

IMPACT OF CLIMATE CHANGES ON THE LIVEHOOD SECURITY OF MINORITY GROUPS IN DAKLAK PROVINCE, VIETNAM

Hoang Thi Huyen Trang and Bui Ta Long

*Faculty of Environment and Natural Resources,
Hochiminh city University of Technology.
e-mail: longbt62@hcmut.edu.vn*

Abstract

Effective livelihood adaptation to climate changes among the minority ethnic groups has been an increasingly important issue in Vietnam in recent years. Numerous studies have relied on the public consultation method; however, few reports emphasize on effective livelihood adaptation and mitigation of damages to household economy due to climate changes. In Vietnam, the number of reports having such emphasis is scarce due to the lack of guidelines and decision-making tools. This report discusses the use of CRiSTAL, one of the original tools developed to evaluate and manage the risks from climate change by using information from the communities. CRiSTAL offers a variety of methods to improve climate change adaptation and risk management. It facilitates the process of developing projects related to community livelihood, imbuing new ideas that allow managers to deal with the challenges of climate change adaptation. With such a powerful tool, the upper management can seek to integrate risk reduction and climate change adaptation into their routine assignments and larger-scaled projects. In this report, CRiSTAL is used to evaluate the impacts of climate changes on the livelihood security of minority ethnic communities in the Daklak province.

Key words: CRiSTAL, community, IISD, adaptation, livelihood.

1 Introduction

Indicators of climate changes in Daklak include earlier arrival of the dry season, occurrence of unseasonal rains, one-month delay of the rainy season, and uneven rainfall distribution across the region. Such changes negatively impact the flora and fauna, lead to possible epidemics, and can cause more frequent droughts. These ultimately create economic burdens to the farmers and losses in the agricultural sector of the economy [6]. Most ethnic minorities in Daklak lack a deep understanding of the environment and the importance of preserving it. Their disregard for environmental protection is reflected in their ancient customs and practices [18].

Climate changes significantly affect food security, forestry, water resources, biodiversity, and community healthcare in the mountainous and midland regions of Vietnam. The most vulnerable people are farmers, the elderly, children and women, and the ethnic minorities in the mountains [2]. At a local and community level, the awareness of climate changes is still inadequate; likewise, the positive and active roles of each community have not garnered enough attention [16]. Community problems include depletion of natural resources, somewhat biased assessments by authorities, lack of financial resources, and lack of consistency in the policies. Each ethnic minority group has specific initiatives to minimize the negative impacts of climate changes and natural disasters [17]. Their methods, however, are only temporary responses such as stockpiling food, deforesting, acquiring loans, and selling household properties [24].

Poor households are affected the most by climate changes, and their adaptabilities are limited by resources such as finance, technology, news, understanding of the climate, etc. As such, their livelihoods relied mainly on utilizing all household members for labor and exploiting natural resources to diversify their incomes [19]. Women can play an important role in preventing disasters; however, their potentials have not yet been realized [5].

Soil erosion, increasingly harsh climates, unforeseen natural disasters, and the use of outdated cultivation methods led to food shortages. The genetic modifications of plants and animals need to focus on the awareness, farming practices, and cultural lifestyle of the local peoples [21]. Improvement plans should focus on boosting the awareness and the adaptability to climate changes for government officials and local communities. In addition, it is necessary to provide direct assistance to the local communities when implementing the plans to adapt and reduce the risks from climate changes [14].

Conferences involving experts who have deep understandings of the local communities are vital in order to share experiences and plans of climate change

adaptations [20]. Selection of appropriate methods is necessary to adapt to climate changes and to minimize its effects [15]. The first step is to build a table to assess the vulnerability of the communities, then choose the appropriate methods depending on the community's awareness of the climate changes [11]. However, the risk assessment based on the communities is most effective when it is done with the bottom-up approach – from the communities to organizations, to local government agencies [9]. Banking credits and charities are considered long-term support for the local economy of the rural areas [23]. In the medicinal field, the public should be educated about the potential harms to public health as a result of climate changes [10].

