


Indigenous Peoples'
Climate Change Adaptation
& Mitigation Measures

# Knowledge, Innovation & Resilience

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Tebtebba Foundation

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Websites: www.tebtebba.org, www.indigenousclimate.org

Writers: Ibrahim Njobdi Amadou; Nabarun Chakma and Senjuti Khisa; Afia Biak Hta Dim; Elifuraha Isaya Laltaika; Jennifer Theresa Rubis; Cao Phan Viet; Leah Enkiwe-Abayao, Jo Ann Guillao, Mikara Jubay-Dulay, Helen Magata
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# Knowledge Innovation & Resilience

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# Table of Contents

Introduction ..... vii

Enhancing Resilience through Sustainable
Development in Chittagong Hill Tracts..... 1
*by Nabarun Chakma and Senjuti Khisa*

Taking the Initiative:
The Chin on Climate Change in Burma..... 39
*by Afia Biak Hta Dim*

Understanding Interactions between Global
Climate Change and Traditional Lifestyle
Initiatives of the Bidayuh-Jagoi in Malaysia..... 81
*by Jennifer Theresa Rubis*

Reclaiming Forests and Coasts: Indigenous
Peoples Cope with Climate Change..... 125
*by Leah Enkiwe-Abayao, Jo Ann Guillao,*
*Mikara Jubay-Dulay and Helen Magata*

Increased Vulnerabilities due to Climate Change:
The Case of the Kep A Village in Northern Vietnam..... 215
*by Cao Phan Viet*

Coping with Drought: Climate Change and
Maasai Pastoralists in Tanzania..... 253
*by Elifuraha Isaya Laltaika*

Ways of the Mbororo: Responding to
Environmental Changes in Cameroon..... 293
*by Ibrahim Njobdi Amadou*

# Introduction

**by Victoria Tauli-Corpuz and Leah Enkiwe-Abayao**

Indigenous peoples are in critical conditions due to the impacts of climate change. This is because their lifeways are well-linked to their ecosystems, whether this is a tropical rainforest, a high mountain, a low-lying coastal area, a floodplain or a temperate forest. Climate change is normally observed in various ways depending on the type of ecosystem indigenous peoples inhabit.

Indigenous peoples who live in forest ecosystems have developed indicators of a changing climate that is often not desired. Among these are the non-appearance and inactivity of certain animal and plant species such as flowering plants and useful insects. There have also been changes in rainfall patterns as various parts experience more frequent tropical cyclones and storms.

Much of the literature on climate change are not able to reflect adequately the impacts and responses of indigenous peoples to climate change. The best way to address this is for indigenous peoples themselves to define and conduct their research. Thus, Tebtebba encouraged indigenous activists to engage in participatory action researches on this topic. In 2007, Tebtebba and a group of indigenous researchers embarked on a focused work on climate change and indigenous peoples. Seven researches were conducted to: 1) demonstrate the magnitude and extent of climate change impacts, and 2) build a good database on grassroots indigenous peoples' climate adaptation and mitigation practices.

Tebtebba worked with researchers in co-producing research guides, which were used in a flexible manner. Understanding that indigenous peoples can contribute distinct ways on how they are affected by climate change, the researchers focused on communities which have or are suffering from climate change impacts. They gathered empirical evidence and did participatory and collective analysis of these based on their indigenous knowledge. These researches have been presented at the Asia Summit on Climate Change and Indigenous Peoples on February 24-27, 2009 in Bali, Indonesia.

This collection of articles brings together the work of indigenous scholars and activists working on indigenous issues in their respective countries, and who were themselves informed by their research findings and have found the relevance of applied research in their work. Tebtebba is now publishing this collection as a book entitled Knowledge, Innovation and Resilience: Indigenous Peoples' Climate Change Adaptation and Mitigation Measures.

These seven case studies came up with two common observations in terms of defining factors, which further exacerbate the adverse impacts of climate change in communities of indigenous peoples. These include 1) the conditions affecting the transmission and continuity of indigenous ecological knowledge, and 2) the prevailing weak state policies and lack of programs to support indigenous peoples in their efforts to adapt to climate change impacts.

## Threatened Ecosystems

Indigenous peoples are anxious about climate change because of its undesirable impacts. Most ecosystems that indigenous peoples inhabit are critically threatened. These ecosystems are badly affected by external forces, mostly related to national development-driven programs and some of the projects intended to mitigate climate change. Indigenous peoples fear the long-term impacts of climate change. As it is now, the immediate impacts are dealt with variably by indigenous peoples.

Some communities are confused with the new weather patterns and are extremely challenged by the effects of a changing climate. Ibrahim Njobdi Amadou's article on the "Ways of the Mbororo: Responding to Environmental Changes in Cameroon" and Elifuraha Isaya Laltaika's "Coping with Drought: Climate Change and Maasai Pastoralists in Tanzania," have documented the cases of the Masaai of Tanzania and the Mbororo of Cameroon, showing how indigenous communities have coped with food, water and health insecurity due to prolonged droughts. Their papers show how pastoralists are struggling to adapt to worsening droughts. The pastoralists' seasonal patterns of mobility are disturbed. These authors also highlighted how the settled commercial agriculture is creeping into their communities and pastoralists are pressured to take part as cheap agricultural laborers in these systems.

Village level data show that several cattle died as a result of the droughts and several families have experienced hunger and malnutrition after losing their livestock—a vital source of milk and meat. Invasive grass species locally called agugu, mbaajoo, bokassa and Fulawa have replaced indigenous grasses. Cows do not eat these grasses. This problem is an added work for pastoralists as they have to spend time clearing these invasive grasses to recover their lost grazing lands. Pastoralists also noted the advent of cattle pests called Sille Jijam.

Access to clean water is a serious concern. Many maaje or water points have dried up, reducing the indigenous pastoralists' access by 50 per cent (from 8 water points to 4 water points). Important medicinal herbs and trees have also disappeared. Communities affected have thus held "rain rituals," which involved slaughtering cows, to appease gods and ancestors.

Amadou and Laltaika concurred that the immediate impacts of climate change are malnutrition and hunger, resulting to extreme poverty. Yet, another alarming impact is the degradation of ecological and cultural values, beliefs and practices among indigenous pastoralists. As the cash economy is introduced, livelihood patterns change. This has redirected many community members to an increasingly individualized way of living, mak-

ing kin relations unimportant. Such monetized way of life of the indigenous pastoralists is increasingly being institutionalized as a system. As result, this has adversely affected property relations, livelihood patterns and inter-village living. Both authors saw the need for technical and social interventions to these climate change-induced problems affecting indigenous pastoralists in East and Central Africa.

The transformation of economic activities has resulted to the decline, if not loss, of cultural values at the community level. In Africa, the Masaai Enturuj food sharing concept among young men and the traditional practice of Inkishu lipai (milk cows) best illustrate this. As livestock and other economic resources have been monetized or given market value, traditional institutions and indigenous systems of relations have been corrupted. As communities adapt to new conditions, they employ new systems of survival, which are hardly grounded on their customary institutions. The market economy has come to define the pastoralists' survival system, which unfortunately continues to erode significant cultural institutions at the community level.

Severe climate change impacts are similarly felt by indigenous peoples in Asia as shown in the cases of Bangladesh, Myanmar, Malaysia, Vietnam, and the Philippines. Researchers from these five countries have demonstrated that climate change impacts have effects both on the physical and psychological states of indigenous peoples and the cultural structures of indigenous communities. Indigenous peoples in Asia still maintain spiritual relationships with their lands, territories and resources. This is commonly seen in the research findings from Asia, a region where indigenous communities maintain many sacred sites and groves in their forests and other landscapes, and mainly depend on subsistence farming of diverse food crops as well as on wild food crops and medicinal plants.

