Dang Kim Chung, 2010; Doan Cong Khanh, 2011; Luu Thi Thu Giang, 2013; Than Thi Hien, 2013). Some studies have gone deeply into the extreme events in specific areas with impact assessment of such events and proposed adaptation solutions (Nguyen Lap Dan et al., 2012). The "Technical guidelines on methods for climate change impact assessment and identifying adaptation solutions" have been developed with the timeframe to assess the impact and vulnerability of 20 years, corresponding to local socio-economic development directions (IMHEN, 2011).

Extreme events and climate change are always linked to poverty issues, since natural disasters often cause greater damage to life, property and livelihoods of the poor and disadvantaged social groups (poor farmers, the elderly, children, women, etc.). Moreover, poverty is a great barrier in climate change adaptation and implementation of sustainable development. The relationship between poverty, social welfare and climate change will continue to be the research

topic in Vietnam in the coming years, which has been reflected in the approved long-term research programmes on science and technology at all levels.

In theory, the majority of studies have shown the appreciation for future interests and benefits as sustainable development goals, however, in practice this is not always the case, since not all of climate risks were considered in decision-making. Many medium-term development plans (5 years) only focus on short and medium-term visions, current climate risks, ignoring or not taking long-term vision into account; the approved long-term strategies, sectoral/local socio-economic development plans for 2011 – 2020 were only reviewed and supplemented with climate change factors after the issuance of the National Strategy for Climate Change (2011) and the National Strategy for Green Growth (2012). Even if the content of climate change has been integrated in the strategies and plans, they often lack implementing guidelines (IMHEN, 2012).

Correlation between current and future benefits is one of the problems that contain mixed opinions. Sometimes, the integration of climate change issues into development decisions is considered as creating more complex procedures, increasing investment in the projects. The results of which are immediate benefits often dominate the long-term climate change adaptation (Tran Thuc, 2012).

A question for the research and deployment of sustainable development is the relationship between the beneficiaries and the payers of response activities. In Vietnam, the Government is still the major payer for certain types of goods, public services, price subsidies (electricity, clean water, etc.), and is responsible for allocating annual state budget expenditures (collection, treatment of domestic waste, operation, construction of new landfills...), although the Government has issued mechanisms and policies to mobilize payments from the other stakeholders (so called socialization policy), however their participation is still modest (MONRE/UNDP, 2010). The reason comes from both sides: the capacity of the potential payers and their benefits have not been guaranteed for both short-term and long-term.

8.3.2. Barriers to Combining Short- and Long-term Goals

The studies related to climate change adaptation topics contain evaluations, remarks on the barriers or gaps in the combination of short-term and long-term goals. The main barriers in integrating climate change issues and disaster prevention into development plans in Vietnam have been shown in a recently published study (IMHEN, 2012a), in which a notable issue is the situation of “overloading integration works” (i.e. there are too many aspects to be integrated in the formulation of development plans). The lack of consistency of policy mechanisms, the organizational structure which are the barriers for the implementation of the short-, medium- and long-term goals, have been identified in the strategy, planning and development plans of nationally and locally (MONRE/UNDP, 2010; ISPONRE, 2013a).

Generally, there are four groups of barriers or deficiencies which can be generalized and have been shown in studies, corresponding to five types of adaptation measures for short-term, medium-term and long-term, including: (i) awareness; (ii) legal basis; (iii) resources; (iv) coordination; and (v) technology.

Awareness deficits: In Vietnam this deficit is evaluated as the leading barrier within policies planning and implementation level as well as local and community level resulting in difficulties in allocating investment resources and action coordination (Tran Thuc, 2009; Truong Quang

Hoc, 2009; Nguyen Huu Ninh and Pham Thi Thuy Huong, 2009). There are certain economic activities (hydropower development, tourism) that may exacerbate the effects of climate extreme events caused by lack of knowledge (Le Dien Duc and Han Tuyet Mai, 2009; MONRE/UNDP/DFID, 2009).

The lack of the legal basis: the biggest deficiency is that there are currently no existing regulations of statutory nature but only regulations under the law enacted by the Government. This deficiency results in difficulties, obstacles in assigning, allocating resources for a basic, long-term solution towards climate change response; focuses on the sectoral benefits; poor coordination and overlapping of responsibilities and benefits; complicated and cumbersome administrative procedures (ISPONRE, 2013a).

The lack of resources is considered an important barrier in the implementation and especially in the combination of short-term and long-term objectives regarding climate change response, including adaptation to climate change and disaster prevention (Nguyen Duc Ngu, 2009; IMHEN, 2012a). The lack of resources is common in developing countries (UNISDR, 2009), however if there are good strategies and policies, international cooperation mechanisms, it can help mobilize considerable financial resources, science, technology, communication etc. for climate change response (Nguyen Ngoc Tran, 2009; Nguyen Duc Ngu, 2009). Financial resources for climate change adaptation and disaster prevention and mitigation has not yet met the design requirements, especially financial resources local level have not been built on long-term planning, inefficient use due to integration with other purposeful activities. (Le Thu Hoa et al., 2013).

In general, resources for climate change adaptation and disaster prevention in Vietnam still mainly rely on the state and international support, and yet are poorly mobilized from non-state sources (MONRE/UNDP, 2010). The specific deficiencies are human resources, finance, information, networking organizations, technical facilities (MONRE / UNDP, 2010), especially the large shortage of experts on climate change (Nguyen Ngoc Tran, 2009). Overall evaluation regarding general resources for climate change adaptation and disaster prevention in Vietnam is highly deficient and comprehensively shortage of resources for the present and the next several years, especially human resources, facilities – technology and finance (MONRE/UNDP, 2010).

The lack of coordination is common in Vietnam management development activities. Particularly in climate change adaptation and disaster reduction, the coordination is somewhat even more loose due to both the unfamiliarity and lack of resources – which are important basis for coordination, and there are even more obstacles that cannot be resolved in the near future. This study shows that the main cause is the overlap of responsibilities, lack of clarity about the benefits and lack of legal basis for the coordination of activities (ISPONRE, 2013a). Legal documents or sector plannings are usually developed from the perspective of the sector responsible for drafting or planning and there is no harmonious combination between different sectors and levels (ADB, 2009).

There is a highly appreciated motto in climate change adaptation and disaster prevention which is “think globally, act locally”. Experience shows that the active participation of the community is an important factor in climate change response, especially in dealing with extreme climate events that occur frequently. However, there is still little involvement from the community in Vietnam, which is deemed as “small and unstable” (Nguyen Ngoc Sinh, 2012).

Technology deficiency is also common in poor, developing countries and a barrier to be taken into account in climate change response and extreme events, especially in forecasting and impact assessment. Due to the particularities of climate change and climate extreme events, currently in Vietnam, the technology for climate change adaptation and disaster prevention lies primarily in research and development (R&D) institutes established by the state. Monitoring equipment, scientific research and other necessary technology are evaluated to be of huge shortage (MONRE/UNDP, 2010).