Because livelihoods of the ethnic minorities rely on self-subsistent farming and natural resources, they are extremely vulnerable to climate changes [13]. The strategies to cope with rises in the sea level include frequent job changes and migration to higher altitudes [12]. A summary of multiple studies indicates the policies underestimate the importance of climate changes. Meanwhile, the communities still have considerable room to adapt [11].

Within recent years in Vietnam, there have been a few studies focused on modeling the adaptation and risk mitigation of climate changes based on the communities. The models aim to reduce vulnerability and to augment the adaptive capacity. The models, however, are not tailored for each local communities [3]. Selection of appropriate methods to adapt to and mitigate the effects of climate changes should be a top priority in the national development strategy [1]. This study focuses on assessing the impacts of climate changes on the livelihood security of ethnic minorities in Daklak.

2 Research method: CRiSTAL model

2.1 Approach

This method is based on the Environmental Impact Assessment (EIA) and the Sustainable Livelihoods Approach (SLA) [4]. In this method, CRiSTAL classifies the type of risk caused by climate change and the degree of vulnerability of the local communities, from which it can select an appropriate solution for adaptation (Fig. 1). On the other hand, SLA focuses on the analysis of 5 types of livelihood assets: physical capital, natural capital, financial capital, human capital, and social capital (Fig. 2). First, data from a particular research area is collected using effective consultation with the communities and other related parties (Fig. 3). Data will then be entered into each step of CRiSTAL tool, which returns an output of which should be the most important livelihoods and what are the appropriate adaptive solutions for the communities [22], (Fig. 4, 5).

Comprehensive climate risk assessment			CRiSTAL	
	Must understand...	Information required	Key questions	
A	Current and future development trends	- Development conditions, trends and challenges	- What are the development goals and objectives for the target community/area? What are the main non-climate stresses affecting their achievement? How are the main changes in socioeconomic, political and environmental context changing? What will it look like in the future?	Partly (only focus on current livelihoods) Livelihood context (step 1, see Figure 2 next page)
B	Actual and expected climate context	- Current weather and climate - Current climate variability and extremes - Observable climate changes - Projected climate changes	- What are the current weather and climate conditions (rainfall and temperature patterns)? - What are the main climate hazards (location, intensity, frequency)? - How have climate variables (temperature, rainfall) and hazards changed in recent years? - How will climate variables and hazards change in the coming decades?	yes yes yes yes -Climate riskanalysis (step 2)
C	Climate impacts and risks associated with actual and expected climate variability and change	- Current and future exposure - Current and future vulnerability - Current and future climates risk	- Which people/resources are located in areas prone to climate hazards? - How are men and women/resources affected by climate hazards? Why? (Sensitivity) - What do men and women do to respond to the impacts? (Adaptive capacity) - What are the probabilities and the range of potential harmful consequences of climate variability and change?	Partly (only focus on current exposure) Partly (only focus on current impacts, does not explore the "why" question in detail) Partly (only focus on current impacts) - Climate risk analysis (step 2)
D	Response strategies that minimize negative impacts and maximize positive ones	- Response options available - Feasible and effective options	- What do we want? What are the options? What is working now? What may work in the future? - What can be actually implemented based on cost, benefits, tradeoffs, etc?	yes yes yes - Revise existing projects and/or design new activities (steps 3 and 4)

Figure 1: Role of CRiSTAL in risk assessment of climate change

2.2 Sources of data

2.2.1 Public consultation

Data had been collected on these following livelihood assets: lands, physical capitals, financial income, public resources, and especially the communities' awareness of climate change.

From June 2013 to September 2013, a total of 6 meetings were held at 3 representative minority ethnic groups including E De, Gia Rai, and MNong. The purpose of those meetings was to educate the public through consultation, workshops, and seminars. The program was attended by 55 community members.

2.2.2 Meteorological data

Meteorological data had been collected from the Tay Nguyen Centre for Hydro-Meteorological Forecasting and from the Provincial People Committee. Those include weather observations such as temperature, amount of precipitation, as well as population change and economic growth. These data were to show an increase in temperature and precipitation within 10 years.

