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Climate change and its gendered impacts on agriculture in Vietnam

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Abstract

Studies have shown that Vietnam is one of the countries that most affected by climate change because of its geographical and natural conditions together with its fast but massive and unplanned urbanization. There are many research and studies that have been conducted to assess the impacts of climate change on different sectors in Vietnam. Agriculture plays an important role in the country's economy in terms of poverty reduction, food security, employment and export but projected to be heavily affected because of sea level rise, floods or droughts etc. A large proportion of Vietnam's population, especially women, involves with agricultural works and production. So, this paper using a gender perspective will examine possible impacts that climate change has been causing to women and men differently in order to propose some solutions for the facing problems. Since the paper only utilizes available resources, it can serve as a concept note for further works in the future.

Keywords: Climate change, Gendered impacts, Agriculture

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1. Introduction

Climate change has been increasingly recognized as a global crisis which affects every country, people in different locations, social classes, men and women, elderly and children. "Climate change represents a serious challenge to sustainable, social justice, equity and respect for human rights; especially the rights of future generations" (UN Vietnam, 2009, p. 3). It includes increase in temperature, changes in rainfall patterns, sea level rise, salt-water intrusion and a high probability of extreme weather events such as flooding and droughts (Bates et al., 2008 cited in Tran, 2011). It is a global issue now but studies have pointed out that negative effects of these changes are likely to be felt more obviously and strongly in the less developed world compared to developed world. The main reason is that a large share of the global population lives in the exposed areas, depend heavily on natural resources for their livelihood and have very limited institutional capacities to take proactive measures (Adger, 1999 cited in Tran, 2011). "Vietnam is among the countries with the most adverse impacts of global climate change and especially sea level rise, affecting land, population, GDP, urban areas, agriculture and wetlands" (Dasgupta et al., 2007 cited in UN Vietnam, 2009).

2. Climate change in Vietnam

Climate change is widely understood that any long-term significant change in the "average weather" that a given region experiences due to the direct and indirect impact of human activities resulting in global warming and extreme weather conditions (UN Vietnam, 2009 and VNRCS, 2004). It is studied that the main cause of climate change is the increase of Green House Gases (GHGs) in the atmosphere as a negative result of human activities such as burning of fossil fuels (coal, oil, gas) for energy. "According to research by international experts, Vietnam contributes modestly to GHG emissions that cause climate change; Vietnam's greenhouse gas emissions are about 1.6 ton of carbon dioxide equivalent per capita (total projected is about 140 million tons per year). Compared to industrialized countries such as the United States with more than 20 tons per capita per year, this is still very limited" (Oxfam and UNVN, 2009, p. 11). The question might be raised why Vietnam being likely the most significantly impacted nation in the world from climate changes. Geographically, "Vietnam is located in the Southeast Asia in the tropical monsoon area and is under the influence of the typhoon Centre in the west of the Pacific; with its 3,260 km coastline and highly varied geography, Vietnam is one of the most disaster-prone countries" (VNRCS, 2004, p. 7). Although climate change in Vietnam is consistent with the global situation which characterized by sea level rise and frequent severe natural disasters but different regions in Vietnam are likely to have unique climate impacts, making a single national policy for adaption more difficult as well as requiring localized knowledge and experiences (World Bank, 2010 and VNRCS, 2004). According to the world risk index 2011 which used four components including *exposure, susceptibility, coping capacities and adaptation* in its assessment in terms of *natural hazard sphere* and *societal sphere*, Vietnam ranked 34th. At the same time, World Bank report in 2009 also considered Vietnam as one of the five countries all over the world predicted to be the most affected by climate change due to its geographical and natural conditions.