If information is considered an constituent part of science and technology, the lack of information was also rated as large, both on the basis of information resources and management (storage, processing, information providing, etc.) (MONRE/UNDP, 2010). In addition, information sharing mechanisms are unclear and ineffective (Bui Cong Quang, 2009).

8.3.3. Connecting Short- and Long-Term Actions to Promote Resilience

Resistance capacity, according to the most common concept, is the manner in which a system, community or individual copes with turbulence and unexpectedness, is the ability of a system to predict and mitigate, respond and recovery from the external impact, more specifically, reducing, responding and overcoming damages caused by climate change since this is the capacity of a foreseeable system, (IPCC, 2012 page 34). Resistance capacity has been recently studied in Vietnam mainly in agricultural system, since it is more vulnerable and is under the direct impact of climate change and extreme events with increasing level of intensity and extent of damage. Research on resilience capacity also often refers to the ability to actively adapt or positive adaptation of social systems, residently, in which measures to strengthen the capacity to respond flexibly and on-site are usually leading.

The major disaster phenomena, particularly related to climate, occur more and more frequently resulting in enormous consequences for the economy and society, therefore it is necessary to construct synchronization solutions for short-term (1-5 years), medium-term (5-10 years) and long-term (10-30 years), with suitable roadmap to be able to mutually integrated and adjusted according to economy and society fluctuations of the region or country (Le Anh Tuan, 2013).

In Vietnam, the connection between the short-term and long-term activities in climate change adaptation and strengthening resistance capacity is implemented through climate change impact assessment and integrating climate change issues into social - economic development strategies and plans (IMHEN, 2011, 2012a). These policies are planned according to implementation phases (usually 5 years), with specific targets for each phase and overall goals set forth for longer vision (usually 15-20 years). Through the integration and implementation of climate change issues set forth in social - economic development strategy and planning, short-term and long-term activities are connected, which contains the objective of strengthening resilience capacity with leading role belongs to the State in connecting long-term and short-term activities towards climate change response (Nguyen Ngoc Tran, 2009; Nguyen Duc Ngu, 2009).

Realizing the impact of climate change on the sustainable development of the country, there have been studies on the effects, impact assessment and integrating of climate change issues into social - economic development strategies and planning for both short-term and long-term (Nguyen Ngoc Tran, 2009; Nguyen Duc Ngu, 2009; IMHEN, 2011, 2012a; Tran Thuc, 2009). The solutions were identified and decided for different industries, regions, areas and subjects in their vulnerable conditions (IMHEN, 2011).

The approach to the impact assessment and identifying adaptation measures is based on the principle of ensuring systematic, synthetic, interdisciplinary, inter-regional, gender equality, hunger elimination, poverty reduction characteristics. A planning process to cope with climate change and the process of climate change impact assessment with spatial boundaries of administrative units, geographical units, ecosystems, climate regions and impact assessment contents including nature, economy, society conditions are specifically studied and recommended accordingly (IMHEN, 2011).

Studies on integration have been implemented and applied in some ministries, sectors and local regions assisting in policymaking towards climate change response (Nguyen Van Thang, 2010; Dang Kim Chung, 2010; Doan Cong Khanh, 2011), particularly the integration of climate change issues into social - economic development plans have proposed a five-step process: screening; measures selection; measures integration; implementation; monitoring and evaluation (IMHEN, 2012a), as well as the criteria for assessing the integration of climate change issues are referenced from international documents (IPCC, 2014 page 453) and put into the integrated process (monitoring and evaluation stage). Cost benefit analysis (CBA) in impact assessment and climate change integration are also considered (Nguyen Danh Son and Truong Duc Tri, 2009; Nguyen Danh Son, 2013; IMHEN, 2011), since CBA is necessary for the identification, selection and combination of objectives and activities for short- and long-term, which is a step in the process of determining solutions towards climate change adaptation (IMHEN, 2011). In addition, other methods have also been proposed to determine priorities and selection of response measures, such as cost-effective analysis (CEA), multi-criteria analysis (MCA), expert method (IMHEN, 2011).

8.4. Access to Resources, Equality, and Sustainable Development

8.4.1. Capacities and Resources

Major policies usually focused on developing the resources and improving the capacity towards climate change response, including mitigation of natural disasters and climate change adaptation, which are clearly manifested in the Law on Natural Disaster Prevention and Control (National Assembly, 2013), the Environmental Law (National Assembly, 2014), objectives of the National Strategy for Climate Change (2011), organizational capacity, institutions and policies in the National Target Programme to Response to Climate Change (2008). National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 (2007) proposed a high priority for developing human resources and financial resources, science and technology, strengthening the system of dykes and reservoirs.

Within the framework of implementing the National Target Programme to Response to Climate Change, including the field of adaptation, (MoNRE, 2008 page 57) defined four groups of difficulties, challenges, which are: i) The weakness of awareness, both in the scope and extent as well as measures to respond to climate change; ii) Lack of coordination in response to climate change in the construction of policies, planning and programmes in different areas and sectors, iii) Lack of tools and methodologies to guide and consult policymakers and iv) Lack of knowledge.

Financial resources play very important roles in disaster risk management and adaptation to climate change. Law on Natural Disaster Prevention and Control (National Assembly, 2013) Article 8. stipulated Financial sources for natural disaster prevention and control, including state budget, Natural disaster prevention and control funds and voluntary contributions from organizations and individuals. National Target Programme to Respond to Climate Change (MoNRE, 2008) set a 2.374 billion budget for the period 2009-2015, including activities of disaster risk reduction and climate change adaptation (see Chapter 7, Section 7.4.2.4). Construction and implementation of the National Target Programme, National Strategy, National Action Plan to respond to climate change, Vietnam has also attracted technical support and financial resources from bilateral and multilateral sources, mainly for the climate change adaptation and mitigation activities in Vietnam, estimated to be nearly 200 million USD and funded by Denmark, Japan, the Republic of France, World Bank, CIDA and programmes for reducing greenhouse gases emissions through efforts to restrict deforestation and forest degradation (REDD +) funded by Norway which is up to 100 million USD (MPI and UNDP, 2011). Certain international financial resources also prioritize supporting Vietnam in the field of disaster mitigation, adaptation to climate change and areas related to climate change which are summarized on the website on Climate Finance Option (Climate Finance Options, 2014) and constructed by UNDP and World Bank and currently financial resources relating to climate and climate change for Vietnam are introduced by MPI (Climate Finance Options - Vietnam, 2014).

Financial resources for preventing and mitigating natural disasters are primarily laid in the State overall budget and mobilizable social resources, including backup budget and the national reserve to ensure the processing of requirements regarding the response and recovery from disaster consequences (see Chapter 6, Section 6.4.3.1. Finance). For example, the "Raising public awareness and community-based disaster risk management Project" period 2009-2020 owns a total investment amount equivalent to 54 million USD, whereas cost estimates for the implementation of the National strategy for preventing and mitigating natural disasters to 2020 of MoARD are 18 billion USD (see Section 6.4.3.1).