Data from extreme weather events such as floods, droughts, landslides, and insect-borne disease outbreak are collected, compiled, and analyzed from direct surveys done at the local communities (by means of consultations, history

charts, and severe weather disaster maps). Annual report on natural disaster is sent to the local authorities [6].

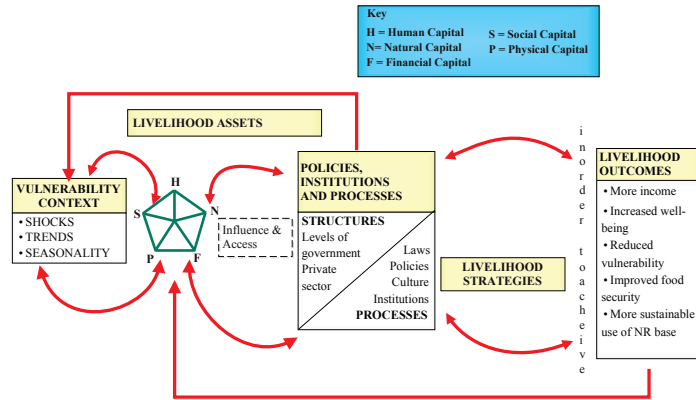


Figure 2: Sustainable livelihood framework (SLF)

Resources	Data collection (i.e. local consultations)	Data entry and analysis (individual or team meeting)
Knowledge	- Basic knowledge about climate variability and change, climate adaptation, livelihoods, community dynamics, community mobilization, gender and diversity, participatory approaches, Rapid Rural Appraisal/Participatory Rural Appraisal tools	- Basis knowledge about climate variability and change, climate adaptation, livelihoods, community dynamics, gender and diversity
Skills	- Experience in applying PRA tools - Gender-sensitive facilitation skills (incl. ability to probe information from community members) - Ability to be fully functional in local language (s)	- Basic computer literacy - Ability to synthesize different sources and types of information - Analytical skills
Participants	- At least two facilitators (one moderator and one note taker) - Facilitation team should include both men and women. Female facilitators should work with women's groups to increase comfort. - At least two focus groups (one group of men and group of women) per community, each consisting of about 10 participants (maximum 15). Where there is marked heterogeneity in the community, especially in terms of power relations and self-expression, more focus groups are recommended.	- The number of participants (project team and other local partners) will depend on the objectives and resources available - CRiSTAL works well with a group of a dozen participants (project team and other local partners) but it can also work with smaller or larger groups. - It is highly recommended to involve a multistake holder team (i.e., project team and partners from community, local government and civil society). For example, involving local government representatives can help to secure ownership of the results.
Time	- Plan at least four hours with each focus group and consult community on an appropriate time for them. - Try to organize focus group discussions at the same time but in different locations, to allow participants in different groups to speak freely.	- Typically, data entry and analysis can take between a half a day and two days.
Materials	- Flipchart paper, colour markers, coloured paper, masking tape, notebooks and clipboards - Local materials such as stones, sticks, seeds, etc. - Recording device and camera to document the process (if deemed appropriate) - Snacks/lunch/water (depending on how much time the meeting will take place)	- Computer/laptops - Ideally, but depending on the number of participants, it is recommended that more than one laptop is made available to enter the data according to the different focus groups. - The new version of CRiSTAL is only compatible with Microsoft Windows 7 operating systems and greater versions. - Printer (recommended but optional) to distribute the summary reports to all participants to facilitate analysis.
Cost	- Cost will vary according to the number of participants and the location of the community consulted. Keep in mind that consultations can be time consuming. - Plan to organize a meal for the community that has been consulted.	- CRiSTAL is a free desktop application, available online (www.cristaltool.org). Once users have downloaded the tool, it can be used without being connected to the Internet. - Meeting costs and human resources