"According to the climate change scenario officially approved by the Minister of Natural Resources and Environment in June 2006, it is estimated that 3 climate change scenario are identified: a) A1F1 (high emission scenario); b) B2 (medium emission scenario); c) B1 (low emission scenario)" (Tran, 2011, p. 17). Based on these scenarios, Vietnamese government in cooperation with different stakeholders has developed a number of measures and plan activities to cope with climate change from local level to central level. Some main hazards that enhanced by climate change have been pointed out including typhoons, floods and droughts. "Vietnam has already begun to feel the effects: the average surface temperature has risen 0.7° C since 1950s; the typhoon and flood seasons are longer than they used to be; droughts in areas previously not vulnerable to aridity have been noted, as have increased incidences of heavy rainfall and flooding; and storms are tracking into new coastal areas" (Reid, 2008 & Ho, 2008 cited in World Bank, 2011). Typhoons are natural hazards that cause severe impacts to Vietnam. "During the past three decades, under the impact of climate change, the number of typhoons that hit Vietnam as well as their violence tends to increase. Typhoons now often occur late in the year and move to the Southern latitude; typhoons occur with a higher intensity and move faster" (VNRCS, 2004, p. 8). "Since the 1950s, there have been over 200 typhoons that have affected Vietnam, although not all of them have been large. In an average typhoon season, about 30 typhoons usually develop in the Northwest Pacific; of which around 10 are based in the Eastern Sea" (World Bank, 2010, p. 9). Much of Vietnam's coastline of 3,260 km is exposed to typhoons, which strike the country an average of 6-8 times per year (GFDRR, 2011, p. 6). During the past few years, big floods in the Central region and Mekong delta tended to occur more frequently compared to the first half of the last century. Especially, the frequency of big floods and flash floods is clearly increasing. "Floods now occurring every 100 years, will likely take place every 20 years" (VNRCS, 2004, p. 9). Heavy rains during typhoons cause flooding, which results in pumping costs, flash floods, landslides and infrastructure damage; sea level rise causes flooding, particularly in the Red river basin, the Mekong delta and the coastal areas (VNRCS). The wet seasons projected to get wetter with climate change, rainfall is expected to be concentrated even more in the rainy seasons, leading to an increase in the intensity, frequency and duration of flood (GFDRR, 2011). "Overall, it is expected that by 2050 there will be increased rainy season precipitation in the Red river delta and Mekong delta of 10-20 percent. There will, however, be decreased precipitation predicted for the Central Highlands and South central coast" (MONRE, 2009 cited in World Bank, 2010). The increase in temperature and the evapotranspiration rate, in combination with the changes in rainfall, leads to changes in water storage water reservoirs and catchments. Particularly, "rainfall will strongly concentrate in the wet season; river flow in the dry season may be reduced by up to 40.5 percent in 2070" (VNRCS, 2004, p.9). Droughts can occur in every part of Vietnam, but have been concentrated in recent years in the central and southern part of the country. "The drought also set the conditions for forest fires in the Central Highlands and the Mekong delta; thousands of hectares of plantations were damaged" (ADB, 2007 cited in World Bank, 2010). As climate change is expected to increase rainfall variability as well as raise temperatures and lead to more heat waves, drought is likely to remain a serious problem for Vietnam (GFDRR, 2011).

Around 70 percent of the population of Vietnam who lives in lowland or delta areas and coastline are exposed to hazard risks as a negative consequence of climate change, especially more climate-related stresses (heat waves, droughts, typhoons, more intense rainfall) are expected under medium and high

scenarios of global GHGs in Vietnam and this may undermine human development gains (Oxfam and UNVN, 2009). It is reported that "even in the absence of pressures from climate change, livelihoods of people in Vietnam have long been subject to natural disasters. From 1953 to 2010, nearly 25,000 people were killed by natural disasters, and 77 million people were affected in one way or another; total damage has been over 7 billion USD" (World Bank, 2010, p. 6). The most serious climate hazard in terms of people killed, affected and total damage are tropical cyclones (hurricanes) with over 80 percent different storm events and around 45 million people affected and nearly 19,000 killed from 1953-2010 (World Bank). It is proved that the long coastline covering 15 percent of the national land area with 18 million residents accounting for 25 percent of the population has the strongest exposure to the climate events. Many studies estimated that a 100 cm rise in sea level by 2100 would affect approximately 9.3 percent of Vietnam land's area and 10 percent of the population; also associated with sea level rise is saltwater intrusion into the Red river and Mekong River resulting in more than 1.7 hectares of land has been affected (Tran, 2011). Different hazards affects to Vietnam in different ways in terms of human beings, assets, development. Deaths from hurricanes have averaged 250 people every year while floods from both rains and typhoons are extremely serious in the Red river delta and Mekong river delta because of high population densities of people living in those areas. The biggest impacts would be felt in the Mekong delta where forty-three percent of Ho Chi Minh City, the economic Centre of Vietnam, is at risk of inundation and many poor people have been identified as living in these inundation zones (World Bank, 2010). In addition, provinces with a large number of households dependent on rain-fed agriculture (Central coasts) and households with little or no diversification of income sources (Central Highlands) are likely exposed most to the climate change. All sectors depending on natural resources in the country from forestry, agriculture and livestock, industry to fisheries and aquaculture are all affected by the changes in climate in terms of floods droughts, typhoons and related extreme weather events (GFDRR, 2011).