However, the allocation of resources is uneven between central government and local regions, among different ministries, as well as among demographic groups. Financial resources for climate change adaptation and disaster prevention have not always been employed effectively in local level (Le Thu Hoa et al, 2013). The public expenditure related to climate change responses in five ministries during 2010-2013 are significant and equivalent to 0.1% of GDP, focused primarily on the MARD and Ministry of Transport (MoT), for irrigation and road projects, with main purpose of adaptation (MPI, World Bank and UNDP, 2014). So far, financial information related to disaster risk reduction, climate change adaptation is incomplete due to lack of general, long-term and large-scale studies.

At local level, strengthening the capacity of local decision-making, including the promotion of applying community-based approach in disaster risk management, is specially emphasized, in which the People's Committee and other social and political organizations play important roles (see Chapter 5, Section 5.4.2 and Section 5.4.3).

8.4.2. Beneficiaries and Stakeholders at Local, National, and International Levels

Vietnam is one of the few countries strongly affected by climate change and sea-level rise with material damage caused by the impact of natural disasters and climate change estimated to be

equivalent to 1-1.5% GDP annually (CIEM and UNU, 2012). The loss of the territories and groups of population is very significant. Coastal areas, Red River Delta, Mekong Delta, and certain mountain areas are vulnerable ones against disasters and extreme events related to climate and hydrology (MoNRE, 2008 ; Nguyen Duc Ngu (Chief author), 2008). The most vulnerable population groups include the poor, ethnic minorities, women and children (MoNRE, 2009, 2011). Certain vulnerable industries include agriculture, forestry, fisheries, transport, health (MoNRE, 2008; Nguyen Duc Ngu, 2008).

A study on the impact, responses capacity and policy issues related to climate change in ethnic minorities areas in Northern Mountains (Mai Thanh Son et al., 2011) has proposed that extreme events such as droughts, flash floods, landslides, cyclones, hail often increase in frequency, intensity, and erratic, and have greatly affected in agriculture activities and life of ethnic minorities. These are important causes affecting poverty situations, in which people in rural areas are more strongly affected than urban dwellers (Le Anh Tuan and Tran Thi Kim Hong, 2012).

Vulnerable people are often the poor. The impact of natural disasters and extreme climate on the poor is greater and less predictable for their livelihood (Oxfam, 2008), whereas the poverty rate in Northern Mountains and Central Highlands is the highest in the country (World Bank, 2012). The livelihood of the people depends on agriculture, therefore when disasters and extreme climatic events occur, agricultural activities are often strongly impacted, and therefore, affecting their livelihood (Oxfam, 2008).

Women are also vulnerable to the impact of natural disasters and climate change (IMHEN, 2011). Although Vietnam has gained remarkable achievements in gender equality, women remain disadvantaged in education, health, information access, employment opportunities and decisionmaking (Oxfam and UN-Vietnam, 2009), especially in the case of natural disasters, they have little opportunity to create new livelihoods (Oxfam, 2008). For those of ethnic minorities, natural disaster is also the cause to their vulnerability and poverty due to social reasons, such as unemployment, illness or natural causes, such as crop failure or loss of property (World Bank, 2012).

Whereas those who are disadvantaged, those who suffer loss due to natural disasters and climatic extreme events are easily determined, the beneficiaries are relatively difficult to determine. The group of beneficiaries may include programmes and projects on hydro power plants upstreams, programmes on water resources exploitation upstream Red River and Mekong River, which reduced water flows downstream Mekong Delta, exacerbating extreme events such as saltwater intrusion, flood-tide and coastal erosion and opposing on people living downstream (Nguyen Huu Ninh, 2007).

Therefore, it is difficult to clearly define between beneficiaries and those who suffer loss at local, national or international level in the battle against natural disaster extremes and climate change. However, when building the relationships for Strategy for climate change adaptation and disaster risk reduction, one should also consider groups of beneficiaries and affected stakeholders for the solutions. Solution for this region can create problems for other regions.

8.4.3. Potential Implications for Security Issues

Climate change and extreme events can impact and exacerbate the problems of environmental security and social safety (Nguyen Dinh Hoe and Nguyen Ngoc Sinh, 2012), especially water security while 60% of water resources of Vietnam have foreign origin, mainly from Red River and Mekong Basins (ADB, 2009). Pollution associated with epidemics after natural disasters (such as typhoons, floods) are becoming pressing issues in Vietnam, and requires Vietnam to devote significant resources for handling. Climate change and extreme events can impact and exacerbate the environmental and social safety issues, which Vietnam is making efforts to implement through social and economic development programmes and projects, in accordance with regulations and technical guidelines agreed between World Bank and Government of Viet Nam (World Bank and MPI, 2004a, 2004b). Many of the community initiatives have been applied to ensure healthy and safety for the community in responding to natural disasters, such as distributing water filters and supplying cleanwater for communes affected by natural disasters (CARE, 2007), the media club model “Living with floods” and swimming training model for women and children in Mekong Delta (CARE, Oxfam and World Vision, 2010) or the experience and typical lessons regarding community based-disaster risk management in the highlands of Vietnam (CECI and Live&Learn, 2011).

The issue of food security due to the impact of climate change and climatic extreme events, as well as agricultural production to ensure food security in the context of climate change have been reviewed in chapter 4, Section 4.3.3.2 (issue of food security) and Section 4.3.3.3 (Agricultural Production to ensure food security in the context of climate change). Mekong Delta is an example case of a food and social insecurity due to potential risks of negative impacts of climate change and sea-level rise, which can reduce cultivation area, productivity and yield of agricultural products. This could lead to food security threat, not only for Vietnam but also partly for the world since the Mekong Delta contributes approximately 20-25% to the world’s rice exports, without reasonable solution and effective support internationally, this could be a factor causing instability in food supply for domestic market and a part of international market (Le Anh Tuan, 2012; ADB, 2011c).

A research of UN Vietnam (UN Vietnam, 2014) suggested that unsustainable development and ever-increasingly dangerous climate change are causing environmental degradation and migration; and resettlement according to Vietnam governance is one important tool for sustainable livelihoods in multi-disasters regions. Another research (Le Anh Tuan, 2010a) also pointed out that climate change and sea-level rise decrease cultivation area resulting in food and habitat shortage, natural resources degradation in Ca Mau peninsula, Cuu Long river delta and vulnerability of many poor in rural areas, coastal areas, remote areas and force them to migrate mechanically from coastal areas to urban areas for living.