Figure 3: (Cont.) Role of CRiSTAL in risk assessment of climate change

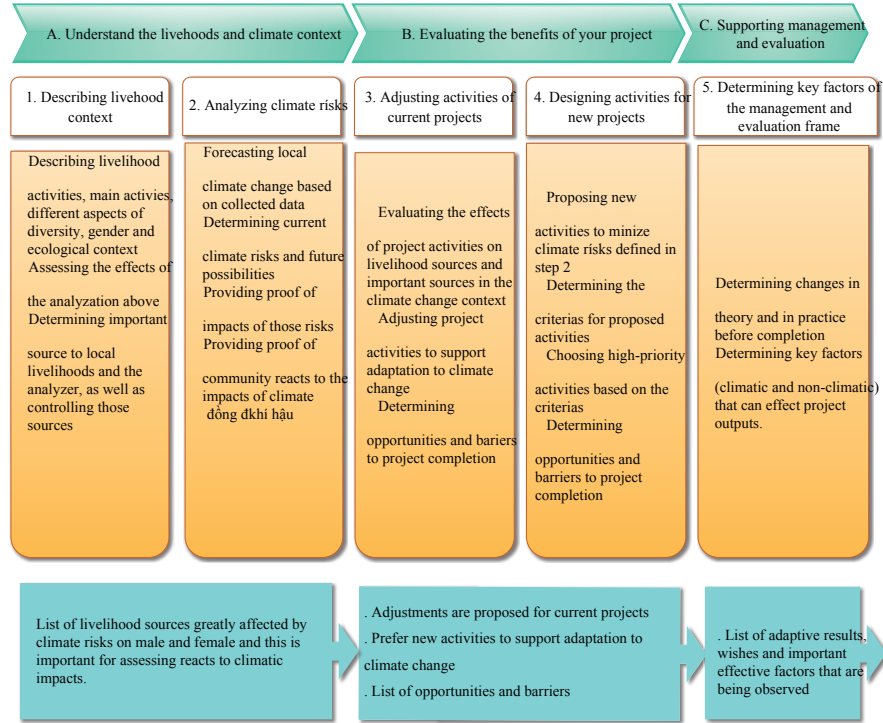


Figure 4: CRiSTAL Frame

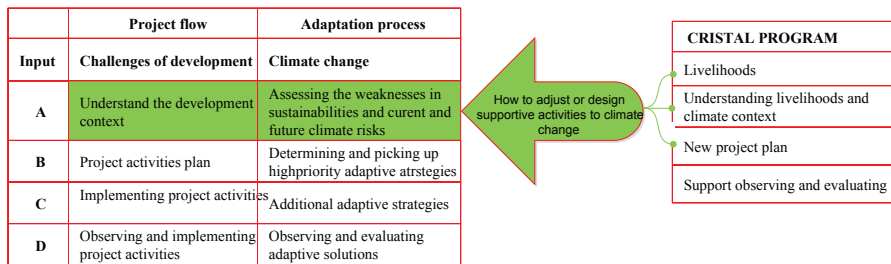


Figure 5: The link between the project, the adaptation process, and CRiSTAL program

2.2.3 Synoptic chart

Maps, disaster charts, and extreme weather events were compiled from actual scenes at the local communities. Annual report on natural disaster is sent to the

local authorities. Maps and charts that show the temperature and level of precipitation are collected from the Tay Nguyen Centre for Hydro-Meteorological Forecasting (Fig. 6).

