SOCIAL IMPACTS OF CLIMATE CHANGE IN VIETNAM AND SOME COUNTRIES

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In recent years, climate change has become such a global issue so many countries throughout the world have been paying a lot of time and attention to this problem. Climate change has affected all countries, whatever their level of development, but poor countries are more severely affected than developed countries because poor they do not have enough resources to cope with climate change. Thus, it is imperative that developed countries take full responsibility to help poor countries adapt to climate change. Because of reasons above, our group conducted a literature review about social impacts of climate change in Vietnam and other countries with a purpose to analyse server affects from natural disasters.

I. Definations about climate change

There are several definitions of climate change. In this writing, we will provide fours popular concepts of climate change which are defined by international organizations. According to the Intergovernmental Panel on Climate Change (IPCC) climate change refers to "any change in climate over the time, whether due to natural variability or as a result of human activities" (IPCC TAR, 2001 a cited in (Levina and Tirpak 2006). Another definition of IPCC is to refer to "a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural processes or external forcing, or to persistent anthropogenic in the composition of the atmosphere or in land –use" (IPCC TAR, 2001 b cited in (Levina and Tirpak 2006). According to United Nations Framework Convention on Climate Change (UNFCCC), climate change is "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period. See also climate variability" (UNFCCC, 1992 cited in (Levina and Tirpak 2006).

The UNFCCC focused on human activities which cause climate change. By contrast, the IPCC believed that climate change is a negative

consequence from both human activity and natural variability.

II. Social impacts of climate change in the world

A study in India showed that the major impact of climate change in India is water shortage. The national economy of India significantly depends on agriculture and related industries that provide employment for millions of poor people. Therefore, lack of water due to climate change has severely affected all facets of farmers' and workers' lives (Nair 2009). Furthermore, Nair (2009) indicates that changing frequency and intensity of tropical typhoons, storms, floods and sea level may affect life and development activities in coastal zones that are necessary in poverty reduction and national economic development. Nair also found that the impact of climate change on the forest environment threatens the livelihood of tribal communities depending on forest resources.

The research of Sadowski (2008) in Poland found potential impacts of climate change and suggested some adaptations to cope with climate change in Poland. Three aspects to assessing climate change impacts are mentioned: agriculture, water management and coastal zone impacts. In terms of agriculture, the researchers suggest that the impact of climate change on agriculture is dependent on the location within Poland, the type of soil, water conditions and the economic welfare of farmers. However, it is then stated that climate change has had mainly negative impacts on agricultural production, including reduced potato crops due to lack of water, reduced cereal yield due to pests and viruses, and increased cost of husbandry. Furthermore, prolonged drought has led to water shortages in industry and housing sectors as well as plant irrigation. Finally, the whole Polish coast is threatened by the impact of climate change. Many rivers and lowlands of Poland will be inundated by a rise in sea level. Most polder dikes may also be inundated with sea water. Some coastal cities and ports will be eroded. Much important infrastructure may be destroyed and so on.

The research of Beniston (2010) focuses on the possible evolution of climate change in the 21st century. It is predicted that global average temperature will increase by $1.5^{o}C - 5^{o}C$ by the end of the 21^{st} century. The article then goes on to outline key climate impacts that may decide the future course of human societies. One of the fundamental consequences of climate change is sea level rise. This will affect a large proportion of the world's population living on or close to the sea, such as those in the Maldives in the India Ocean, the Marshall islands in the Pacific and certain parts of Bangladesh or Indonesia. These people will face potential migration to other places. Changes in precipitation patterns may affect water demand/supply balance and water quality. In many countries, particularly in arid and semi-arid areas, supplying water for irrigation, industrialization and drinking water has become an urgent problem. Food security is also threatened by climate change through direct and indirect routes. Agricultural production may be decreased significantly due to changes in

temperature and precipitation patterns, loss of agricultural land by sea level rise, land erosion, pests and natural diseases. The Food and Agricultural Organization (FAO) has warned that by 2020 to assure global agricultural food, the agricultural yield will need to double compared to the 1990 level. However, present agricultural production may not satisfy global human need in the near future and so threaten food security. The article also forecasts the impact of climate change on human health. This impact is described as complex because populations have different vulnerability to change and susceptibility to diseases. Furthermore, Beniston (2010) focuses on vector-borne disease such as malaria which occurs in tropical and subtropical regions. The change in temperature and moisture is one of the most important factors influencing the establishment and reproduction of the Anopheles mosquitoes.