8.4.4. Implementing Related International Goals

Government of Viet Nam has joined international conventions such as the United Nation Framework Convention on Climate Change and Kyoto Protocol (Chapter 7, section 7.3.1) and the United Nation Strategy on Disaster Risk Reduction (Section 7.3.2) and other related ones such as the Convention on Combating Desertification, the Vienna Convention for Protection of the Ozone Layer (MoST, 2012a). Climate change and natural disasters will directly and indirectly impact on MDGs (IPCC, 2012 pg.458). Vietnam had gain great achievements re regarding MDGs, especially in eradicating extreme poverty, reducing child mortality, achieving

universal primary education, however there is still challenge in ensuring environmental sustainability (MoST, 2010), which will intensify under climate change context.

In 2003, the Government of Vietnam signed a commitment to implement the Sustainable Development Strategy for the East Asian sea periods 2003-2011 and 2012-2016. In 2009, the Government also signed the Manila Declaration on Strengthening the implementation of Integrated coastal management for sustainable development and climate change adaptation with emphasis on the important role of integrated coastal management (ICM) and undertook by 2020 to implement ICM programmes in at least 20% of the country coastline. So far 20/28 provinces have applied IMC at different levels.

In 2009, the Government of Vietnam and 92 countries which own seas and islands in the world signed Manado Ocean Declaration at the First World Ocean Conference in Manado, Indonesia, which emphasized the central role of ocean in solving global, regional and national climate change issues. In that spirit, Vietnam has carried out studies to assess the impact of climate change on coastal areas, small coastal fisheries, the coastal islands and evaluate carbon capture capability of mangroves in Xuan Thuy national park and coastal zone in some provinces of Cuu Long River Delta (Carew-Reid, 2008; Cao Le Quyen, Nguyen Chu Hoi, 2009; Nguyen Quang Hung and Hoang Dinh Chieu, 2009).

Government of Viet Nam also adopted the Hyogo Framework for Action (HFA) and applied this framework as guidelines in the implementation of policies of managing and mitigating disaster risk, simultaneously institutionalized efforts by adopting the Law on Disaster Prevention and Reduction (2013), National Strategy on Disaster Prevention and Reduction (2007) (see Chapter 7). The first priority action of Hyogo which was to ensure disaster risk reduction (DRR) with national and local priority has achieved important progresses, based on evaluated rate of success 4/5 point by MARD with limited financial resources and capacity (MoARD, 2010).

8.5. Relationship between Disaster Risk Management, Adaptation to Climate Extremes, and Mitigation of Greenhouse Gas Emissions

8.5.1. Threshold Limits to Resilience

Climate change may cause change in climatic regime at system-level, large scale that could significantly alter climatic and socioeconomic conditions such as increasing the frequency and intensity of natural disasters lyke cyclones, floods and droughts, the number of people affected.

Tipping point is the point at which a system shifts from one state to another. Each life has a certain threshold point, and all threshold points and their resistant capacity to changes in eco-environmental conditions are completely different.

Although there has been no study on thresholds and tipping points in climate change, the researches related to vulnerability in Vietnam and approached from different areas of the natural-social system, community and coastal resources could also be used as examples (IMHEN and UNDP, 2012).

Threshold analysis is to determine climate change threshold at which exceed resilient capacity of the studied object. For example, if temperature over 35°C lasts for 4 continuous days, shrimps die or if the flooding level is maintained at 50 cm for 7 days, road system in certain locations will be damaged (IMHEN, 2011).

Climate change with changes in temperature and rainfall are leading agents which are capable of altering the ecosystems in large scale and seriously impact on the threshold. This will affect the composition and scale of ecosystems such as coral reefs are invaded by algae or the breakout of *Acanthaster planci* Starfish in some areas of Nha Trang bay, Nam Yet and Thuyen Chai in the Truong Sa islands (Vo Si Tuan et al., 2005).

Resistance capacity of organisms can also be broken by the impact of change in environmental factors lyke the coral in Ninh Hai, Ninh Thuan coastal areas are bleached resulting in sudden decrease of *Acropora* coverage at a rate of 10.8% (Nguyen Van Long et al., 2009); which also occurred in some reefs in Nha Trang, Phu Quoc and Con Dao (Vo Si Tuan, 2009).

When environment changes exceed ecological adaptation thresholds of species, some disappear or appear in specific places, such as the case of Hoang Lien Van Sam pine, a pine species found only in Hoang Lien Son and listed in the World Red Book, previously available only in 2.200m - 2.400m altitude, however currently can be seen at 2.400m -2.700m altitude. Some other endemic species (found only in Hoang Lien Son) lyke Xi Pan maple, Sa Pa mapple, previously only grew at elevation below 1,700 m currently can be seen at altitudes above 2,000m and many other plants are also "climbing" up and occupy spaces of endemic species of cold areas (Pham Duc Thi et al, 2007). According to calculations, by 2070 Vietnam plants can be found upwards 550 m and northwards 100-200 km compared to their current locations, subtropical species shall decline and agriculture, forestry and fisheries production will be forced to adjust (Pham Ngoc Quy and Nguyen Quoc Luat, 2012). When environmental and climatic factors change unexpectedly beyond the resistant capacity of human and infrastructure systems, the vulnerability and damage caused by these impact are very large as in the case of Hue city of limited infrastructure and policy, disaster prevention solutions (Tran Thuc et al., 2013). Therefore, threshold and tipping point play important roles in disaster risk management and climate change adaptation.

8.5.2. Relationship between Adaptation to Climate Change, Mitigation of Greenhouse Gas Emissions and Disaster Risk Management

Recently many researchers have focused on the relationship between climate change mitigation and adaptation to climate change, reduce greenhouse gas emissions and disaster risk management (IPCC, 2012 page 459), which possesses different features in urban areas and rural areas.

8.5.2.1. Urban

In the context of climate change and rapid urbanization, the global sustainable development depends on the formation and development of sustainable cities and resistance capacity against climate change. Forms of urban space is very important for energy consumption and disaster risk management (IPCC, 2012 pg. 460). Urban planning is a tool for disaster reduction, and climate change adaptation and a part of the development process (IPCC, 2012 pg.460).

Urban type affects spatial and society symmetry and thus affects the vulnerability, ability to cope with extreme events and climate change adaptation of urban areas (IPCC, 2012 pg. 460).

In Vietnam, in the last 20 years, the process of urbanization has been going strong, 731 urbans (2009), including 02 special cities of Hanoi and Ho Chi Minh City, categorised from level 1 to level 5, have formed a chain of national central cities and regional centers while also contributes to the increasing the proportion of the urban population from 19.5% in 1990 to around 30% in 2009 (World Bank, 2011b) and as a result leading to overload in using existing infrastructure system. 96% of the population have access to electricity is a great achievement of Vietnam (WB, 2011b, 2012), but this can be associated with the exploitation of large quantity of fossil fuels in power plants, producing more greenhouse gas emissions according to the plan that 46.8% electricity production in 2020 was due to the use of coal (Government of Viet Nam, 2011b). Therefore, the Prime Minister has approved the Urban Development Scheme to cope with climate change period 2013 - 2020 (Government of Viet Nam, 2013b) and actively respond to climate change and to promote urban development in a sustainable way.