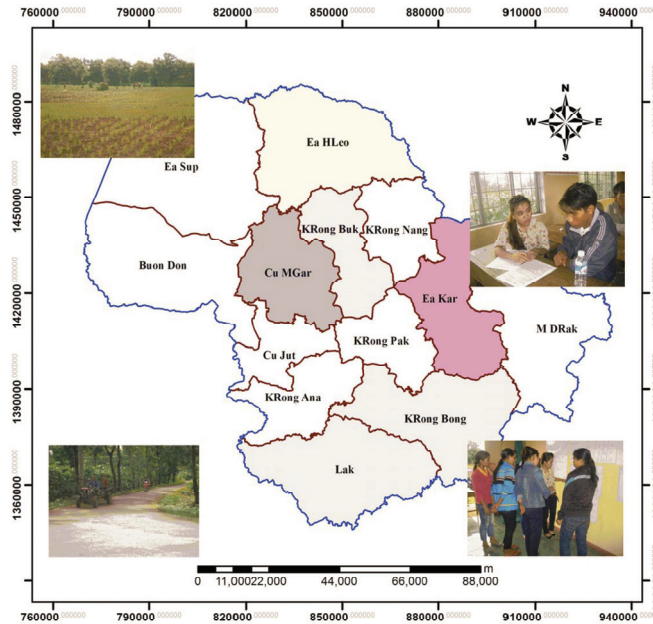


Figure 6: Daklak province’s map

3 Results

Assessing the impacts of climate change on the livelihood security

3.1 Impacts on the important sources of livelihood

Results from public consultation showed that agriculture is the fundamental source of livelihoods for the communities living in these areas. The primary products are long-term industrial crops.

Agriculture in Table 1 is the fundamental source of livelihoods for the ethnic minorities in Daklak, accounting for 75.8 percent of the total production. The percentage of households with high income is 0.0 percent; households with

Sources of Livelihood	Unit (people)	Average Percentage
Agriculture	%	75.8
Livestock	%	0.0
Forestry	%	4.8
Commercial Services	%	9.7
Others	%	9.7

Table 1: Compilation of sources of livelihood for the ethnic minorities in Daklak

average income accounts for 69.3 percent, and the rest 30.7 percent are from the poor and near poor. Results from public consultation showed that the economy of these ethnic minorities in Table 2 is still restricted due to the lack of access to science, using outdated farming techniques, and poor means of transportation.

Income classes	Upper class	Median	Poor	Near poor
Percentage %	0.0	69.3	12.8	17.9

Table 2: Income distribution from different classes

3.2 Impacts of climate change on the livelihoods of the communities

3.2.1 Impacts of severe weather

The following table shows the the results of the level of impact and the size of the impacted area due to climate change that affect the agricultural activities of the communities in Table 3.

Events	Severe weather outbreaks occurring within 5-10 years			Unit (participants)
	Level of impact			
	Increase	Stable	Decrease	
Droughts	100.0	0.0	0.0	%
Floods	50.0	16.6	33.3	%
Increase in temperature	96.9	3.1	0.0	%
Erosion and landslide	93.7	6.3	0.0	%
Tornado	50.0	25.0	25.0	%

Table 3: Survey results showing the level of impact from climate change

3.2.2 Changes in living standards and population growth

According to local government, a large majority of the ethnic minorities relies heavily on coffee crops for their livelihoods. When the coffee crop yields are high and the market price brings good profit, the living standard of farmers is improved. On the other hand, when the coffee prices drop, the community is susceptible to loss. Quantitative analysis of data indicates that 69.3 percent of the households have median income, 12.8 percent are poor, and 17.9 percent are near poor. There is no wealthy household.

Workers from all over the country, including the ethnic minorities from the Northern provinces, have moved to Tay Nguyen to seek employment. The net migration was highest at times when the coffee crop was most profitable, which peaked in the early 1990s; it then decreased gradually as the coffee price dropped. High migration rate led to abrupt changes in the population structure, resulting in even more problems to the livelihoods of local communities. Having customs that differ from those of the majority Kinh ethnic communities, the minorities tend to migrate to remote areas, clearing forests for cultivation in those areas.

3.2.3 Lack of food and education for children of poor families

Saving is not a common habit among the ethnic minorities. When the coffee price was high, such that 1 kg of coffee could be exchanged for 4-5 kg of rice, instead of storing the extra assets the households would spend and consume more. When the price dropped and 1 kg of coffee can only be exchanged for 1-2 kg of rice, their finance became difficult because they were not prepared for such event.

The percentage of children going to school in Table 4 is higher than in the past and the awareness of the common people has also been improved. In the public meetings, 2.9 percent of the participants were illiterate and unable to speak the standard language. Among them, 80.6 percent are farmers whose livelihood depends on agriculture. Every village still has several adults who cannot speak and write. About 2.9 percent of the communities had never attended school, and only a few people had completed high school and college.