"The definition of vulnerability for climate change is defined as the degree to which a person, household, social group, business, organization, locality or a sector is unable to cope with, resist or recover from adverse effects of shocks and stresses, including climate variability and climate extreme that are enhanced by climate change" (Oxfam and UNVN, 2009, p. 15). There are several factors that are contributing to vulnerability to climate change including social inequality, resilience and increased pressure on natural resources. More specifically, the relative vulnerability of individuals and households to natural hazards and climate change is largely determined by their livelihood resilience, baseline well-being of household members, self-protection, social protection and governance (Oxfam and UNVN). In recent years, Vietnam has been undergoing national trends that link to increased vulnerability to climate change in terms of loss of mangroves to shrimp farming for global export, decline in the diversity of crops harvested in many agricultural areas, household livelihoods that are becoming less diverse, privatization of many public sectors, and social safety nets that have been eroded leaving households with more individual responsibilities (World Bank, 2010). Within the vulnerability context, reduced poverty, economic growth and rising inequality are three interconnected factors, particularly in the situation of Vietnam. "There have been a strong reduction in overall poverty in Vietnam in the past 20 years, with the fraction of households living below the poverty line at less than 15 percent in 2006, compared to over 58 percent in 1993 (VDR, 2008 cited in World Bank, 2010). At the same

time, over the period of 1995-2005, GDO grew at average 7.3 percent per year which makes the country as one of the fastest economic growth nations. However, poverty still remains in the rural and mountainous areas; so the recent success in poverty reduction has the potential to be undermined by the effects of climate change. It is clear that "the poor tend to have less diversity of income sources, and less access to credit to fill in income gaps, which likely increases their risk of disaster when one of their sources is strongly affected by climate (VDR)" (Nghiem et al., 2010). Vietnam began its transition from a centrally planned economy to a market oriented economy since 1986; the central role that the state played in collective security in the past has been changing as a result and this has important consequences for the poor who lack of resources and ability to invest to absorb climate related risks or to recover from the extreme events once they happen (Chaudhry and Ruysschaert, 2007). The income inequality gaps are also becoming prevalent, and there is some evidence that this is affecting longstanding practices of communal risk management which provided a bulwark for the poor against climate threats. In general, "high economic growth and significant poverty reduction since early 1990s, but social inequality is rising with market difference between poverty levels across provinces, and between rural and urban areas. Ethnic minorities are disproportionately affected by poverty. Remote, rural and upland populations with many ethnic minorities see less economic growth (Oxfam and UNVN, 2009, p. 27). Most people are affected by climate-related stresses and disasters but general improvement in household resilience due to national socio-economic development processes, household efforts and government/civil society poverty programme – but benefits are not distributed equally across society (Oxfam and UNVN). It is very true as poor people tend to have less resilience such as less access to insurance, less ability to rebuild or move away from affected areas. That's why they are more likely to live in a shoddy or substandard housing that is vulnerable to climate events and be more exposed to health hazards because of the occupations available to them there (World Bank, 2010).