Village level data from the Chittagong Hill Tracts (CHT) of Bangladesh and the Dayak Bidayu of Sarawak, Malaysia show cases of severe destruction of crops, homes and other community institutions due to floods. Take the case of Bangladesh's CHT. In their work on "Enhancing Resilience Through Sustain-

able Development in Chittagong Hill Tracts," Nabarum Chakma and Senjuti Khisa wrote that indigenous peoples are highly vulnerable to prolonged droughts or excessive rains. Both floods and drought destroy important crops, thus threatening CHT communities with hunger and malnutrition.

Another important work is Cao Phan Viet's "Increased Vulnerabilities Due to Climate Change: The Case of Kep A Village in Northern Vietnam." He reports about unusual catastrophic floods, landslides and cold temperatures from 1998 to 2008. Citing village-level data, he writes that a significant number of households and domesticated animals were swept away by floods or buried under landslides due to typhoons. Extremely cold temperature has also damaged several agricultural products such as maize, rice, cassava and other useful plants. There were also high incidences of epidemics including strange diseases. Local people attributed these to deforested watershed forests in Northern Vietnam.

Vietnam's case also demonstrates how abnormal weather patterns have negatively affected not only farm production but also public health. Unusual insects and diseases have struck both agricultural products and indigenous populations. Villagers were also alarmed by many cases of 400 to 700-meter wide cracks in mountain villages as a result of prolonged drought. This makes the villages vulnerable to landslides.

In 2007 Vietnam experienced a two-month cold spell, an unusual phenomenon that adversely affected its mountain ecosystems. This climatic pattern has confused indigenous communities as they struggle to comprehend how to adapt a new agricultural calendar.

Monitoring changes in weather patterns, the Dayak Bidayuh-Jogoi of Sarawak, Malaysia devised a mechanism to address failing harvest or the significant decline in crop yields due to a prolonged dry season. Jennifer Theresa Rubis, in her "Understanding Interactions between Global Climate Change and Traditional Lifestyle Initiatives of the Bidayuh-Jagoi in Malaysia," emphasizes the value of knowing village-level traditional knowledge and history of their ecosystem. She studied the padi farm-

ing system to illustrate village tracking of changing weather patterns. She also established a "community climate timeline" to demonstrate the community's memories of weather events, including occurrences of famine and floods.

Emphasizing the Dayak's desire for crop diversity over crop productivity, Rubis discussed the Dayak practices of multi-cropping, diversification of padi varieties, and rotational farming as important adaptation measures to climate change.

Similarly, Chakma and Khisa documented a distinct juming or farming innovation system among the indigenous peoples of Khagrachari district.

## Indigenous Knowledge at Risk

Indigenous peoples in Asia rely heavily on the health and integrity of their ecological systems. Their cultures, norms, values and practices revolve around land, water, air, sun, flora and fauna, their relationships with the living earth, the seen and the unseen, as well as with the past and the future.

Thus, changes to the ecosystem brought about by the variability of the climate have affected their lifeways. Climate variability, such as changes in rainfall patterns, resulted to food insecurity and a significant decline in the practice of agricultural rituals. This has seriously impinged on kin relations and other indigenous socio-cultural practices.

While indigenous peoples have developed and used their cosmologies and traditional knowledge systems in their communities even in addressing the adverse impacts of climate change, the basic spiritual and value foundations of these systems are at risk. If their knowledge systems, which are closely linked with their day-to-day relations with their landscapes are undermined, their vulnerability to climate change further increases.

Thus, indigenous peoples' vulnerabilities to climate change need to be looked at several levels: 1) in terms of its impacts to the physical landscapes and peoples' physical and social well-being; 2) in terms of the human rights impacts, the psycho-cultural impacts and effects on the traditional knowledge and customary governance systems of indigenous peoples; and 3) differentiated impacts on gender and also on age groups. This multi-faceted way of analyzing the impacts of climate change is important as the usual ways of governments and corporations towards adapting and mitigating climate change employ "one-size-fits-all" approaches, which are insensitive to cultural, economic, gender and intergenerational specificities, especially among indigenous peoples. Thus, solutions for mitigating climate change sometimes lead to violations of basic human rights and fundamental freedoms of indigenous peoples. Approaches, which basically rely on the markets, are not very appropriate and are very inadequate in addressing these realities of indigenous peoples.

## Risks and Impacts of Mitigation Measures

The UN Framework Convention on Climate Change and the Kyoto Protocol have established that those mainly responsible with mitigation of climate change are the highly industrialized countries clustered in what is known as Annex 1 countries. Since these countries are responsible for more than 90 per cent of the greenhouse gas emissions in the atmosphere which the world is suffering from, it is but right that these countries carry the costs of mitigating climate change. Thus, indigenous peoples, particularly those in developing countries and even those in these rich Annex 1 countries, are not expected to bear this cost. They are the ones bearing the costs of the adverse impacts of climate change, even if they did not contribute in causing this problem. The studies contained in this book show how they have to cope with the impacts of climate change especially those

caused by strong typhoons, cyclones and hurricanes, floods and prolonged droughts.

The key solution to climate change is the shift from the use of fossil fuels (oil, coal and gas), which is the main source of greenhouse gases. This means a shift away from a development path and consumerist, wasteful, high energy lifestyles which are totally dependent on fossil fuel use, whether in industries, transport, energy use, and industrial agriculture, among others. However, instead of moving towards a low-carbon emissions development path, most countries would still opt to maintain the high-energy, high-emissions economic development pathway and use the market-based approach of buying carbon offsets in developing countries to meet their obligations under the Kyoto Protocol. This is where some of the renewable energy projects, which are being pushed and supported in some developing countries, come in. While there is no question that renewable energy should be developed to replace heavy reliance on fossil fuels, the social, environmental and human rights implications of this shift should also be taken into account.

What has been shown in these studies is that some renewable energy projects such as the push of agricultural production and forest projects towards planting of biofuel crops and establishment of hydroelectric mega dams and geothermal plants, are causes of concern for some indigenous peoples. The increased need for biofuels is leading to the further expropriation of lands, territories and resources of indigenous peoples as shown in the case of Myanmar, Malaysia, Philippines and Indonesia. There is a significant acreage of lands being devoted to oil palm and jatropha plantations for biodiesel production.

Afia Biak Hta Dim's work on "Taking the Initiative: The Chin on Climate Change in Burma" shows the impacts of a government project for jatropha cultivation in some indigenous Chin communities in Burma. Many of the Chin's lands were confiscated to give way to jatropha plantations.

In 2005, Senior General Than Shwe, supreme commander and head of the state's ruling party, decreed that each state and

division across the country should allot 500,000 acres to be planted to jatropha. On national television, Shwe announced that in three years, seven million acres across the country should have been planted to jatropha. After Shwe's announcement, the Ministry of Agriculture and Irrigation had said that the cultivated land for jatropha across the country would extend up to eight million acres. In Chin State, in order to meet the quotas under the General's plan, every man, woman and child would have to plant more than 1.25 acres, since the population of the State is less than 400,000. Because of the biofuel project, the Chin were forced to labor in the plantations, their forests deforested and were punished for refusing to plant or purchase jatropha seeds or seedlings.

Some solutions being proposed to address climate change, which are oblivious of the human rights, social and environmental impacts, can cause serious problems for indigenous peoples. This example of biodiesel crop production demonstrates what can happen to indigenous peoples' lands and territories in Southeast Asia and other tropical countries where indigenous peoples live.

It is important to study and analyze more deeply indigenous peoples' traditional knowledge systems and livelihoods, which are low in carbon dioxide emissions and which are sensitive to sustaining and restoring ecosystems, landscapes and waterscapes. Their capacities for resilience and for adapting to adverse climate change impacts are directly proportional to how they are able to continue practicing these knowledge systems and also their customary governance systems, which include ensuring environment-sensitive ways of dealing with their physical territories. Traditional knowledge systems and local institutions—which are continuously used, adapted, revitalized and developed—will produce immediate and strategic solutions to climate change.