Urban flooding in Vietnam has become a pressing issue and apparently is getting worse under the impact of natural disasters and in the context of climate change, especially for coastal cities (See Chapter 9, Section 9.4.2 *Urban flooding: threats and challenges of urban planning*). The cause was identified as not performing the integration of disaster risk reduction and climate change adaptation in urban planning and in practice individual solutions have proved to be ineffective.

Since 2009, the project "Asian Cities Climate Change Resilience Network (ACCCRN)" funded by Rockefeller Foundation was implemented in three cities in Vietnam: Da Nang, Quy Nhon and Can Tho; through activities of enhancing management capacity of marine ecosystem as a resource, livelihood development, modeling of local communities under the impacts of climate change (ISET, 2009). However, these cities are also facing pressure from the rapid urbanization, including environmental issues, migration, water scarcity and other restrictions on infrastructure, climate-related danger, such as obstructing the flow, increasing depth and speed of flood in Quy Nhon, the impact of storm surges, saline intrusion and sea-level rise in Can Tho and river erosion in Danang (ISET, 2013). Institute of Development Studies in the UK have studied institutional and management aspects of Danang, including structural aspects and functions of local Government, urban planning, decentralization of Disaster Prevention and Mitigation, to provide a basis for the proposal on enhancing capacity to withstand climate change and adaptation strategies for the city (IDS, 2007). In summary, in order to strengthen resilience capacity to climate change and extreme events, urban planning system in Vietnam should reinforce: i) the approach to overall planning based on proven fact - and should present accurate aspects and positions in demand and ii) avoiding fragmentation in the planning system and to integrate and fully coordinate between functional regions or space.

Project "Adaptation to Climate Change through Sustainable Development" in Can Tho has applied advanced methods "integrated management of urban water systems" to improve the service system and aquatic environment, thereby enhancing the ability to adapt to climate change (CSIRO, 2012). As one of 10 cities in the world most affected by climate change (OECD, 2008), Ho Chi Minh City was assessed by Asian Development Bank (ADB, 2010) on its vulnerability in urban development and land use planning, population growth and poverty, transport and transport infrastructure, water supply and sanitation, industrial, agriculture

development and natural ecosystems, energy, health care by 2050 and proposed adapting solutions.

8.5.2.2. Rural

Rural areas have to face many disasters and are vulnerable. Vietnam's rural areas are home to nearly 70% of the population of the country (Hoàng Bá Thịnh và Nguyễn Kim Thủy, 2011), agricultural production, forestry and aquaculture production are primarily livelihood of the locals, and are also the sectors most affected by natural disasters in the context of climate change.

Many projects have studied the impact of climate change on provinces, building databases and simultaneously proposing adaptation measures as in case of Ca Mau (ADB, 2011a) and Kien Giang (ADB, 2011b). World Vision Vietnam focused on assessing vulnerability and adaptive capacity of communities in Ca Mau (WVV, 2012). Due to the impact of sea-level rise combined with high tides and low water level of Mekong River in the dry season, sea water intrudes deeply inland causing salination and affects agricultural production (Le Anh Tuan, 2009; WWF, 2012).

The ecosystems services and biodiversity affected by extreme climate phenomena in the Mekong basin (WWF, 2009), in wetlands and nature conservation (Le Anh Tuan, 2010a), and the Ca Mau peninsula (Le Anh Tuan, 2010b; Hoang Van Thang, 2013). Damage or costs incurred in the absence of application of climate change adaptation measures in agriculture and aquaculture from now to 2050 (World Bank, 2010).

Agriculture and forestry production and the livelihoods of mountain communities affected by phenomena such as floods, droughts, landslides and cold spells. The project "Capacity building of coordination and integration of disaster risk reduction and adaptation to climate change in agriculture in the Northern Mountains of Vietnam" has gathered experience to provide guideline for mainstreaming disaster prevention and mitigation and adaptation to climate change in the agricultural development planning for Phu Tho, Yen Bai and Lao Cai (MoARD và FAO, 2012). Non-Governmental organizations also actively participate in the study on impacts, adaptive capacity of ethnic minorities in Northern mountainous areas and some policy issues (CCWG, 2011) as well as review the impact of climate change on sustainable development in Vietnam regions in terms of policymaking (Vo Thanh Son, 2013).

It is difficult to ensure the harmony between the development of rural economy and natural resources preservation. Keeping balance and performing controlled exploitation of natural resources are both regulating tools on capacity-building potential and an important mechanism to ensure long-term sustainability of rural livelihoods and the ecosystem services (IPCC, 2012 page 461). In fact, in Vietnam, the ecosystems services, biological diversity are affected by extreme climate events and climate change, as in the case of Mekong basin (WWF, 2009), impacts of climate change on biological diversity in these wetlands and nature conservation in the Mekong River delta (Le Anh Tuan, 2010a), and the Ca Mau peninsula (Le Anh Tuan, 2010b; Hoang Van Thang, 2013).

REDD + programme, with the goal of reducing emissions from deforestation and forest degradation, conserving and enhancing carbon stocks, linked with sustainable forest management is an example of protection and sustainable management of resources natural resources motivation are driven by activities in greenhouse gas emissions, while creating the ability to share benefits for adaptation and promoting biodiversity conservation, sustainable forest management and strengthening reserves carbon, improving the livelihood of rural people

in Vietnam (Nguyen Hang et al, 2011). REDD + in Vietnam is divided into two phases: (i) Phase 1 (2008-2012): Capacity building at all levels and all stakeholders in the implementation of REDD +, simultaneously, conducting pilot projects; and (ii) Stage 2 (after 2012): Implementing REDD + Programme (UN-REDD Vietnam, 2011a, 2011b). A number of studies introducing REDD+ implementation in Vietnam consider REDD + as a solution to sustainable development (Holland and McNally, 2010) and promotion activities, awareness raising, conducting technical guidance, such as forest carbon monitoring manual involving the participation (UN-REDD Vietnam, 2011c), building and design of benefit-sharing systems (Nguyen Hang et al, 2011). Other studies such as evaluating biodiversity and carbon stocks to build REDD + in Vietnam (Vo Thanh Son et al., 2011) and mapping to assess the potential application of REDD + for conservative work (Mant et al, 2013) have also been implemented.

8.6. Planning for Proactive, Long-term Resilience to Future Climate Extremes

8.6.1. Planning for the Future

Disaster risk management and climate change adaptation are basically making plan for a future with uncertainties, a process related to the combination of subjective will (individual and collective) and vision of what may come (IPCC, 2012 p.g462). Recently, reports of the Development and Climate Knowledge Network (CDKN, 2012) have stressed the importance of disaster risk management and climate change adaptation in Asian region, including Vietnam.