Moreover, households' livelihoods in Vietnam, especially in rural areas, depend heavily on a small number of sources of income without much diversification, mainly on agriculture and finishing which affected by climate events. They have climate-sensitive resource dependence (World Bank, 2010). Agriculture and finishing are contributing a significant part of Vietnamese economy. In which, rice is the largest single crop, accounting for 43% of gross agriculture produced in 2007 and half a million people in Vietnam have their main income from finishing and about 2 million people have fishing-related income (World Bank). The relative contribution of agriculture, forestry, and fishing has declined in recent years due to the rapid growth of the industry and service sectors; but they still contribute 21% of GDP and employ over 47% of the country's labor force. And it is projected that agricultural productivity will be lowered by climate change around 2-15%. In addition, with its high urbanization rate in recent years, Vietnam is also facing some urban vulnerability. Although it is understood of the strong vulnerability of rural populations to climate change, many studies also pointed out that cities are struggling with their large number of population. In Vietnam, big cities which are economic centers of each region in the affected areas including Hanoi and Hai Phong in the North, Da Nang in the Central, Ho Chi Minh and Can Tho in the South. "In terms of overall numbers of affected peoples, the population density of urban areas means that while the overall percentage of affected people may be lower in urban than rural areas, the total affected numbers will likely be higher in urban areas" (World Bank, 2010, p. 23). Particularly, in Ho Chi Minh City: current exposed population are 1,931 million,

will be 9,216 million in the future; current exposed assets are 26.86 $ billion, but they will be 652.82 $ billion (2007 and 2070 – OECD). There are some other aspects which also construct the urban vulnerability such as poor drainage system, low adaptive capacity of urban residents, works in the informal sector etc.

> *"According to Adger (1999), social vulnerability includes individual and collective vulnerability and it is determined by access to resources, diversity of income sources and by social status of individuals or households in a community. The vulnerability for an individual or group can change over time, is differentiated between and within groups through their institutional and economic positions, and it is affected by environmental changes. Existing policies and practices in natural resource management and inequitable access to productive resources can have preserve effects on increasing vulnerability"* (UN Vietnam, 2009, p. 3).

3. National policies and mechanism responding to climate change

Recognizing the urgent situation of the country in dealing with climate change, Vietnamese government has been active in developing policies to regulate the actions regarding adaptation and mitigation as well as establishing national mechanism to incorporate the global crisis into the national context. "At a national conference on environment and sustainable development in 1990, a strategy on sustainable development for Vietnam as approved and policies for the period 1991-2000 were developed; these already acknowledged the impacts of climate change and sea level rise" (Oxfam and UNVN, 2009, p. 23). That was the incentives for the country to sign and ratify the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and 1994 respectively; the Kyoto Protocol (KP) was also signed and ratified in 1998 and 2002 respectively. Vietnam is a non-Annex I Party to the UNFCCC. Following these actions, the national Agenda 21was called the Strategies Orientation for Sustainable Development in Vietnam and it was approved in 2004. The Agenda 21 specifically linked to reaction to climate change in terms of analyzing challenges for the country in adaptation planning and greenhouse gas mitigation. However, "Vietnam's first National Communication to the UN Framework Convention on Climate Change (UNFCCC) in 2003 did not say much about adaptation policy, listing only a few technical possibilities in adaptation to explore, like introducing new drought-resistant crops and building sea dikes higher, but did not give financing or timelines to these ideas" (GoV, 2003 cited in World Bank, 2010, p. 27). Unlike the other countries in the same region, Vietnam has not yet completed or submitted a national adaptation program of action (NAPA).

But it is undeniable that "disaster experience in Vietnam especially in the recent decade, and the release of reports on global climate change impacts have made Vietnamese government and scientists acutely aware that the country's natural resources base is highly susceptible to serve impacts of climate change" (Tran, 2011, p. 18). As a result, "the government of adopted its National Target Program to Respond to Climate Change (NTP-RCC) in 2008, thus setting goals that involve a range of inter-sectoral institutional measures and reflect the cross-cutting nature of the impacts of climate change" (GFDRR, 2011, p. 13). Although it does not focus on adaptation, the Vietnam's NTP-RCC is considered the closest equivalent to a NAPA as many