Research by Brounwer and Akter in Bangladesh (2007) also analyses negative consequences and adaptation strategies to climate change in this country. Bangladesh is a highly flood prone country with 80% of the country consisting of floodplains. Predominantly poor rural people live in these floodplains with an average annual income of 325USD (Bangladesh Bureau of Statistic, 2005 cited in Brounwer, Akter et al. 2007). Floods cause scarcity of drinking water and diseases such as diarrhoea, cholera and other intestinal diseases as well as to exacerbate poverty in Bangladesh. The research results show that flooding is one of the most important problems which local people have to face in this area every year, followed by other crucial issues such as bad roads, unemployment and lack of electricity. Half of the population indicated that they suffer from diarrhoea during the rainy season and 90% of those have to find medical treatment for this. The article also shows that every household loses 200 USD per year due to flood damage. This amounts to nearly 20% of the average household income. The flood causes damage to houses (27%), to crops (27%), to fishponds (19%) and other issues such as damage to fruit trees, medical issues, loss of livestock and income losses from day labour and trade.

When interviewed about preventive methods to flood, 86% of the floodplain residents said that they took no preventive measures. Some of the main reasons cited included; not enough money to protect themselves against flooding (45%), lack of knowledge as to what measures to take (30%), and belief that flooding is a natural process that can not be prevented (21%). However, local government protects local people by building embankments along the river. Poor flood-affected families are given temporary accommodation in village schools or local government buildings for weeks or months. The government and organizations arrange aid of food and water for 150 to 180 days until the next harvesting season. In particular, non government organizations play an important role in helping floodplain residents to cope with disasters. Furthermore, this article analyses the complex relationship between environmental risks, poverty and vulnerability in a case study of Bangladesh, focusing on household and

community vulnerability and adaptive coping mechanisms.

III. Social impacts of climate change in Vietnam

In Vietnam, there is a considerable amount of research about impacts and adaptation to climate change by researchers. The research of climate change, environmental degradation and migration implemented by Warner, Hamza et al. (2010) was conducted in three less developed countries: Egypt, Mozambique and Vietnam. Many people in the Mekong delta, Vietnam are forced into rural out-migration and displacement due to flooding. The Vietnamese part of the Mekong delta is home to 22% of Vietnam's population. It provides 40% of Vietnam's cultivated land surface and produces 50% of Vietnam's rice, 60% of its fish shrimp harvest and 80% of Vietnam's fruit crop (Warner, Hamza et al. 2010). Therefore, Mekong delta people directly depend on agriculture for their livelihood. However, this area is especially vulnerable because flooding destroys their crops. "This can trigger a decision to migrate elsewhere to find an alternative livelihood" (Warner, Hamza et al. 2010) outside the Mekong delta. During the flood season, local people move towards urban centres such as Hochiminh City, Cần Thơ city and Đồng Nai province to bolster their livelihood. This affects agricultural productivity and labour sources in the Mekong delta as well as the total national rice export of Vietnam (90% of Vietnam's total national rice export comes from Mekong delta). The Vietnam government has a program known as "living with flood" to relocate people living in vulnerable zones along river banks. Approximately 20,000 landless and poor households will be targeted for relocation by 2020. Furthermore, changing livelihood schemes are implemented to save local people (for example from rice to fishery-based jobs). Migration and alternative livelihoods are considered as reasonable adaptation strategies to cope with climate change in the Mekong delta. However, this leads to changes in social structure and the agricultural culture of the local people. This may cause stress, psychological and mental health impacts during and after flooding. Therefore, it is very important to relocate people to places with similar customs, lifestyle and agricultural culture to mitigate psychological stress. Migration and livelihood change can be applied in my own project, but they will be considered carefully to meet local people's needs and culture.

In terms of health issues, Few and Pham, et al. (2004) show that climatic hazards in Vietnam such as typhoons, tropical cyclones and droughts exacerbate health risks of local people. The researchers show that annual hazards bring both direct and indirect health risks to people in their study sites. For example, accident and injury, changes in exposure to vectors and pathogens, psychosocial effects, impacts on food supply and impacts on health care services are severe consequences of climate change to health problem in Vietnam. This research was conducted in two areas of Vietnam: the Mekong delta and the Central Provinces in February and March 2006. Results showed that overall

there was an increased risk of diarrhoea disease in both the study sites after floods and typhoons. Children were seen to contract this disease because of using unsafe river water sources without boiling the water and due to poor hygiene. Further possible health impacts of hazards were stress-related illness and risk of malnutrition related to loss of income and livelihood.