## Revitalizing Indigenous Knowledge

In "Reclaiming Forests and Coasts: Indigenous Peoples Cope with Climate Change," the research team from the Philippines composed of Prof. Leah Enkiwe-Abayao as research consultant, Jo Ann Guillao, Mikara Jubay-Dulay and Helen Magata of Tebtebba highlighted two cases of indigenous communities, coastal and mountain ecosystems, with pronounced adaptation measures to climate change. Knowledge of traditional weather forecasting and agricultural calendar are central to indigenous communities as they adapt to climate change.

Securing control to ancestral domains has been crucial in the implementation of mitigation strategies. Efforts of some indigenous peoples in the Philippines to adapt and mitigate climate change revolved around how they can still continue to protect and sustainably use their traditional knowledge and practices on forest and water use.

## Ways Forward

Given increased vulnerabilities and the gravity of climate change impacts, indigenous communities need assistance as they adapt to the adverse impacts of climate change. Laltaika posits that the most urgent need of indigenous peoples in Africa are researches that look into the issues of food and water insecurity and ways to address these. The identification of livestock species that are more adaptable to new climate conditions (e.g., drought tolerant livestock) are urgently needed.

Viet's work calls for accurate information on climate change-related issues and a good early warning system for disaster-prone indigenous communities.

There is a crying need for more participatory action researches in many indigenous peoples' territories the world over,

but these have to be done jointly with the communities concerned. What we have seen in this modest initial research work, is that communities have to be made more aware of what the phenomenon of climate change is all about, so they will be able to understand this better and see the roles that their traditional knowledge and practices can play in addressing this issue.

These case studies are just scratching the tip of the iceberg. More researches of this kind can elicit more knowledge on the social, cultural, physical, economic, and spiritual impacts of climate change, which can then help identify possible ways of strengthening the resilience and coping strategies of indigenous peoples as well as what they can contribute in terms of providing solutions to this problem.

# Enhancing Resilience through Sustainable Development in Chittagong Hill Tracts

by Nabarun Chakma and Senjuti Khisa
Maleya Foundation, Bangladesh

## Introduction

Bangladesh is one of the most vulnerable countries to sea level rise caused by climate change. Various environmental reports state that about 40 per cent of its total land mass will be inundated, affecting a large population directly or indirectly. Many will be dislocated from lands they have inhabited since time immemorial and will become environmental refugees. The Sundarban, the world's largest mangrove forest, is predicted to be submerged under water by the end of this century.

As the world climate is changing fast due to global warming caused by industrial pollution in rich countries, Bangladesh will become even more vulnerable to natural calamities like Sidr and other types of cyclone. Being a third world country, it emits a very small percentage of 0.1 per cent of the world's total greenhouse gas (GHG) emissions but will suffer the most from its consequences. The government initiated the National Adaptation Programs of Action (NAPA) in 2005 and consequently adopted the Bangladesh Climate Change Strategy and Action Plan in 2008. But even as climate change is a growing concern in the country, only a few projects have so far been undertaken to address it and its impacts. The government's climate change policy also does not include indigenous peoples who are even more at risk because they depend on natural resources for their survival and often inhabit diverse but fragile ecosystems.

The majority of Bangladesh's 143.3 million people are Bengalis, and approximately 2.5 million are indigenous peoples belonging to 45 different ethnic groups. The indigenous peoples are concentrated in the north and in the Chittagong Hill Tracts (CHT) in the southeast of the country. There is no constitutional recognition of indigenous peoples in Bangladesh, being referred to only as "backward segments of the population." They remain among the most persecuted of all minorities, facing discrimination not only on the basis of their religion and ethnicity but also because of their indigenous identity and socio-economic status.

The situation of CHT indigenous peoples is more vulnerable than that of other indigenous groups in Bangladesh. In a real sense there are no actual data and statistics of their number and identity, which some have been denied of because of their assimilation into mainstream culture.

This case study focused on how climate change is affecting the indigenous peoples in the Chittagong Hill Tracts, specifically in the two villages of Headmen Para and Monglechand Para. It also looked into how government's climate change policies and programs are affecting them and their own practices in mitigating and adapting to climate variations. As Bangladesh has just launched its climate change action plan, the study was not able to assess its impacts.

The concept of climate change is not familiar to indigenous peoples. They do not think in terms of mitigation strategies, but rather practice resource management that appropriately serves to help them adapt to critical environmental situations they face. Although the study tried to confine information on climate changes within the last 20 years, the climatic data gathered from the community level was not in this exact time frame but more in terms of present and past generations.[1]

## *Situation of Indigenous Peoples in Chittagong Hill Tracts*

According to the 1991 census, indigenous peoples belonging to different groups, can be found in all 64 districts of Bangladesh. Traditionally, the indigenous peoples were concentrated in the north and northeastern borders, the forest areas of the north-central region and the entire upper Burma to the East Arakan in the south and the Chittagong District.

There are about 45 indigenous groups in Bangladesh that can generally be divided into two, based on their geographical location: those in the plains and those in the southern hill area. The former are the indigenous peoples in the plain districts in the northeastern region, north Bengal, greater Mymensingh and a few groups in Dhaka, Sundarban and coastal areas. These areas have three ecosystems—tropical forests, high mountains and coastal villages where indigenous peoples have been living since time immemorial.

The main indigenous populated region is the Chittagong Hill Tracts, which consists of 13,295 sq km, covering 10 per cent of the country's total land area. Most of it is dense forest spanning 47 per cent of total forest land (BBS 2001). The 2001 population of CHT was 1.34 million, which was estimated to be 1.1 per cent of the national population. About 13 indigenous groups, collectively known as Jhumma or Pahari people, live in CHT, the three largest groups being the Chakma, Marma and Tripura.

The Chittagong Hill Tracts has traditionally been the homeland of 11 ethnic groups. Only a century ago the hill people accounted for more than 90 per cent of the total CHT population. Today their population size and that of Bengalis is nearly the same.

Almost all the indigenous communities are mainly agricultural. Those in the northwestern districts have long been engaged in settled wet rice cultivation, although most of them have other secondary occupations like trading, crafts and weav-

ing. Among the indigenous peoples of Sylhet district, the Khasias have been involved in trading across the border. The Munipuri are basically craftsmen.

In CHT, all indigenous communities living on ridges have customarily engaged in shifting cultivation. The valley-inhabiting groups were similarly shifting cultivators in the past, but stopped due to government prohibition, subsequently adopting settled plow cultivation for growing wet rice. The CHT indigenous peoples have also traditionally harvested forest resources for domestic purposes, exploiting these in harmony with nature. They consider forests as common property and exercise their social right to communal uses of these resources. Even today, the hill people collect bamboo, timber and fuel wood; forage for vegetables, roots, herbs and other useful plants; and hunt, fish and trap birds for their own food consumption. However, increased population pressure aggravated by a lack of suitable lands for jum farming has led to over harvesting and scarcity of forest products. The people have thus been compelled to alter their attitude to forest resources and their livelihood.

The CHT region is generally backward in communication, education, infrastructure and socio-economic condition. The health of the local people is affected by environmental contamination of common public goods, deforestation, landslides, plant burning by shifting cultivation, soil erosion, waste and garbage dumping. A stagnant local economy, poor water supply and inadequate sanitation are major causes of poor health. Furthermore, access to basic healthcare is difficult for the population, especially in the more remote areas. Prevalent diseases in CHT are diarrhea, especially among children below five years, pneumonia, malaria and Vitamin A deficiency.