other countries have done under UNFCCC obligations (World Bank, 2010). The Standing Office of this program is hosted by the Department of Meteorology, Hydrology and Climate Change (DMHCC) of the Ministry of Natural Resources and Environment (MONRE). At the same time, the National Steering Committee for implementing the UNFCCC and the Kyoto Protocol was also established in July 2007 (Oxfam and UNVN, 2009). The NTP-CCC includes components in vulnerability assessments across sectoral, regional and community level; enhancing the role of science and technology for adaptation solutions; increasing public awareness and participation; and integrating climate change into development strategies, plans and programs in all sectors (GFDRR, 2011, p. 13). "MONRE is taking the overall role for implementation of the NTP and acts to help other ministries develop their own specific plans. The NTP identifies 1.965 billion VND ($115 million) that will be needed to implement strategy from 2009-15, of which 50 percent will be domestic funding, and 50 percent from international sources" (World Bank, 2010 p. 29). "One of the shortcoming of the NTP-RCC is that there is no specific targets or activities identified which address women's vulnerability or gender issues in particular at the community level" (Oxfam and UNVN, 2009, p. 24).

Vietnam submitted its second National Communication on Climate Change to the UNFCCC in 2010 which identified the following vulnerable sectors and approaches that are needed to cope with the impacts of climate change: water resources, coastal zones, agriculture, forestry, aquaculture, energy and transportation, and human health (GFDRR, 2011). The Government of Vietnam also approved the Master Plan of the National Natural Resources and Environmental Observation Network until 2020. In addition, as part of the NTP-RCC, Vietnam is developing Scientific and Technological Program on Climate Change with the aim of establishing a scientific foundation to support policies, strategies and action plans (GFDRR)."The top priority in Vietnam is now to concretize the National Target Program into an integrated practical strategy with the participation of all stakeholders; it is important to note that some of the most vulnerable people are the rural poor with limited access to information and financial and technical supports in order to adapt to the best of their abilities" (Chaudhry and Ruysschaert, 2007).

4. Gendered impacts of climate change on agriculture

In general, climate change has a serious impact on agriculture, environment and health over the world. "It is predicted that by 2080 the cereal production could be reduced down as 2-4% meanwhile the price will increase up to 13-45% and about 36-50% of population being affected by hunger" (Tran, 2011, p. 17). "Studies for the Southeast Asian region show that climate change could lower agricultural productivity by 16-26% in Thailand, 2-15% in Vietnam, 12-23% in the Philippines and 6-18% in Indonesia" (Yu et al., 2010, p. 1). With its geographical location, in Vietnam, Mekong River Delta and coastal areas in the North of the Central region are most vulnerable to the impact of global warming due to rising sea level (Yu et al.). "The relative contribution of agriculture, forestry, and fishing has declined in recent years due to the rapid growth of the industry and service sectors; but they still contribute 21% of GDP and employ over 47% of the country's labor force" (GFDRR, 2011, p. 1). Especially, agriculture continues to play an important in poverty alleviation and food security in Vietnam and remain an important sector of Vietnam's economy. In which, "rice

production has its vital role for the country in terms of food security, rural employment and foreign exchange, employing two-thirds of the rural labor force and positioning Vietnam as the world's second largest rice exporter" (GFDRR). Rice is grown by nearly 80% of Vietnamese farmers and covering about 45% of the country's agricultural land. The most important rice bowls of Vietnam are in the Red River Delta and Mekong River Delta which are heavily affected by sea level rise. "The changing climate could be especially damaging for rice cultivation due to substantial modification in land and water resource. Hydroclimatic disasters such as typhoons, floods and droughts which could become more severe and more frequent as the climate changes, would also affect rice production substantially in the country" (Yu et al., 2010, p. 1). In Mekong River Delta, with the major risks posed by sea level rise, it is projected that the region will have to see a loss of 590,000 hectares of cropping rice due to inundation and saline intrusion, an area which accounts for 13% of today's rice production (GFDRR, 2011).

> *"Climate change impacts and declining agricultural productivity could compound the risk of food insecurity in Vietnam. Because the scope of expanding arable land to increase production is limited, and land area many shrink due to climate change, productivity-led growth is the only feasible option to improve rice supply in the long run. Increasing rice productivity will ensure food security, help the country maintain a stable source of export revenues, support rural employment and generate higher household incomes"* (Yu et al., 2010, p. 1).