With regard to long-term policies, Vietnam has made great efforts in improving the policy system in response to climate change, including disaster risk reduction and climate change adaptation towards building a sustainable society. The legal system related to the environment and natural resources to address disaster reduction and climate change change has been established, including the revised Law on Environmental Protection (National Assembly, 2014), Law on Forests Protection and Development (National Assembly, 2004), Law on Water Resources (National Assembly, 2012), Law on Biodiversity (National Assembly, 2008), Law on Fisheries (National Assembly, 2003); Law on Disaster Prevention (National Assembly, 2013). At the same time, relevant strategies have also been adopted, most important is the Strategic orientation for sustainable development in Vietnam (Government of Viet Nam, 2004), Sustainable Development Strategy Vietnam 2011-2020 (Government of Viet Nam, 2012a), Environmental Protection Strategy by 2020, with a vision to 2030 (Government of Viet Nam, 2012c), National Strategy for Green Growth (Government of Viet Nam, 2012d), the National Strategy on Water Resources by 2020 (Government of Viet Nam, 2006), National Strategy on Biodiversity (Government of Viet Nam, 2013a), National Strategy on Disaster Prevention and Reduction (Government of Viet Nam, 2007), National Strategy on Climate Change (Government of Viet Nam, 2011a). these policies form an important foundation for Vietnam to actively devise long-term solutions to cope with climate extremes, prevent natural disasters and adapt to climate change (see Chapter 6, Section 6.4.1. The legal documents and legal compliance mechanisms).

Pursuant to the adopted laws and strategies was, the ministries, sectors and local authorities have actively built their climate change action plans, with emphasis on disaster prevention, response and reduction as well as climate change adaptation. Ministries that have established

climate change adaptation plan include MoNRE (2010), MARD (2011), MIT (2010), MoT (2011) and Ministry of Labour, Invalids and Social Affairs (MoLISA) (2011); particularly, MoNRE also developed an action plan for implementing strategies on disaster prevention and response (2009). Moreover, the National Programme to Respond to Climate Change (MoNRE, 2008) has divided responsibilities among ministries, local authorities and also dvised specific projects in climate change adaptation and disaster risk reduction.

The Five years Socio-Economic Development Plan 2011-2015 (Government of Viet Nam, 2012h) has reviewed the challenges of natural disasters and extreme events in the context of climate change and the proactiveresponse solutions. Several sectoral plannings consider climate change and sea-level rise an important factor, most notable is the water resource planning in Mekong Delta for 2012 - 2020 and orientations to 2050 in the context of climate change and sea-level rise (Government of Viet Nam, 2012f), and water resource planning in Red River delta for 2012 - 2020 and orientations to 2050 in the context of climate change and sea-level rise (Government of Viet Nam, 2012g).

8.6.2. Approaches, Tools, and Integrating Practices

In Vietnam, the essential tool for policy-makers and planners have been more or less applied in the areas of sustainable development, disaster reduction and climate change adaptation. the tools that have been used a lot revently include climate change and sea-level rise scenarios, five-year socio-economic development scenarios, sectoral strategies, and specific action programmes. These form important foundation for climate change response in Vietnam.

In order to recognize and assess the future potential, scenario development has become a research tool both in the natural sciences and social sciences (IPCC, 2012 page 462). Scenarios can be based on different geography (e.g., globally, nationally, and locally) and on different durations (e.g., from a few years to several decades or century).

Vietnam has developed the climate change and sea-level rise scenarios for the purpose of research and policy-making. Developed first in 2009 (MoNRE, 2009) and updated in 2011, Vietnam climate change and sea-level rise scenario was analyzed in details at the provincial level and for coastal areas, especially added with some climatic extreme elements, for the purpose of designing and planning (MoNRE, 2011).

8.6.2.1. Improving Analysis and Modeling Tools

Various tools can be used to design environmental and climatic policies, among them, integrated economic-energy-environment model can produce long-term projections taking into account population, technological and economic trends, however most models are within limited geography and time frame , which doesnot address specific extreme climate events or disasters.(IPCC, 2012 p.g464). Vietnam has used a number of tools to design environmental and climate policies such as regulations on environmental impact assessment (EIA) for the purpose of proposing mitigation solutions to the adverse effects of environmental activities, which are written in the Law on Environment (National Assembly, 2014). (MPI, 2011b) summarized and developed "Guidelines for the Strategic Environmental Assessmentl (SEA) in setting strategies, for socio-economic development planning", including additional guidance on integrating climate change issues into strategic environmental assessment.

Current status of integrating disaster risk management and climate change adaptation into plans and policies in Vietnam was described in Chapter 6, Section 6.3.1. A range of policy instruments related to sustainable development and climate change are being developed and completed, especially in integrating climate change policy development and guidance of the National Target Programme to Respond to climate change (MoNRE, 2008). Integration techniques are applied with techniques in Strategic Environmental Assessment and Sustainability Assessment (Vu Tuan Anh et al., 2011) in developing national as well as socio-economic development plans (Tran Thuc, 2012).

Several ministries have actively integrated climate change issues into their activities, such as the Action Plan on response to climate change in agriculture and rural development for 2011-2015 and Vision to 2050 (MARD, 2011), development of documents on mainstreaming disaster risk reduction and climate change adaptation for provinces such as Yen Bai and Lao Cai (MARD and FAO, 2012), and technical guidelines on disaster risk management and climate change adaptation (MARD and FAO, 2012). These integration tools are also applied by development organizations such as Oxfam, Red Cross (CARE, 2009; CCWG, 2010). In addition, technical documents on disaster risk management and climate change adaptation (MARD and UNDP, 2012) and technical guidelines on Forest Carbon Monitoring in the framework of the UN-REDD Vietnam (MARD-REDD, 2011) were also developed.

A series of guidelines are designed to integrate disaster risk reduction into the provincial socio-economic development plan in the Mekong Delta (ADPC, 2010a; ADPC, 2010b). Simultaneously the adaptation strategies for coastal livelihoods, which is most at risk due to climate change impact in central Vietnam, has also been developed (MoNRE, 2010).

In 2004 when the Orientations for Sustainable Development in Vietnam was issued, several studies on the sustainable development indicators of have been conducted (Le Anh Son and Nguyen Cong My, 2006), mainly based on the research of the Sustainable Development Council of the UN (United Nations, 1996, 2001, 2007). The set of national sustainable development indicators was adopted and issued in the Sustainable Development Strategy of Vietnam for 2011-2020 (Government of Viet Nam, 2012a), and the set of local indicators was issued in the Indicators for Monitoring and Evaluating Local Sustainable Development for 2013-2020 (Government of Viet Nam, 2013d), with emphasis on implementing green growth strategy, ensuring the economic development at low-carbon level, mitigating impact of and adapting to climate change, and disaster prevention. Specifically, the green GDP index (implemented from 2015) to calculate the pollution cost and damage caused by disasters in the national accounts system, and the national green GDP calculation methodology are being designed and tested (CIEM, 2012). At the local level, the local sustainable development indicators are also being proposed, particularly indicator number 26 on "The number of disasters and the extent of damage", to provide additional data for calculating green GDP.