In order for sustainable development to succeed, the local population needs to have basic education, as it provides the framework for an individual to be a productive member of society and for understanding the impact of personal actions. In CHT, the major obstacles to development and thus, for sustainable development, are the interrelated issues of poverty and low rate of education. The literacy rate in CHT in 2001 was

37.35 per cent while the national literacy rate was 45.3 per cent. Male literacy was also lower at 45.13 per cent compared to the national average of 49.6 per cent; and female literacy even more so at 28.06 per cent compared to the national rate of 40.8 per cent. (BBS 2003)

The Chittagong Hill Tracts is unique from other parts of the country not only for its ethnicity but also for its biodiversity, geography, aesthetic value and natural resources. It is considered as a biodiversity hotspot of the country. The area is mostly covered by hills and forests, having a mean sea level of 9-1100 meters. According to land capability, only seven per cent of the area is suitable for intensive agriculture and 77 per cent can be used for forestry. For this reason, many argue that proper policy and projects should be taken to develop the area and the people, so less harm is incurred on the environment and indigenous peoples. Land rights and land tenure system are still generally problematic in the country.

The CHT region experiences a tropical monsoon climate. Annual temperature varies from 10 degrees to 35 degrees Centigrade. A mean minimum temperature of 24$^{o}$C is experienced during the month of December to January and a maximum temperature of 34$^{o}$C during March to May. The dry and cool season is from November to March. The pre-monsoon season is (April-May) hot and sunny, and the monsoon season (June to October) is warm, cloudy and wet (Khan et al. 2007).




**Figure 2:** The greater CHT area in Bangladesh

## Impacts of Climate Change on Indigenous Peoples

The indigenous peoples live mainly in tropical rainforest and coastal ecosystems, with most of them found in the former, including the Chittagong Hill Tracts. As discussed below, they are already experiencing the various effects of the changing climate on their land and resources, livelihood, food security, life and health, and ecological and cultural values.

### *Tropical Rainforest Ecosystems*

The natural environment in the tropical rainforest is closely related to the climate, but in the last 30-40 years, changes in the climate have caused an imbalance. Many elders in CHT have observed temperature increases and changes in rainfall pattern. According to them, the temperature is increasing day by day and this is the main cause for the different impacts being felt. Other observations are the following:

#### Drying water resources

The CHT has many water resources. like small rivers and springs, which are the main sources for irrigation and household use. But now almost all these sources are drying up, and various fish species have also vanished. People blame over cutting of trees in the forest as the main cause.

#### Changing rainfall pattern affecting agricultural cycle

The timing, duration and intensity of rainfall have been changing due to global environmental changes. Generally rainfall occurs in the rainy season, but for a few years now people in CHT have experienced irregular rainfall patterns, which have altered the agricultural cycle. Rain sometimes occurs during the dry season, but during sowing time when water is essential for

the plants, it sometimes does not come at all. At other times, the rains are so intense the crops get damaged.

Increased rainfall due to climate variability is also bringing massive floods, which destroy fertile soil and crops and cause loss of fresh water supply. Climate change also spells droughts through increase in annual mean temperatures. Drought and increased flooding are taking a toll on agriculture, thus affecting food security.

**Loss of biodiversity due to warmer temperatures**

In the past, the whole CHT area was full of life. People recognized the coming season by hearing the sound of various insects like the cricket. The elephant, fox, hare, bear, deer, snail and jungle cat were still seen in the area a decade ago, but today they are almost all extinct. Similarly, some types of snake, frog, crab, fish and porcupine have become very rare.

Not only certain animal species are in danger of disappearing but also many valuable and traditional crops. Different varieties of popular rice locally called Kabarak, Renkoi, Sere, Kiring and Giring, various trees like Acchol and Vidol, and varied jungle mushrooms can no longer be found. This is also true for many known and unidentified herbal trees and medicinal plants, which the local people no longer see.

**Increasing natural disasters**

A major result of climate change is likely to be an increase in environment-related natural disasters. Increasing magnitude and intensity of floods, agricultural droughts, storm surges and cyclones and other disasters are already affecting indigenous peoples. Soil erosion, forest resource degradation, loss of biodiversity, landslides and flash floods are some of the common environmental concerns in CHT.

## Food insecurity

Some regions are experiencing frequent and prolonged droughts, while other areas bear the brunt of increased and unpredictable precipitation, leading to flooding. In both cases, food security is undermined and vulnerability is increased.

Rat infestation of rice grown on jum plots poses a growing problem of climate change in CHT. Part of the reason is the elimination of natural predators such as birds of prey, snakes and some jungle cats. Even worse is the potential occurrence in the next five years of the dreaded bamboo flowering and with it the associated rat infestation. This phenomenon causes a large increase in rats that feed on the dying bamboo flowers and seeds. The rats eventually turn upon agricultural crops, causing widespread famine and devastation. This happened in CHT in 2007, causing a devastating famine.

Damage to crops due to excessive rainfall and other natural calamities is commonplace in CHT. It causes food insecurity and poor nutritional status particularly among children under five years of age.

## Increasing diseases

Projections by the 4th Intergovernmental Panel on Climate Change (IPCC) indicate that one of the major impacts of global warming and climate change will be an increase in vector borne diseases (e.g., malaria and dengue fever). Recent studies by the International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B) demonstrate that diarrheal diseases are on the rise, which is attributed partly to increased flooding and poor drainage system. This is expected to get worse with climate change. Global warming will also raise temperatures in the summer season, increasing the incidence of heat strokes, which could be further aggravated by shortages of drinking water. Possible other threats from other vector borne diseases, such as kala-azor and typhoid, have yet to be assessed.

Many people, particularly children below five years, suffer from diarrhea and pneumonia in the CHT. The prevalence of

diarrhea is 6.9 per cent among CHT people (14.1% among children five years or younger and only 5.7% for those older than five). They also suffer from different types of dangerous malarial and blindness diseases, which are also caused by climate change (LGED 2006). The elderly villagers said many new diseases have emerged in the last 4-5 years that they had not seen in their lifetime.

**Table 1.** Weather conditions and types of diseases affecting children, 2007

| Month | Weather condition/natural disaster | Effect on children |
|---|---|---|
| January & February | Cold, cold wave | • Pneumonia, fever, cough, snivel, cold diseases, difficulty in breathing |
| March & April | Heat, heavy rainfall, cyclone, hailstorm | • Diarrhea, hepatitis, dysentery, typhoid fever, measles, small pox |
| May, June & July | Heavy rainfall (Kal Boishaki), intense heat, mosquito infestation, water pollution, flash flood, thunderstorm, hailstorm, landslide | • Children get scared, affected by malarial fever, diarrhea, many deaths caused by landslide |
| August & September | Drought, sun stroke | • Prickly heat, scabies, headache, heat stroke, malaria, diarrhea, hepatitis |
| October, November & December | Change in season, cold, dew | • Fever, snivel, cough, measles, chicken pox |

*Sources: Zabarang Kalyan Samity, Khagrapur Khagrachari.*

## Women and children

Women and children are particularly affected by climate change and by climate-related diseases. Women are primarily caregivers, combining the care for children and elderly with their domestic and income earning activities. These additional responsibilities place additional burdens on them, impacting their ability to work outside the home and to deal with the

effects generated by environmental changes. Women are the most vulnerable in times of water crisis and deforestation, as they have to carry the heavier loads and walk longer distances to collect fuel wood and water. They also play a major productive role, particularly in maintaining the food cycle.

## Livelihood

Most of the indigenous peoples in CHT are shifting cultivators. As a result of climate change and population increase (fallow period is reduced because of less land), their crop production is poorer compared to that in the last 20-30 years. Thus, to survive they have to engage in alternative or secondary occupations like daily wage labor, small business, collecting and selling wood and other forest resources, gardening, plains farming, as shown in the following table.

Some have made a total change of livelihood, like the people in the study area, very few of whom are still involved in jum cultivation. Others have a little piece of land they cultivate in addition to daily wage labor.