Education level	Average Percentage
Go to school	97.1 %
Not go to school	2.9 %

Table 4: Education distribution among the communities

3.2.4 Changes in income sources

In Table 5, areas such as M'gar and Lak district benefited more from the coffee sales than the average due to their favorable land condition for the growth of coffee plants. Other areas whose environment was not as optimal received less return from coffee crops because of their farm diversification practice. Overall, coffee crops remained the primary source of income besides livestock, maize and rice crops. Other sources of income such as government employee salaries, pensions, basket crafting wages are only secondary.

Districts	Average area	Types of crops		
		Coffee (ha)	Rice and Vegetables (ha)	Other whole grains (ha)
Cu Mgar	1.46	1.05	0.38	0.03
Krong Bong	1.58	0.58	0.73	0.27
Lak	0.87	0.29	0.40	0.18

Table 5: Crop Distribution in different districts of Daklak Province

3.2.5 Deforestation and the lack of arable lands and water resources

In the 1990s, the local government encouraged the minorities to convert forestland and hillsides to farms that could be used to grow coffee crops. During that time, a large number of migrants who also need to provide for their family participated in the deforestation. All these factors combined led to a serious damage to the environment. Forests were cut down and burned to generate croplands which eventually resulted in damage to the ecosystem and a disruption of the water cycle. Nowadays, the Daklak communities have to rely on groundwater from wells and pumps during dry season.

Shifting cultivation without adequate fallow periods caused land degradation. The growing number of migrants contributed further to an increasing demand for land use. Climate changes had a direct impact on the agriculture, leading to crop failures and threatening the communities main source of livelihood for the rest of the year. Land shortage led to even higher risk of deforestation. Since the laws had not been strictly enforced, forest clearance continued to be a serious problem to the natural.

3.3 Climate adaptation strategy adopted by the community

3.3.1 Public awareness of climate change

The government system in Daklak, from the Council of States to the People's Council, have no organization whose role is to design strategies to help the community cope with climate change. Most actions are guided by the local government and the non-experts on the subject.

The community response to climate change adaptation and risk mitigation are still slow and disorganized. None of the members had received any training nor attended any seminar lectures on climate change and severe weather outbreaks. Overall, the community awareness of climate change in Table 6 is still limited. About 82.86 percent of households have somewhat heard about the effect of climate change through the media while the remaining 17.14 percent have no concept about the subject. Most of them have not realized that extreme weather events such as droughts, floods, and the rising of temperatures are indicators of climate change.

Public awareness	Number of answers	Percentage %	Source of information
Do not know	6	17.14	
Know	29	82.86	TV, radio, news, local announcement, etc.

Table 6: Education distribution among the communities

3.3.2 Community adaptation strategy for the main source of livelihoods

Statistics showed that about 50 percent of households grew coffee plants in the fertile areas while the rest abandoned their lands. According to a recent survey, however, some households switched from coffee to peppers and cashew nuts (Krong Bong District). Areas to be abandoned first are those that have low crop yields and are expensive to maintain. Examples are lands on a slope, those far from the water sources, and ones growing old coffee plants. Some households have started to make efforts to explore new coffee varieties that give high yields, which are available from agricultural organizations.

After discussing and sharing experience with the agricultural organization staffs, it is anticipated that the fertilizer to be used in the next growing season is going to be microbe-based. Households that grow coffee in the fertile areas (Cu M Ga, Lak, and EhLeo District) should maintain the coffee crops and wait for the price to rise. Low-income households that do not have enough cropland

should earn additional income from small trades or employment. Extra income could also come from raising cows or from growing peppers, rice, vegetables, or cottons.

3.3.3 Adaptation strategies of the local authorities in the community

In response to the climate changes in Daklak, more observatory stations should be set up to better monitor and forecast the weather. Additional forest protection stations should be built to watch over and preserve the ecosystem. Development of hydropower plants should take into account changes in the environment, and so do bauxite mining and irrigation. Reasonable water consumption is encouraged to ensure the availability of water resources during the dry season. All of these factors collectively can contribute to a sustainable development of the economy and society based on the improved public awareness of how climate change can impact the livelihoods of communities in Daklak Province.