In the Mekong delta area, Abery and Nguyen, et al. (2009) conducted another study about perception of climate change impacts and adaptation of shrimp farming in Ca Mau and Bac Lieu province. This research shows that recent temperature trends are increasing and becoming more variable (hotter in summer and colder in winter). This area also always suffers severely from annual floods, storms and sea level rise. The was conducted in Cà Mau and Bạc Liêu provinces (located in the Mekong Delta) by Abery and Nguyen, which have a large proportion of land used for shrimp farming. The aims of this study were to identify and understand shrimp farmers' perceptions about climate change impacts on their farming system or farm production as well as the ways to adapt to climate change and its effects in order to maintain sustainable livelihoods for shrimp farmers in the study sites. The result of this research shows that farmers have a high awareness about climate change in their community. They also outlined impacts of climate change on their lives. These include canal/river water-level rises leading to destruction of farming infrastructure such as ponds, dykes and sluice gates; big storms causing disease and eroding pond dykes; and unusual seasonal changes causing poor water quality and shrimp stress and diseases. In addition, farmers suggest some solutions to cope with climate change and protect their shrimp production. These include protecting water quality by maintaining pond water levels, growing tress on the pond dykes to shade their shrimps in response to hot weather, always heeding weather warnings and preparing to protect their shrimp ponds, changes to the crop calendar to suit storm and flood season changes, and reducing stock density.

In terms of adaptation strategies to climate change, Tran and Nitivattananon (2011) present adaptation measures to respond to flood risk in coastal cities due to the impact of climate change by studying the particular case of Hochiminh City, Vietnam. Two main methodologies were conducted in two districts of Hochiminh City: rapid vulnerability assessment (RVA) and environmental assessment and management. The RVA approach identifies the impacts of climate change, determines factors causing flooding and then identifies impacts of flooding including direct and indirect vulnerabilities. The direct impacts of flood are to society, including impacts on human health, infrastructure and transportation, and to the environment, such as impact to water resources. RVA identifies indirect vulnerabilities as those which relate to the economy. The environmental assessment and management tool identifies adaptation strategies and then chooses specific adaptation measures. Finally, Tran and Nitivattananon (2011) combined the

RVA tool with the environmental assessment tool to build, plan and manage adaptation programs for Hochiminh City to cope with flooding. According to interviews and research results, the local residents in two districts of Hochiminh City are concerned about their properties, transportation and communication rather than health impacts when floods occur. Therefore, the basic solutions employed to prevent floodwater flowing into local people's houses are use of "bag barriers or concreted walls in order to protect their properties rather than protecting water resources from flood" (Tran and Nitivattananon 2011). Overall, the research result of Tran and Nitivattananon (2011) shows that low awareness of local communities of the need to protect water supply resources from pollution when flood occurs is also becoming a challenge in flood risk mitigation. Therefore, water pollution is one of the most urgent problems in Hochiminh City in the flood season. To cope with floods in Hochiminh City, researchers in this study planned adaptation strategies with the following aims: Enhance water efficient and conservation/protection programs, create and improve floodwater and rainwater storage facilities, improve water treatment, and urban planning and infrastructure development.

Research implemented by Tran and Marincioni, et al. (2007) analyses the impacts of floods on the economy, environment and society as well as community solutions to cope with floods in the Central provinces of Vietnam. The research was conducted in Tam Giang and Cầu Hai lagoon in Thừa Thiên Huế province. During the rainy season, crops, infrastructure, ecosystems and inhabitants located around the lagoon suffer from severe floods and storms. Damage and losses of property, houses and people cause a cycle of poverty in the study sites. The study applied the Risk Management Research implemented by Tran and Marincioni, et al. (2007) analyses the impacts of floods on the economy, environment and society as well as community solutions to cope with floods in the Central provinces of Vietnam. The research was conducted in Tam Giang and Cầu Hai lagoon in Thừa Thiên Huế province. During the rainy season, crops, infrastructure, ecosystems and inhabitants located around the lagoon suffer from severe floods and storms. Damage and losses of property, houses and people cause a cycle of poverty in the study sites. The main findings were that annual floods have brought significant damage to agriculture and aquaculture in terms of economic, including floods destroying crops in the rice field, sweeping away aquaculture or ruining the fish and shrimp ponds etc. This causes a cycle of poverty in the communities with 24% of surveyed households being under the poverty line with an average per capita monthly income of 11 USD or less. In terms of social impacts, floods lead to a high rate of out-migration to cities to find work during the flood season. Most migrants are males and young. This causes more risks in response and recovery to floods for people living at home, especially the elderly and disabled. In addition, 93.3% of respondents in the communities stated

that their children could not go to school due to annual floods.

Thừa Thiên Huế is a province in Central Vietnam. Research was conducted in Thuận An town, Phú Vang district, Thừa Thiên Huế province by Lam (2006). The aims of this research are to generally study livelihood activities of Thuận An town, to analyse in depth and understand local people's vulnerability under climate change, and from there, develop local adaptation strategies to cope with natural disasters and providing necessary services for Thuận An people to control natural calamities.

The research shows that Thuận An being located along the beach, supports livelihoods involved with catching fish in the lagoon and the sea; tourism services; aquaculture; cultivation and husbandry. However, the frequency and intensity of disasters such as storm, flood, salt-affected phenomena, sea erosion, deposit, erosion and drought seem to pose many difficulties to local people. In particular, these disasters seriously affect their livelihood due to crop failure, boat damage, and infrastructure damage to restaurants, hotels, and tourist centres etc. The adaptation strategies contain constructive and non – constructive strategies. Building new sea dykes and dam systems is one of the most important activities to prevent floods and sea level rise. The most noticeable feature in the adaptation program of this project is non – constructive strategies such as using local knowledge to predict disasters.