**Table 2.** Alternative occupations in Khagrachari District

| Name of Village | Community | No of HHs | No of HH involved in shifting cultivation | Secondary/Alternative Occupation |
|---|---|---|---|---|
| Jerok Para | Tripura | 34 | 34 | Day labor, selling wood/firewood, gardening |
| Horinath Para | Chakma | 115 | 80 | Day labor, selling wood, firewood, gardening, small business, plain land cultivation |
| Prakalpa Para | Marma | 24 | 24 | Fruit gardening, working rubber garden |

*Source: Research Report of Zabarang Kalyan Samity, June 2007.*

**Local ecological and cultural values**

The indigenous peoples have a distinct ethnicity, a separate way of life and a unique value system. In the case of forest and hill people—Chakma, Marma, Rakhain, Tanchangya and Tripura, among others —culture is eco-based, that is to say, cultural norms and practices revolve around the essential elements of ecology, such as land, water, trees, birds, fishes and animals and even the air, sky and planets. Thus, the changing nature due to the changing climate has a harmful effect on biological diversity and related knowledge, innovations and cultural practices of indigenous peoples.

## *Coastal Ecosystem*

Bangladesh is one of the low-lying countries, which will be badly affected by a sea level rise. Its deltaic coastal regions are most susceptible to the adverse effects of global warming. Professor Nazrul Islam and Mohammed Abdur Rob of the University of Dhaka's Department of Geography and Environment have predicted that cyclones, storm surges, tornadoes, droughts and floods would intensify due to the increase in the atmospheric temperature and global warming. According to them, saline water of the sea will engulf coastal regions and the depressions in the floodplain mangrove patch in the world will be devastated due to sea level rise.

River bank and soil erosion, destruction of the regional biodiversity and severe landslides will also occur due to climate change. The experts fear that at least 24 million people in coastal areas of Bangladesh will be directly affected. Agriculture, fisheries, industry, trade and communication will be severely disrupted.

The Rakine indigenous groups mainly live in the country's coastal area, which is at great risk from global climate change because of its very low elevation and exposure to various wa-

ter-related hazards. From an analysis of 22 years of data (1977-1998), sea level rise has been estimated as 7.8 mm/year, 6.0 mm/year and 4.0 mm year at Cox's bazaar, Char Changa (Hatia) and Hiron Point, respectively (SMRC 2000a). The effect of tectonic subsidence may be more pronounced in a high rate of sea level rise.

Although the magnitude of the change in climate may appear to be small, it could substantially increase the magnitude of existing climate events (flood, drought, cyclones) and decrease their return period. For example, a 10 per cent increase in precipitation may increase runoff depth by one-fifth and the probability of an extremely wet year by 700 per cent. The probable climate change scenarios for Bangladesh are provided in the following table.

**Table 3.** Climate change scenarios for Bangladesh

| Year | Sea-level rise (cm) | Temperature increase (0C) | Precipitation fluctuation compared to 1990 (%) | Changes in evaporation | Remarks |
|---|---|---|---|---|---|
| 2003 | 30 | + 0.7 in monsoon | - 3 in winter | + 0.9 in winter | Based on 2nd IPCC projections (WB 2000) |
| | | + 1.3 in winter | - 11 in monsoon | + 15.8 in monsoon | |
| 2050 | 50 | + 1.1 in monsoon | - 37 in winter | 0 in winter | |
| | | 1.8 in winter | + 28 in monsoon | + 16.7 in monsoon | |
| 2030 | | + 0.8 in monsoon | - 1.2 in winter | | Based on 3rd IPCC projections (Agarwal et al., 2003) |
| | | + 1.1 in winter | + 4.7 in monsoon | | |
| 2050 | | + 1.1 in monsoon | -1.7 in winter | | |
| | | + 1.6 in winter | + 11.8 in monsoon | | |
| 2100 | | + 1.9 in monsoon | - 3.0 in winter | | |
| | | + 2.7 in winter | + 11.8 in monsoon | | |

*Source: Where Land Meets the Sea, 2007, a Profile of the Coastal Area of Bangladesh.*

Coastal zone resources are especially endangered by the projected climate change and consequent sea level rise. The observed and felt effects of the changing climate by indigenous peoples in coastal ecosystems are as follows:

- Changes in water level and induced inundations and water logging;
- Increased salinity in ground and surface water and corresponding impacts on soil salinity;
- Increased coastal morphological dynamics (erosion and accretion);
- Increased frequent and severe tropical cyclones, with higher wind speeds and storm surges leading to more damage in the coastal region;
- Sea level rises leading to submergence of low lying coastal areas and saline water intrusion up coastal rivers and into ground water aquifers, reducing fresh water availability and drainage congestion inside coastal holders, which will adversely affect agriculture;
- Warmer and more humid weather, leading to increased prevalence of disease and disease vectors;
- Increased river bank erosion and saline water intrusion in coastal areas are expected to displace many indigenous people who will be forced to migrate;
- Changes in rainfall patterns and in frequency and severity of tropical cyclones and storms likely to happen quickly (and may be happening already with cyclone Sidr in Bangladesh and cyclone Nargis in Myanmar happening within six months of each other).

Due to sea level rises, climate refugees are increasing and they are rehabilitated on indigenous peoples' traditional land. As a result, indigenous peoples are evicted from their own land and deprived of their resources; recognition of indigenous land rights remains a problem in Bangladesh.

In general climate change is likely to adversely affect fresh water and marine fisheries. The spawning of fresh water species, rise in water temperatures in ponds and inland fisheries, and the flow of saline water inland in the south of the country will change the aquatic ecosystem and production of fish in this zone. Turbulent and rough weather along the coast may prevail for longer durations, negatively impacting on the livelihood of fishermen.

The following table shows the major impacts of climate change on various sectors.

**Table 4.** Major climate change impacts on various sectors and health

| Event | Major impacts on various sectors | | |
|---|---|---|---|
| | **Agriculture, forest ecosystem** | **Water resources** | **Health** |
| Increase in temperature | Decreased crop production | Water crisis, decreased quality of water | Increase in heat stroke |
| Heavy rainfall | Soil erosion, damaged crop production due to water logging | Impacts on surface water and ground water quality | Increase in diarrhea and skin diseases |
| Increased drought | Decrease in quality of land and crop production | Water crisis | Increase in malnutrition due to crisis of food security and water, increase in water-related diseases |
| Cyclone and storm surges | Damage in crops and forest. | Hampered collection of water | Increase in illness and water-related diseases |
| Sea level rise | Increased salinization in coastal areas | Decrease in alkalinity due to salinization | Increased risk in human health due to flood |

*Source: Field, Headmen para & Khagrachari sadar area.*

## *Causes of Climate Change*

Climate change is not only a consequence of natural causes but also of human activities such as over consumption of fossil fuels and raising of excessive herds of livestock. The current scientific consensus is that increasing atmospheric concentrations of greenhouse gases (carbon dioxide, methane and chlorofluorocarbons) are causing global warming. The countries that pollute most and contribute hugely to climate change however are not the ones who suffer most from its impacts. For example, the United States' per capita emission level of greenhouse gases is 22 tons while Bangladesh's is a modest 200 kilograms. But there is considerable fear that Bangladesh will go under water in the next few decades as a result of sea level rising from global warming. The rich countries and emerging economies like China pollute enormously, while poor countries like Bangladesh may face extinction, for no fault of their own.

On the community level, most of the respondents remarked that the cause of climate change is the cutting down of forests. No limit is set to cutting of trees, bamboo and other forest resources, which directly or indirectly have adverse impacts on the environment. A major part of CHT is vulnerable to forest degradation and has limitations for use from a biophysical point of view. Forest degradation and soil erosion mean the increased likelihood of landslides and flash floods. Natural disaster, whether aggravated by human activities or not, further impacts both the environment and the population, worsening existing problems of poverty and land ownership. And many initiatives like afforestation and the Kaptai dam, undertaken by government and outsiders, further influence such impacts.

While the indigenous peoples lack education and awareness about climate change, they understand that some changes are happening, which directly affect their economic production and livelihood. For over cutting in hills and degrading the forest, they know the annual rainfall would be reduced, some plant species would be lost (some herbal, mushroom and medi-

cine plants are no longer found) and bodies of water like streams, small rivers, chara would dry up, which are the facts of climate change.