Vietnam has developed and issued the "Evaluation Criteria for Priority Projects under the Support Programme to Respond to Climate Change" (Government of Viet Nam, 2011c). The indicators related to climate change adaptation and disaster risk management policies are often integrated into the socio-economic development indicators or environmental indicators, in particular the following: (i) 30 indicators to monitor and assess Vietnam sustainable development for 2011 - 2020 (2012); (ii) 274 National Statistical Indicator System (NSIS) divided into 24 groups covering economic, social and environmental sectors (2005); (iii) The Management Information System for Forestry Sector (FORMIS) and Forest Inventory (2006);

(iv) 231 indicators in the Management Information System for Resources and Environment Sector (2007) and other targets/indicators systems. These indices/indicators form an important database to assess the impact of climate change and disaster risk within sectors and territories, as well as propose response solutions.

One of the important tools is the construction and maintenance of disaster risk management information systems, including information infrastructure and databases, equipment, management software and suitable human resources (See Chapter 6, Section 6.5.1). This information is particularly useful in mainstreaming disaster risk management into the planning of national, regional and local sustainable development.

8.6.2.2. Institutional Approaches

As a disaster-prone country, Vietnam has drawn extensive experience in prevention, particularly strengthening the institutional system, organization and response measures. The National Strategy on Disaster Prevention and Reduction to 2020 emphasized the role of Government in unifying state management in disaster prevention, response and reduction at the national scale. MARD is the permanent body, coordinating with the relevant authorities in assisting the Government in implementing State management in this area. MARD and the Central Steering Committee for Flood and Storm Prevention and Response are the leading agencies in implementing the National Strategy for Disaster Prevention and Mitigation to 2020.

One of the typical and practical experiences of Vietnam in disaster prevention is the summarization of the "Four On-sites" motto (on-site leadership; on-site human resources; on-site facilities; and on-site logistics) to cope with and overcome the consequences of floods and storms (JANI, 2011). In fact, the "Four On-site" motto is applied before, during and after disasters and in prevention and mitigation activities for all types of natural disasters which occur frequently in Vietnam such as typhoon, flood, landslides and sea-level rise, salinization, drought, forest fires, etc.

Tools such as insurance, reinsurance, insurance fund, catastrophe bonds, microinsurance, and other mechanisms, transferring economic risk from one person to another, thereby providing compensation in exchange for a payment, usually a premium (IPCC, 2012 Section 5.6.3, 6.5.3 and 7.4, and case studies 09.02.13). In Vietnam, these new tools have recently been researched and applied to all sectors and industries that are at high risk from natural disasters and climate change. This policy is being piloted to agriculture such as insurance for rice, coffee, some livestock and crops in the context of climate change, through the issued Decision on the pilot implementation of agricultural insurance in 2011-2013 (Government of Viet Nam, 2011d) (See chapter 6, Section 6.5.3 Sharing unresolved risks).

The financial instruments applied in the environmental sector in recent years were only limited to establishing the Environment Fund at a relatively small scale (MPI, 2012b). Parallel to this process, the MPI also reviews and assesses the financial resources for climate change, specifically from Official Development Assistance (ODA) and public expenditure (MPI, 2011a). Recently, a study on "Assessment of investment and climate public expenditure of Vietnam" (MPI, World Bank and UNDP, 2014) conducted by the MPI, the World Bank and the United Nations Development Programme analyzed the institutional aspects, policies and public expenditures of 5 ministries, 3 provinces and proposed recommendations and related action plans.

8.6.3. Facilitating Transformational Change

Facing strong, abnormal impacts of climate extreme events and disasters, if there is no positive change in policy and society, it will be difficult to adapt to climate change. Adaptation is marked by shifting from recognizable trend projects to the macro strategy and from discrete results to an approach including adaptive management, learning, innovation and leadership.

8.6.3.1. Adaptive Management

In general term, adaptive management can be defined as a process for improving management and operational policies of the system by proactive learning from the outcomes of implemented activities in order to adapt to changes of the environment (IPCC, 2012 pg.467). The principle of adaptive management can contribute to a more process-oriented approach disaster risk management, and promoting sustainable natural resources management under conditions of uncertainty (IPCC, 2012 Page 467). Adaptive management is often associated with “flexible” organizations that are not locked into rigid plans, but instead always evaluating the information and emerging challenges to figure out new methods to operate in accordance with new conditions (IPCC, 2012 page 467).

Adaptive management has been only implemented in some fields such as livelihoods in the context of climate change and disaster risk reduction by non-Governmental organizations such as CARE, Oxfam implemented (CARE, 2007; CARE, Oxfam and World Vision, 2010). Management form can be referenced from models of provincial disaster management, and the establishment of the disaster prevention and mitigation centers in Da Nang, Quang Nam, Quang Ngai and Binh Thuan (See Chapter 5, Section 5.4.5. Initiatives and actions of social-political organizations at local). This is an innovative and effective model of local authorities in disaster prevention activities, which can be replicated in other provinces in the country.

8.6.3.2. The process of learning, awareness raising and resources training

The dynamic notion of adaptation calls for learning as an iterative process in order to build resilience and enhance adaptive capacity now, rather than targeting adaptation in the distant future (IPCC, 2012 page 467) . Adaptive management is an incremental and iterative learning-by-doing process, whereby participants make sense of system changes, engage in actions, and finally reflect on changes and actions. Lessons are learned from theories, including experiential learning. (IPCC, 2012 page 467) (see Chapter 1, Figure 1-3).

Studying here is also understood as awareness raising for people, the guiding of Governmental leaders and local Government departments, and the sharing of information, lessons learned from success and failure . Learning is a key ingredient for living with uncertainty and extreme events and is nurtured by building the right kind of social/institutional space for learning and experimentation, knowledge systems, values and facilitating innovative and creative adaptation (IPCC, 2012 page 467). Learning process in this field often tends to focus on activities to raise awareness about climate change, prevention and mitigation of disaster risk (MoST, 2012b; CARE, 2007; Care, Oxfam and World Vision, 2010) .

One urgent issue is the training for highly professional staff in the fields related to climate change. A number of universities and research institutions have organized training courses and training programmes for their the staff in this area, especially, since 2011, the National University Hanoi has organized interdisciplinary master training programme on climate change, including the knowledge packages on the basic of climate change, impacts of climate change

on the sectors, regions and coping with climate change, including disaster risk reduction and climate change adaptation. MARD with the support of the United Nations Development Programme implemented a project to enhance institutional capacity for disaster risk management, particularly the risks related to climate change in Vietnam, and simultaneously prepared technical documentation on disaster risk management and climate change adaptation (UNDP and MARD, 2011).