3.4 Evaluating previous and on-going projects

3.4.1 Evaluating previous project

There are many ethnic groups in the Lak District of Daklak province, with M'ngong accounting for 50 percent of the population in the district. This is a place with spacious lands suitable for raising beef cows and has favorable environmental conditions for farming. Many parts of the area have been used for cultivating fruit trees, industrial crops and some agricultural crops. However, the lands are not very fertile so crop yields are poor, and income derived from the crop production is very low. Research on assisting the M'ngong minority to convert agricultural lands used for growing low-yield mixed vegetables to grasslands for raising cattle in the Lak District of Daklak Province. This project provides important guidelines to the initial development of grasslands. It helps the communities to formulate the best cattle-feeding combination, between grazing and feedlot. In the underdeveloped grassland regions like Lak District, raising beef cows in a feedlot allows the selection of higher quality food compared to the pastures [7].

3.4.2 Adjusting on-going projects and proposing new ideas

Maintaining a sustainable coffee production under the impact of climate change requires improvement in both agricultural technology and management. The motto "*3 to-reduces; 3 to-do; 3 to-increases*" are to encourage the community to reduce fertilizer usage-water consumption, and pesticides treatment, to do use good quality crop-plant shade trees, and harvest at the right time, and to

increase income-quality, and productivity [8].

Not only can these strategies result in cost reduction but they can also lead to long-term protection of the ecosystem. Combine both mechanical and biological methods to control and prevent erosion. Increase the use of organic fertilizers such as manure, and green manure to contribute to the improvement of soil properties. Improve the water and fertilizer holding capacity. Help plants to absorb more nutrients. Prevent land degradation.

3.5 Proposing adaptation strategy for the local communities

Create alternative sources of income for people in the area: obtain employment elsewhere, involve in fruits sale or embroidery (baskets, bamboo, etc.)

Prevent deforestation: Protect the forests, strictly enforce laws and forest management, implement community-based forest management, improve irrigation systems and flood drainage, preserve biodiversity.

Men respond differently to climate changes than women. They dig more wells and pump water from far away sources during a drought. When plants or livestock are infected with diseases, they apply methods such as spraying insecticides and cleaning animal cages to sustain their family's livelihoods.

Develop a sustainable farming cycle: use drought-resistant strains of coffee, rice, maize, cassava, etc., alternate growth of coffee and rice, raising livestock and growing high-nutrient grass, feeding fish with field grass.

Raise community awareness, advocate actions to adapt and response to climate change.

4 Conclusion

The ethnic minority communities are particularly vulnerable to the impacts of climate changes. CRiSTAL recognizes the important role of the communities in the adaptation to climate changes at the community level, based on empirical data about the current status of climate risks. Climate change adaptation at the community level should combine the knowledge and experience of the communities. Results from CRiSTAL in the three case studies in Daklak, showed strong correlations among climate change, coffee crops and other livelihood assets. Agriculture, coffee crop in particular, is facing great difficulties. Providing strategies of adaptation and risk mitigation to the local community is important and prevents possibility of over-exploitation. These case studies emphasized the importance of agriculture as alternative sources of income. Risk mitigation options should then be prioritized to sustain the primary source of livelihoods. Proposed solutions that take into account these factors should be

effective for the adaptation and risk mitigation in response to the current and future climate change.

5 Acknowledgements

This research was financially supported by National scientific program on climate changes /11-15, project number 38. We thank scientific committee of this program.