## *CHT Peoples' Measurement of Climate Change*

The indigenous peoples of CHT largely depend on their traditional/indigenous knowledge and experiences, and have their own various indicators to measure how the environment is changing. They observe the migration of birds and behavior of animals like rodents to determine whether the rains would come. However, the ecological indicators such as the flowering of certain plants, the songs of certain birds, or the appearance of certain types of butterflies or other insects are not happening. In this way, they see the changes in climate. Their seasonal cycle has altered, and the plant and animal species they used as traditional food have also disappeared.

They are also experiencing more severe natural disasters. In 2006 the indigenous peoples in Khagrachari suffered a severe flood, which destroyed many houses, displaced thousands of people and damaged acres of crops. They said that they had never before seen such a flood, which lasted 15 days, and that it was a result of climate change.

In 2007 indigenous peoples were again victims of a flash flood, which most of the key informants similarly said was unlike anything they had seen before, and that this was due to climate change.

**Table 5.** Situation of Khagrachari District after 2007 flood

| Village | Total Family | Flood affected | Types of loss | | | | How affected |
|---|---|---|---|---|---|---|---|
| | | | Paddy crops | House | School | Others | |
| Woacrak para | 51 | 47 | 6.80 acres - 6 families | 5 | # 1, std. - 24 | pond, banana garden 10 acres, toilet 6 | snivel, stomach ache |
| Montri para | 40 | 6 | 7 acres - 6 families | | | kitchen garden 3 acres - 6 families, toilet - 4, ringwell - 1, culvert - 1 pond-20 decimals | diarrhea, snivel, fever |
| Passim Amrita para | 50 | 25 | 5 acres - 11 families | 4 | # 1, children - 3 | kitchen garden, 1acre - 3 families, pond - 1 family, toilet - 11 | snivel, fever |
| Pakujjachari | 100 | 10 | 1 acre - 10 families | 10 | | sugar cane garden - 2 acres of 2 families, 4 shops, 5 ponds | |
| Harikunja para | 68 | 43 | 9 acres - 32 families | | | banana garden - 6 acres, 12 families | snivel, fever |
| Amlai Haduk | 30 | 24 | 6 acres - 20 families | | | banana garden - 20 decimals | diarrhea snivel, fever |

*Source: Zabarang Kalyan Samity.*

The impact is also evident in their traditional jum cultivation. According to the Tripura indigenous community of Alutila, Khagrachari, most of the indigenous communities in CHT have been jum cultivators since time immemorial. Done generation after generation, longtime jum is the agricultural method that produces an abundance of crops without the use of chemicals, either fertilizers or pesticides. Food produced from jum is disease free and plants are not attacked by dangerous insects. But at present, such production has decreased and various harmful insects infest jum fields. The indigenous peoples assume this could be an impact of climate change.

For the Santal, Oraong, Munda indigenous communities of North Bengal, intense dew is another manifestation of the effect of climate change: "Massive dew fall now like a spider web, which reacts like toxic acid, affecting agricultural production. Massive dew fall increases severe crop diseases, decreasing production. It's also an example of the impact of climate change."

## *Increased Vulnerabilities*

According to IPCC, vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity and its adaptive capacity.

The CHT has certain geographical and socioeconomic conditions that may aggravate its vulnerability to climate change. Its environment is under pressure due to its geophysical setting. Its hilly landscape is the result of geological uplifting, felting, tilting, folding and dissection of sedimentary rocks dating back to the tertiary period. These tectonics are associated with the uplift of the Himalayan mountains and subsequently, the formation of mountains and of the Assam and Burma Hill, including those in the eastern folded part of Bangladesh.

Population increase is also increasing people's vulnerability. Traditional slash and burn farming system or jum cultivation is becoming unsustainable due to the scarcity of suitable land due to population growth. Along with other factors such as over exploitation of forests and creation of the Kaptai reservoir, it has increased land degradation. This in turn leads to soil erosion, nutrient decline and decreased biodiversity, which may aggravate vulnerabilities of indigenous peoples to impacts of climate change.

The biggest impact that indigenous communities are most vulnerable to is the changing rainfall pattern that is producing drought and heavy rainfall. Both damage and destroy crop production and houses and cause diseases, and consequently, the community's ability to ensure food security.

## Government Policies and Programs on Climate Change

In 2004 the Ministry of Environment established a climate change cell under the UNDP-DFID (Department for International Development) international disaster management programme. A year later, the government undertook a more particular program that directly addresses climate change, It developed the National Adaptation Programme of Action (NAPA) on climate change after extensive consultations with communities across the country, professional groups and other members of civil society. In the aftermath of COP 13 meeting in Bali, Indonesia in 2007, the government increasingly felt the need for a climate change strategy to carry forward and coordinate activities in support of the Bali Action Plan. Subsequently it came up with the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in September 2008. The plan focuses on climate adaptation through making the country more resilient and less vulnerable to natural disasters, but it also includes actions for promoting a low carbon path for social and economic de-

velopment. The BCCSAP is built on six pillars which meld current and future challenges in climate change. In the first five-year period (2009-13), the programme's six pillars and objectives are:

*Food security, social protection and health***:** To ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change and that all programmes focus on the needs for food security, safe housing, employment and access to basic services, including health.

- *Comprehensive disaster management:* To further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities;
- *Infrastructure:* To ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructure (e.g., cyclone shelters and urban drainage) is put in place to deal with the likely impacts of climate change;
- *Research and knowledge management:* To predict the likely scale and timing of climate change impacts on different sectors of the economy and socio-economic groups, to underpin future investment strategies and to ensure that Bangladesh is networked into the latest global thinking on climate change;
- *Mitigation and low carbon development:* To evolve low carbon development options and implement these as the country's economy over the coming decades;
- *Capacity building and institutional development:* To ensure the capacity of government ministries and agencies, civil society and the private sector to meet the challenges of climate change.

The government has designated a national authority and national CDM board and drawn up a national plan for health response to climate change with support from the World Health Organization. It has shown its commitment by allocating US$45

million in its 2008 budget for climate resilient development and for implementation of BCCSAP.

## *Impacts of Government Mitigation Projects on Indigenous Peoples*

Although Bangladesh's contribution to the generation of greenhouse gases is miniscule, it wishes to play its part in reducing emissions now and in the future. The government emphasizes emergency efficiency as well as renewable energy development, particularly solar energy and biogas plants. It is also committed to reducing greenhouse gas emission from agriculture and urban waste management. Currently, the country has two clean development mechanism projects concerned with solar energy and waste management. In recent years in partnership with civil society, it has also implemented a major nationwide programme on social forestry and planned greenbelts as a key adaptation mitigation strategy.

### Social forestry

In Bangladesh monoculture has been carried out under the names of social forestry or community forestry. The government has initiated a mass movement for afforestation, which has already contributed to enhance the country's forest cover. However, this activity is adversely impacting CHT indigenous areas. Social forestry in the hilly areas has created tremendous pressure on the indigenous peoples, as their land rights are ignored and violated. Along with their traditional lands, which are undocumented, they have also been losing their registered lands to social forestry projects. This has led to the displacement and eviction of many indigenous families and increased land-related problems.

It is also putting a stop to jum cultivation, on which the people mainly depend, since it is seen as contributing to forest destruction and soil erosion. Considering this negative image of jum

cultivation, government policy and programs are promoting its replacement and urging the Jumia people to practice alternative land uses.

Moreover, monoculture such as of eucalyptus and rubber is a threat to biodiversity, contributing to the destruction of numerous native species. Under the afforestation strategy, mile after mile of eucalyptus trees are growing in CHT but these are destroying acacia trees. The Eucalyptus trees do not support any wild life, and no plants can grow around them. They are planted because they grow quickly and give the hills the phony look of forests. They have no other purpose than providing firewood. Despite these, the Forest Department still promotes the planting of this foreign tree species. Social forestry projects have hastened the deforestation of CHT and proven to be environmentally and economically unsuccessful.