"Climate change is an important factor in agriculture since it can affect every step of the crop's growth; extreme floods and droughts means death to our crops, and spells loss of income" (Bernabe and Penunia, 2009, p. 19). In Vietnam, gender analysis pointed out the different vulnerabilities and capacities to deal with climate change between women and men depending on their identities. Particularly, women face challenges from climate change in three areas: the productive, reproductive and community spheres (UNVN, 2009). "In terms of production, agriculture has been increasingly feminized, 62% of women versus 52% of men engaged in agricultural production; thus, it is likely that more women face risks from climate impacts to the agricultural sector" (World Bank, 2010, p. 21).

As food producers, high dependency on land and natural resources for agricultural livelihood generation makes women more vulnerable. Higher risks and greater uncertainty in agricultural production due to weather patterns change and increased incidence of extreme weather conditions such as droughts, heavy rainfalls and typhoons, among others will directly affect to women's agricultural activities. Climate change adds to water insecurity which increases the work level of women involved in subsistence farming, as they spend more time and effort on land preparation, crop watering and protection from disease. This is true as Vietnam's agricultural lands mostly located in river basins and dependent on irrigation which are threatening by sea level rise, salt water intrusion as well as unpredictable floods and droughts. Meanwhile, Vietnam has more than 2 million women farmers and almost all of the new participants in the agricultural sector are women; two thirds of women in rural areas still have main job in agriculture (UN Vietnam, 2009). So, in the context of resource scarcity and weather extremes, women are more vulnerable compared to men.

"Small scale men and women farmers have fewest resources for coping with storms, with floods, with droughts, with disease outbreaks and with disruptions to food and water supplies. They are eager for economic development themselves, but many find that this already difficult process has become more difficult because of climate change" (Bernabe and Penunia, 2009, p. 19). When losing agricultural activities, migration has becoming an emerging trend as a key coping strategy for people facing hardship and environmental changes in agriculture. Especially, male migration often worsens the situation for women and children left behind; and women migrants often earn less than men and have less access to basic services. In rural areas, migration is seen as a consequence of a shortage of arable land, lack of employment, low incomes from rural non-farming jobs and rural poverty once their areas are affected by climate extreme events. But regarding vital role of women in agriculture, migration of male farmers would cause more burdens for women. "While men concentrate more on land preparation, transportation and pesticide spraying, women tend to do weeding, transplanting, fertilizing and watering, and selling products; they share the work of harvesting and storing agricultural goods" (UN Vietnam, 2009, p. 7). So, if men migrate due to environmental crisis and natural disasters, all agricultural works will be handled by women who left at home. It leads to the changes in gender division of labour in agricultural activities.

"In terms of animal husbandry, including production of pigs, chicken and ducks, women tend to be responsible for almost all aspects of the process. A review of gender division in agricultural production showed that the jobs done by women are time consuming. However, more value was put on men's jobs which are viewed as more labour intensive" (MCD, 2008 cited in UNVN, 2009). In the case of loss of crops and animals during/after floods and droughts, it is very difficult for household of low resilience. Then, both men and women have to work harder to save their crops and animals during and after disasters; other household members take part in planting more crops and raising animals, but women have increased workloads due to the need to replant rice fields, and more planting of subsidiary crops (Oxfam and UNVN, 2009). In the case that the family does not have to use labour migration as an adaptive strategy, the gender division of labour will see husbands traditionally being responsible for buying sees and seedlings, with wives being responsible for their care (Oxfam and UNVN).

With the migration of male farmers of a consequence of climate effects, gendered impacts also show in the access to and control over water resources of women and young girls. Women are usually responsible for collecting water for household use and this responsibility is most arduous during floods or droughts; the burden on women is heaviest in mountainous areas (Oxfam and UNVN). But the absence of men, women will also have to in charge of leading water for irrigation system. In addition, lacking of labour force, young girls tend to be forced to drop out of school to help the family with agricultural activities. The main reason is that in the rural areas of Vietnam, the patriarchal system is remained strongly which put the status of women is lower than that of men.

5. Proposed solutions and final notes

As identified in the second National Communication submitted to UNFCCC in 2010, agriculture is one of the vulnerable sectors in Vietnam that need suitable approaches to cope with the impacts of climate change.