Local people will predict future hazards through experience in production and daily activities. These experiences are transmitted from generation to generation. Making these predictions allows the local community to feel calm and better able to prepare for and mitigate disasters. Furthermore, individuals and organizations related to disaster management in the Community were gathered together in Thuận An town to help with providing information about the weather, assisting people to protect their houses and directing people to berth ships in shelters and giving first aid to victims etc.

This research is different to other studies because it analyses livelihood activities but also utilises the resource knowledge of local people to cope with climate change. Although there is not a full analysis of a clear relationship between livelihood and climate change, negative impacts of climate change on Thuận An people's livelihood activities are recognizable. Also, the methodologies used in this research play a crucial role in collecting in depth information from participants. The research results and methodologies used will be considered in my project, especially in assessing the climate change impacts on the livelihoods of local people.

In Hà Tĩnh province, there were some studies about climate change. First of all, the research of the Poverty and Environment project, and the Ministry of Natural Resources and Environment (2009) by MORNE, was conducted in four coastal communities in Hà Tĩnh and Ninh Thuận province with the purpose to provide an assessment of livelihood adaptation and available response measures to mitigate the impacts of climate change related to natural hazards. The project illustrates that the

main disasters in Hà Tĩnh and Ninh Thuận provinces are storms surges, storm waves, heavy rain, inundation, severe cold, flash floods and westerly winds. These hazards adversely affect the livelihood, food security, health, economy, society and environment of local people in the study sites. In terms of livelihood, climate change causes lack of fodder, lack of drinking water for cattle, for irrigation purposes and industries; reduced crop yield and quality of crop; land degradation and damage to fish farming. With regards to food security, severe consequences of climate change are loss of availability of food and loss of availability of nutritious food.

Natural disasters also lead to health problems such as dependence on unsafe drinking water resources, insufficient water for hygiene purposes and stress due to loss of livelihood and income. Loss of income from agriculture and fishery, unemployment and increased prices of food and fodder are economic impacts due to these hazards. Social impacts of climate change include migration, loss of human life, increased inequity among social groups, conflict, mental and physical stress and increased crime rate, and reduction in school attendance. Finally, environmental pollution and extinction of endangered species and loss of bio-diversity are considered as adverse environmental impacts.

Nguyen (2009) reviewed socio-economic conditions, climate change and natural disasters as well as analysing impacts of climate change and suggesting adaptation plans to cope with climate change in Hà Tĩnh province. This province witnesses several severe natural disasters each year such as tropical storms, drought, heavy rain, intense dry season and hot westerly winds, and flash floods. The impacts of climate change in Hà Tĩnh has caused lack of water resources for agricultural, industrial and household sectors; crop failure and agricultural and aquatic productivity reduction, ecosystem damage in forest and coastal areas which adversely affect the livelihoods of communities. Moreover, safety in industry, transportation, civil works such as hospitals and schools, energy demands and tourism were severely affected by natural disasters in this area.

To cope with climate change, governments and local government planned to prevent potential effects of climate change in all socio-economic sectors: water resource, agriculture, forestry, industry, energy, transport and medical care in Hà Tĩnh province. In terms of water resources, planners suggest building dams and reservoirs for storing water, flood control and regulating water supply and use in the dry season. Improving the irrigation and drainage systems and expanding sea dykes to prevent sea level rise also were mentioned as important adaptation strategies.

In the agricultural field, several methods were suggested to respond to climate change, however, rechecking and regulating plans of crop schedules, irrigation and drainage activities to accommodate potential climate change are all considered as particularly important methods. In health care strategies, it is important to improve people's awareness about domestic sanitation through the Clean Water and Environmental Sanitation program and to improve health care services and

facilities in the regions to prevent epidemic diseases due to climate change.

Conclusion

In conclusion, generally, most studies on climate change impacts focus on the macro level (regional, government, powerful private enterprise) while the impacts of climate change at micro level, particularly on livelihoods, (individual, household and community) have been neglected. Moreover, adaptation options to climate change impacts have been developed by outsiders whereas it is the local communities that have been directly influenced by climate change impacts. In other words, a local voice has not been involved in the processes of developing strategies to adapt to climate change impact in these studies. Therefore, there is an urgent need to study the vulnerability of household livelihood to adverse climate change impacts in coastal zones of Vietnam by applying the results from the research above. To achieve this objective, the next research will identify impacts of climate change on livelihood activities of farmers in Vietnam. Furthermore, the study also provides recommendations for possible adaptation to climate extremes through considering questionnaire responses made by households.

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