Another government development program is the establishment of rubber and segun gardens. The CHT Development Board has assisted some groups to go into rubber gardening. But this type of farming is not environment friendly, as it erodes the soil and drives birds away which cannot adjust to this type of environment. Rubber production has also been found not as economically profitable as expected.

At present, segun gardens are very popular both among government and communities. However, the tree does not grow quickly, and other plants can not grow easily around it; further it similarly leads to soil erosion.

Some multinational and foreign companies have also encouraged farmers to cultivate tobacco to earn more profit, providing them cash, loans, seeds, fertilizers and insecticides. The motivated poor farmers take these offers and plant this crop. The huge area of Diginala, Mahalchari union of Khagrachari district is now under tobacco cultivation. Some farmers and civil society groups however have said tobacco plantations decrease soil fertility. Soil fertility loss and erosion are countered by the use of powerful fertilizers and insecticides, which are also harmful to human health. Further, tobacco cultivation indirectly causes forest loss. A large amount of forest wood is used to dry tobacco

after it is harvested. Moreover, it is very hard to cultivate other crops in the succeeding 2-3 years following tobacco cultivation

### Echo park

Another government initiative to mitigate climate change is the establishment of Echo Parks but the selected sites are mostly in indigenous areas. Many minorities like the Mro community have been displaced from their own land by the setting up of such parks.

### Kaptai hydroelectric dam

A past government project that is instructive in the extreme impact it can bring on indigenous peoples' lives is the Kaptai hydroelectric dam. A mega project undertaken with financial and technical support by the Pakistani government in 1957 and completed in 1963, the Kaptai dam has drastically altered the land use pattern, environment, and social and cultural life in CHT. A massive artificial reservoir, the Kaptai Lake of about 1400 sq km was created by damming the Karnafuli River at Kaptai, which inundated a total of 54,000 acres of the most valuable plough land of the Karnafully, Chengi, Kassalong and Maini valleys of CHT. It displaced more than 100,000 indigenous people, which accounted for more than a quarter of CHT's total population then. It not only submerged jum lands but also 180 sq km of reserved forests, the old city of Rangamati and the home of the Chakma Raja (Chakma circle chief).

The government-led displacement of hill, valley and plains people in the CHT region gave rise to intensive resentment among the local populace. The displaced became refugees (Roy, 1998), and many migrated to India. Many were forced to change their livelihood, with a significant number of jum cultivators giving up their traditional farming for horticulture.

## *Government Adaptation Measures*

Bangladesh would be one of the countries that will lose as much as one fourth of its land mass to sea level rise and salinity intrusion would affect more than one-fifth of its population before the end of the century. The government has thus started to intensify coastal afforestation activities, focusing on community based protection and maintenance of protective ecosystem, while at the same time providing alternatives to climate-sensitive livelihood strategies in coastal areas. This is bolstered by building the coping mechanisms of coastal communities under a comprehensive disaster management programme.

Since the 1970s, the government has taken adaptation measures with the support of development partners, and among these are:

- Flood management schemes to raise the agricultural productivity of many low lying rural areas and to protect them from extremely damaging severe floods;
- Flood protection and drainage schemes to safeguard urban areas from rain water and river flooding during the monsoon season;
- Coastal embankment projects, involving over 6,000 km of embankments and polder schemes, designed to raise agricultural productivity in coastal areas by preventing tidal flooding and incursion of saline water;
- Over 2,000 cyclone shelters to provide refuges for communities from storm surges caused by tropical cyclones and 200 shelters from river floods;
- Comprehensive disaster management projects, involving community based programs and early warning systems for floods and cyclones;
- Irrigation schemes to enable farmers to grow a dry season rice crop in areas subject to heavy monsoon flooding and in other parts of the country including drought-prone areas;

- Agricultural research programmes to develop saline, drought and flood adapted high yielding varieties of rice and other crops, based on the traditional varieties evolved over centuries by Bangladeshi farmers;
- Coastal greenbelt projects involving mangrove planting along nearly 9,000 km of the shoreline.

## Indigenous Peoples' Good Practices in Mitigating and Coping with Climate Change

As the indigenous peoples are dependent on a natural resource base that is to a certain extent unstable and unpredictable, they have traditionally adapted to changes in their environment. They actively maintain the ecosystem in which they live in and play an important role in enhancing its resilience. Consciously they have not taken any strategies to mitigate climate change, but they have good resource management practices which serve the purpose, as these indirectly lessen the impacts of climate change.

### *Mitigation Practices*

#### Village Community Forest

Because indigenous communities of CHT have progressively lost access to their forest, they have devised a new method for sustainable use of its resources. The Village Community Forest (VCF) is based on their traditional resource management practice to retain forest cover within the village for long-term use under the leadership of Mouza headmen. The VCF is managed by the villagers, and CHT has now an estimated 110 VCFs that vary in size from 50 to 300 acres.

An example of the VCF practice to mitigate climate change is that of the indigenous peoples of Headmen Para and Monglechan Karbari Para, Kamalchari Mukh in Khagrachari Hill District. The people of these two villages jointly established the VCF system, where different types of trees including bamboo have been planted. They have a common policy in the use of the forest and equally share its benefits.

The VCF of Headmen Para and Monglechan Karbari Para began when Bangladesh was still part of Pakistan. It started with 20 acres which today has increased to 100 acres. The VCF then served as a source to collect bamboo and trees for constructing houses, schools and temples for the villagers as well as to sell in the market. Today it has multi-purposes to respond to climate change. The villagers, now aware and cognizant of their own investment in environmental balance, know that their forest can serve to mitigate climate change in the CHT region. Aside from this, they derive other benefits such as watershed management, biodiversity conservation, source of biomass and decreased soil erosion.

**Controlling soil erosion caused by excessive rainfall**

Agroforestry is presumed to be superior to other cropping systems in protecting vegetative cover and controlling soil erosion. With good management, several types of agroforestry systems or practices have the potential to reduce erosion to acceptable levels. These include multistoried tree gardens**,** planted tree fallow, alley cropping, plantation crop combinations, multipurpose woodlots and reclamation forestry, which are being done in CHT. In all these cases, however, what matters is not simply the presence of trees but the way in which the system has designed a device for erosion control.

## *Adaptation Strategies*

As for adaptation measures, these are diversified, largely depending on the natural resources the indigenous groups use for their livelihood. As earlier mentioned, the livelihood of indigenous peoples in Bangladesh solely depends on land and water based resources and their utilization.

Based on their accumulated experiences, indigenous people have developed detailed knowledge of the ecological adaptability of different species, for example, what kind of niche and micro climate species favor dry or swampy land in open places or in shade and so on. Farmers have developed multistory home gardens that are highly productive and biologically diverse, based on this knowledge.

In CHT the people build their dwelling units on the *chala* (high land), which are surrounded by wide varieties of plantations of crops, vegetables, fruit plants and large trees. The *baid* (low lands) are mostly used for various types of rice and crop production, using rain water or the traditional way by mustered irrigation water.

Bamboo is an important natural resource that shapes their livelihood, culture and religious practices. It is used for watershed management and to reduce soil erosion. Thus the indigenous peoples of CHT take great effort to conserve their bamboo resources, only cutting mature ones during the winter season. Scarcity of water for irrigation, household use and drinking is also a serious concern among them. During the dry season, the situation becomes quite difficult, and they have developed numerous indigenous techniques to hold rainwater and leakage water for farming and household uses. These practices are:

*Godha*: Using earth, bamboo and wood, a cross dam locally called *Godha* is constructed across a system flowing between two hill ranges to store water for irrigation. Water is spilled onto the field by using a bamboo channel.

*Thagalok***:** A spited bamboo pitch called *thagolok* is placed on a gentle sloping in the course of seepage water on rocky hill slopes, and the water is collected in an earthen pitcher called *kum* for household purposes. Vegetation on the upper slope is carefully maintained. The water is quite clean and cool to drink.