In the education system, MoET has published the ABC Handbook on Climate Change (MoET, 2012) for highschool students and guidelines for teaching and learning about natural disasters risk mitigation (MoET, 2013) for teachers and students with the aim of raising awareness in the field of disaster prevention and adaptation to climate change. At community level, many civil society organizations and development organizations have also deployed multiple training courses to raise awareness on climate change and disaster prevention (Trương Quang Học (Chief editor), 2011) or prepared FAQs documentation on Climate Change (Trương Quang Học et al., 2011). (MARD, 2014) has also recently prepared documentation of community-based disaster risk assessment aiming at raising awareness for the community.

8.6.3.3. Innovation

The transformation of society toward sustainability and resilience capacity involves both social innovation and technological innovation – incremental as well as radical change. Innovation may refer to non-material knowledge like cognition, awareness, information or intelligence or it can refer to any kind of material resources. In some cases, a slight adjustment in practices or technologies may create significant innovative steps toward sustainability, while in other cases, radical transformation is necessary (IPCC, 2012, pg 468).

There is no common way or rule for solutions to natural disasters and climate change adaptation, particularly at the community level. Scientists, communities, people living in regions, from mountains to deltas, from north to south all have much experience and creativity in production and dealing with unfavorable situations. It can be considered the motto "four on spot" in disaster prevention is an innovation of Vietnam under limited resources condition while continuously battling against increasingly extreme disasters. This motto has been institutionalized in legal documents, especially in law against disasters (National Assembly, 2013), which has been widely applied from central to local and highly appreciated from community development organizations (JANI, 2011).

Community-based disaster risk management approach (Government of Viet Nam, 2009) in development projects, poverty alleviation or approach towards climate change adaptation based on ecosystems (ISPONRE, 2013b) would be an innovative method of implementation.

According to the National Strategy for Green Growth period 2011-2020 with a vision to 2050 (Government of Viet Nam, 2012d), green growth must rely on biodiversity conservation, development and effective use of natural resources, which was initially embodied in the sustainable development strategy for Vietnam period 2011 - 2020 (Government of Viet Nam, 2012a) and in the National action Plan on sustainable Development 2013-2015 period (Government of Viet Nam, 2013c).

8.6.3.4. Leadership

The leaders play critical roles in disaster risk management and climate change adaptation, particularly in initiating processes and sustaining them over a long time (IPCC, 2012 Page 469).

In Vietnam, there is a unified leadership of the Party and the Government in responding to climate change and disaster prevention missions demonstrated by capturing the era trends, actively building institutional systems, policies, from building structures, developing human resources, to completing legal system, developing strategies and specific action plans. These practices have been summarized in the report of the Government on the implementation of sustainable development in Vietnam, and was presented at the Summit of the United Nations on Sustainable Development (RIO + 20) (MoST, 2012a).

8.7. Synergy between Disaster Risk Management and Climate Change Adaptation for a Resilient and Sustainable Future

The evaluation results of this chapter have shown the opportunities of coordination between disaster risk management and climate change adaptation to contribute to the sustainable development of economy, society and environment and towards a resilient future, although there is not one approach or a unique way that can achieve that. The key elements are: 1) capacity to connect short-term with long-term goals ; 2) The desire connect the diverse manifestations of risks in the context of many threats and pressures; 3) Integrating disaster risk reduction and climate change adaptation into the socioeconomic policy development process; 4) Creative, flexible and innovative leadership,; 5) Adaptive, responsive and accountable management; 6) Supporting the flexibility, innovation, and learning at the local levels and in various sectors.; 7) Ability to identify and address the root cause of vulnerability; 8) Long-term commitment to manage risk and uncertainty and promote risk-coping thinking.

Disasters often requires urgent actions, consistent from top to bottom but this command does not seem to work well in disaster risk reduction as well as adaptive risk management. In such systems, the threat of disaster risks are often overlooked in the policy-making process, proactive response plans are not established, while indigenous knowledge of the communities are not properly considered. During disasters, interests or needs of the people affected are often not fully considered. These could be the most common limitations in order to mobilize local people to get involved in disaster risk reduction as well as integrating them into the planning of local socioeconomic development. Decentralization of responsibilities to relevant authorities to plan for the future through sound decisions is particularly important, including the role of international, national and local organizations (IPCC, 2012 pg.471).

Actions for disaster risk reduction and climate change adaptation always involve tradeoffs with other social goals, as well as conflicts among different values and visions to achieve a harmony (IPCC, 2012 page 471). In Vietnam, the tradeoff, or balancing among various objectives, such as the tradeoff among the objectives of biodiversity conservation, environmental protection and economic growth targets in the context of climate change is a huge challenge that each individual, each organization at different levels have to face and address.

Threats and vulnerability from natural disasters forced the individuals and the whole society to cope and adapt. Although there has been progress in disaster risk management, especially with

the early warning systems, vulnerability still remains at a high level, thus we have to make choices in resolving issues such as justice, rights, and participation at different levels.

At the macro level, climate change adaptation and disaster risk management issues must be integrated into the content of sustainable development, particularly in restructuring the economy development in depth, at high pace but ensuring sustainability; and this objective has been shown in the recently published strategy, such as sustainable development, green growth and climate change. At the micro level, many development projects, including poverty reduction, natural resource management and biodiversity conservation, have adopted a community-based approach in climate change response, which has been widely implemented throughout the country, especially in the Mekong delta, Red River delta and several midland mountain areas.

Thus, in recent years, Vietnam has achieved initial results in climate change adaptation and disaster risk reduction, from which many lessons learnt could be drawn.

Lesson one: Strong commitment of the Government in disaster risk reduction and extreme climate events to proactively adapt to climate change. The Government has mobilized all social and political resources for disaster risk reduction, extreme climate events and climate change adaptation linked to the sustainable development of the country. The legal system and the legal documents on natural disaster prevention, extreme climate events and climate change adaptation, with short term and long term visions, are developed synchronously and gradually improved. Relevant policies are coordinated and promoted at both central and local levels, line ministries and significantly contribute to reduce vulnerability and improve resilience of the sectors, communities and individuals.

Lesson two: awareness raising, capacity development associated with the mobilization of community participation in disaster risk reduction, extreme events and climate change adaptation. The society and social organizations are encouraged to participate in activities to raise awareness, share experiences and develop capacities in natural disaster prevention and mitigation, extreme climate events in order to proactively adapt to climate change, maintaining a link to poverty alleviation and local socioeconomic development. The "Bottom-up", "Community-based" approach are initially in the policy-making and planning, creating opportunities for people to be consulted during the design and planning of development programmes, policies and projects in the context of climate change.

Lesson three: Coordinating, promoting national capacity and international cooperation. Vietnam actively participates in international activities in disaster risk management, extreme climate events, and climate change adaptation. Through this cooperation, Vietnam has also received valuable international, particularly technical support, human and financial resources, which contribute to the development of the country's resources in addressing the challenges caused by climate change in order to move towards a sustainable and resilient society.

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