> *Short-term measures include erosion control, construction of reservoirs, crop selection, and farming methods that are better suited to the changing climate. Long-term measures include switching cropping patterns, crossbreeding and modernizing cultivation techniques. Management and planning solutions are also needed for the development of new crop-livestock systems, designing new agricultural incentive systems, and setting up insurance policies* (GFDRR, 2011, p. 2).

It is elaborated that "gendered vulnerability assessments are needed at sectoral, regional and community levels, and that there is a need for more detailed information, awareness and specific attention for the gender implications of climate change and of climate change responses in Vietnam" (Oxfam and UNVN, 2009, p. 12). Although gender equality is emphasized as one of the guiding principles of the NTP, women's involvement in the discussion and consultations during the process of NTP development was limited. It is necessary that the potential contribution of women for planning and implementing the NTP to cope with impacts of climate change should be explored (UN Vietnam, 2009). Gender mainstreaming into action plans for climate change adaptation of ministries and provinces (guidelines needed) is important. At the same time, women's involvement in local committees for flood and storm control should be increased to have women's voice from local community; so that the action will be closed to need and situation of local women and girls. In some remote areas, there is a need of investment from government for building local clinic and childcare centers to reduce the burden for women in agricultural sector. "More information is needed as how the changes in cropping is affecting women and men differently and how this might change in the future as slow onset climate changes and felt more keenly" (Oxfam and UNVN, 2009, p. 37). Based on that, some vocational training for women for diversification of income generation as well as allocation of resources (financial and human) for gender research and engendered actions in climate change adaptation activities would be provided by government and civil society.

Importantly, in the case of Vietnam, the tradition of forming supporting associations and networks from the Vietnam War should be utilized by now. Taking into consideration the network of Women Union from the central level to the commune level, a sister-supporting network could be developed in dealing with the impacts of climate change. The main of this network is to share adaptive and resilient approaches to climate change and promote alternative ways of living. Using this model, women from every community will join hand in hand together to create a sister network. If women in this community are affected by any climate events, women in all other communities will support them in terms of finance and human resources. It means that donation can be called from money to clothes, foods and personal appliances to volunteer works in the affected areas. The network is based on the system of Women Union which has a long history of supporting women's lives as well as advocating for women's rights in the country, so it could be feasible to implement.

References

Bernabe, D. and Penunia, E. (2009), "Gender links in agriculture and climate change", *Women in action,* No. 2, pp. 19-21.

Chaudhry, P. and Ruysschaert, G. (2007), "Climate change and human development in Vietnam", UNDP Occasional paper, UN Vietnam, Hanoi.

GFDRR (2011), *Vulnerability, risk reduction, and adaptation to climate change: Vietnam*, the World Bank Group, Washington, DC.

Nghiem et al. (2010), "How climate change challenges food security in the Red River delta of Northern Viet Nam", available at: http://www.scribd.com/doc/42966720/How-climate-change-challenges-food-security-in-the-Red-River-delta-of-Northern-Viet-Nam-paper (accessed 1 February 2013).

Oxfam & UNVN (2009). "Responding to climate change in Vietnam: opportunities for improving gender equality", policy discussion paper, UN Vietnam, Hanoi.

Tran, D.V. (2011), "Climate change and its impact on agriculture in Vietnam", Journal of International Society for Southeast Asian Agricultural Sciences, Vol. 17 No. 1, pp. 17-21.

UN Vietnam (2009), *Gender and climate change in Vietnam: a desk review*, UN Vietnam, Hanoi.

VNRCS (2004). *Training module: hazards and disasters related to climate change*, Vietnam Red Cross Society and the Netherlands Red Cross, Hanoi.

World Bank (2010), "The social dimension of adaptation to climate change in Vietnam", discussion paper, No. 17, the International Bank for Reconstruction and Development/ The World Bank, Washington, DC, December.

Yu, B., Zhu, T., Breisinger, C. and Nguyen, M.H. (2010), "Impacts of climate change on agriculture and policy options for adaptation: the case of Vietnam", IFPRI discussion paper 01015, International Food Policy Research Institute, Washington, DC, August.