References

- [1] "Strategic National Environmental Protection 2020, with a vision to 2030", Ministry of natural resources and environment of the Socialist Republic of Vietnam, 2012.
- [2] "National Target Program to Respond to Climate Change", Ministry of natural resources and environment of the socialist republic of Vietnam, 2008.
- [3] "Review of climate change adaption methods and tools", Mekong river commission, 2010.
- [4] "CRiSTAL User's Manual Version 5", The International Institute for Sustainable Development, 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4, 2012.
- [5] Oxfam Hong Kong, "Vietnam: Climate change, Adaptation and Poor People", 2008.
- [6] People Committee of Daklak, Development Strategy the province and city of Buon Me Thuot, 2011.
- [7] The Western Highlands of Agriculture and Forestry Science Institute, "Assisting the Mngong minority to convert agricultural lands used for growing low-yield mixed vegetables to grasslands for raising cattle in the Lak district of Daklak province", 2012.
- [8] The Western Highlands of Agriculture and Forestry Science Institute, "Technological strategies for sustainable coffee production in Lak and EhLeo District", 2013.
- [9] M. K. van Aalst, T. Cannon and I. Burton, *Community level adaptation to climate change: The potential role of participatory community risk assessment*, Global Environmental Change, **18**(2006), 165-179.
- [10] K. L. Ebi and Jan C. Semenza, *Community-Based Adaptation to the Health Impacts of Climate Change*, American Journal of preventive Medicine, **35**(2008), 501-507.
- [11] J. D. Ford, T. Pearce, F. Duerden, Chris Furgal and Barry Smit, *Climate change policy responses for Canada's Inuit population: The importance of and opportunities for adaptation*, Global Environmental Change, **20**(2009), 177-191.
- [12] A. Hammill and S. Kelleher, *Livelihoods and Climate Change: Report on Sri Lanka test of CRiSTAL*, the International Institute for Sustainable Development and the International Union for Conservation of Nature, report, Sri Lanka, 2003.
- [13] M. Keller, "Assessment Report for Two Community-Level Projects in Southern Honduras", The International Institute for Sustainable Development, report 2009-3.
- [14] Lam Thi Thu Suu, Pham Thi Dieu My , P. Bubeck and A. Douma, *Adaptation to climate change based on the community wood river basin, Thua Thien Hue province*, Center for Social Resesearch And Development, R.Vietnamese.thesis, Thua Thien Hue, Vietnam, 2010.
- [15] J. Laukkonen, P. Kim Blanco, J. Lenhart, M. Heiner, B. Cavric and C. K. Njenga, *Combining climate change adaptation and mitigation measures at the local level*, Habitat International, **33**(2008), 287-292.

- [16] Le Thanh Sang and Bui Duc Kinh, *Mekong Delta adapt to climate change*, Society and Science Magazine, **41**(2010), 45-52.
- [17] Mai Thanh Son, Le Dinh Phung and Le Duc Thinh, *Impact, resilience and some policy issues (case studies of ethnic minorities Northern Mountains)*, Climate Change Working Group and Ethnic Minorities Working Group, report, 2011
- [18] Nguyen Huu Tri, *Environmental protection in the traditional culture of the indigenous peoples in Daklak*, Journal of Science and Technology, **14**(2010), 10-17.
- [19] Nguyen Xuan Mai, *Economical-social Changes of households*, Society and Sciences Magazine, **59**(2007), 59-65.
- [20] I. Picketts, A. Werner, T. Murdock, J. Cury, S. Defy and D. Dyer, *Planning for climate change adaptation lessons learned from a community-based workshop*, Environmental science and policy, **17**(2012), 82-93.
- [21] Pham Quang Hoan, *Mechanism to cope with food shortages of the highland minorities of Vietnam and Laos*, Journal of Ethnic Studies, **1-2**(2009), 11-17.
- [22] C. Robledo, N. Clot, A. Hammill and B. Riché, *The role of forest ecosystems in community-based coping strategies to climate hazards: Three examples from rural areas in Africa*, Forest Policy and Economics, **24**, (2012), 20-28.
- [23] N. Stejskal and M. Fernandes, *Climate change, vulnerable communities and adaptation: report on Nicaragua Testing*, www.iisd.org/pdf/2006/security_field_test_nicaragua.pdf, 2006.
- [24] Tran Van Ha and Dang Thi Hoa, *The influence of social and cultural factors to mechanism to copy with food shortages of the Kho Mu: Studies in the Binh Son 1, Ta Ca, Ky Son district, Nghe An Province*, Journal of Ethnic Studies, **1-2**(2009), 74-89.