*Bamboo container:* Cylindrical bamboo water containers are used to store water for drinking and household purposes. These are usually made from the Neohouzeana dulla species which have well spaced nodes. One bamboo container can help to store one liter of water. From 5-6 such containers are bound together and placed in a bamboo basket called *turong*. In this process, water also remains cool for a long time.

**Soil erosion control and drought management**

In valleys where arable land along stream banks and agriculture fields on hill slopes is particularly vulnerable to landslide and erosion, indigenous peoples have developed various farming techniques and traditional adaptive measures. Common soil conservation practices include raising banana and bamboo plantations, logged barriers and cactus hedging. Many of these traditional practices are scientifically sound and environment friendly.

Indigenous communities, such as the Santal in northern Bangladesh, have also learned to manage drought. Drought occurs on the flood plain during the pre-monsoon period of low rainfall when evaporation losses are high and soil moisture is greatly decreased. As this hampers crop production, farmers

prepare their land early, knowing that young plants need reasonable topsoil moisture level to survive and once established the plant roots can explore the soil for moisture. Crops differ in their demand for water and farmers are aware of those that are more drought-tolerant. For example, a local variety of *brinjel* with thorns on the stem and leaves that allow minimal water loss through transpiration is favored in the dry season. Farmers heap extra soil around the plant stems to reduce evaporative water loss.

**Innovative farming systems**

The villagers of Dil Chand Karbari Para, Dighinala Upazila in Khagrachari district are all jum cultivators who have traditionally met their basic needs from jum land from generation to generation. But now such production has failed to serve the same function due to the climatic variability that contributes to soil degradation, low yields and demand for additional food grains to support the increasing population. Since they have no alternative way to survive, lacking the education or skills for other work, they have developed since 1997 alternative approaches to juming and farming techniques. Under this system, a family cultivates in their jum yearly short-term crops (such as rice, banana, turmeric, ginger, vegetables), 2-5 year lasting crops (such as horticulture) and up to 10-year lasting plants, such as mango, jackfruit, karai, gamari and other woody plants in the same plot at the same time.

Because jum is the main livelihood in CHT, the current, very short fallow periods do now allow farmers to find other lands to cultivate. Thus, the long term cultivation is a good alternative that keeps long fallow period, conserves soil fertility and gives profitable income.

## *Challenges and Opportunities*

How effective are the traditional adaptation activities of indigenous peoples? Throughout history, indigenous peoples have coped with climate variability, drawing on their traditional knowledge and sustainable practices. But this knowledge is being challenged by the intensity and frequency of current climate changes. Their adaptive capacity and resilience are also hampered by poverty, limited resources and lack of access to technology. Other major challenges are the financial crisis and the government's lack of consideration of their basic land rights and needs.

As indigenous peoples have shown, however, sustainable development can reduce vulnerability to climate change by enhancing adaptive capacity and increasing resilience. Supporting indigenous communities in Bangladesh to strengthen these capacities should thus be a high priority in coming decades. It is essential to preserve and promote their traditional adaptation and mitigation activities through documentation, and these should be improved on through new technological development and research. Climate change investment should include indigenous communities to learn from them and build on their traditional knowledge of their local environment.

To promote indigenous peoples' good practices, they should be included and considered in national action plans and public awareness campaigns on climate change. Bangladesh's recently launched climate change action plan and the focus placed by many organizations and donor countries on this issue open opportunities to use and promote the traditional knowledge of indigenous peoples in this field.

## Recommendations

Reliable and systematic climate data would help countries determine their current climate variability and model future changes. The information presented in this paper is quite general and hence not enough for a real understanding of the indigenous peoples' local mitigation and adaptation measures to address climate change in Bangladesh. More research is needed for a comprehensive ethnology of all the indigenous communities of Bangladesh.

To make any plan successful, the total commitment and participation of local communities is absolutely essential. This can only be possible if they are involved not only at the implementation stage but before the policies are formulated and prepared. The following recommendations are thus proposed:

- Conduct more research and identify gaps on climate change;
- Familiarize and sensitize the public on the issue of climate change;
- Lobby and advocacy among policy and decision makers and concerned government departments to consider vulnerable groups in climate change mitigation policies;
- Raise awareness and build capacity and training among indigenous peoples;
- Ensure full and effective participation of indigenous peoples in government and NGO initiatives;
- Incorporate Free, Prior and Informed Consent of indigenous peoples in programs/projects;
- International involvement to build capacity of Bangladesh along with proper guidelines and funds;
- Review mitigation and adaptation strategies to include indigenous peoples and their concerns, as they are not

mentioned in these strategies but are more vulnerable to consequences of climate change.

As Bangladesh, with its existing resources, is not capable enough to address climate change, international involvement is required to build the capacity of local and national institutions to develop mitigation and adaptation measures to respond adequately to climate change and its impacts.

## Endnote

[1] The study had other limitations. Time constraints limited direct field visits, so more consideration was given to literature review and interviews. No available relevant statistical data were found for comparing past and present climate changes especially in CHT area. Village people in CHT lack awareness on climate change. Moreover they did not have the time to give all necessary information because of their own daily livelihood activities, making data gathering difficult. Timely data collection was also constrained by access lack to computer facilities and electricity.

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# Taking the Initiative: The Chin on Climate Change in Burma

by Afia Biak Hta Dim

## Introduction

Burma is a country in Southeast Asia, surrounded by India and Bangladesh in the west, China in the north, Thailand and Laos in the east, and Bengal and Andaman sea in the south.

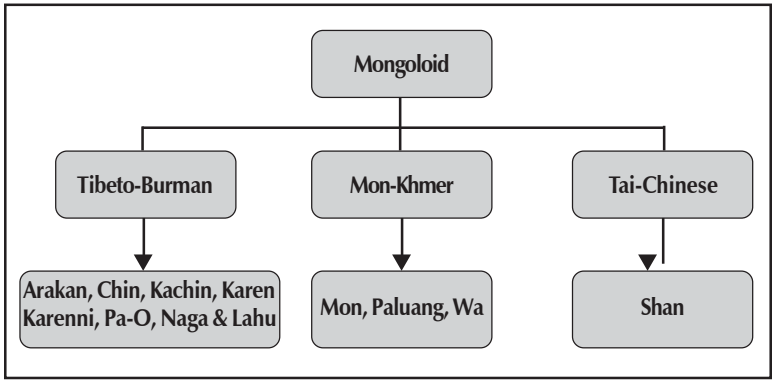
Today's Union of Burma was conceived when in 1937 then British-India was divided into two territories, British-India and British-Burma, in accordance with Burma Act 1935. The indigenous peoples were not traditionally a part of Burma but independent kingdoms before the British invaded Burma, except for Mon and Arakan which had already been occupied by the Burman who represent the dominant society today. Karenni State was recognized as a sovereign country by both British colonizers and the then Burmese King. Burma was born through the Panglong agreement when the British granted independence in 1948. The Panglong agreement is a treaty concluded between the Interim Burmese Government and indigenous leaders from Shan, Kachin and Chin in which they agreed to establish a federal union based on equal status and rights among Burman and indigenous peoples in the country. Later the Karenni state joined the treaty.

**Map No. 1. British Burma**
Before the Second World War



Generally, the indigenous peoples in Burma can be categorized into two groups based on their populations as major and smaller groups. The major groups are Arakan, Chin, Kachin, Karen, Karenni, Mon and Shan. The smaller groups are the Naga, Palaung, Pa-O, Lahu and Wa.

**Ethnolinguistic groups in Burma[1]**




**Ethnolingusitic groups, population and territories[2]**

| State | Peoples | Area | Population | Linguistical group |
|---|---|---|---|---|
| Arakan | Arakan, Chin and Rohingya live in the state | 14,200 sq miles | 2,649,802, Arakan leaders claim over 3 million population of Arakan[3] | Tibeto-Burman |
| Chin | Chin | 13,907 sq miles | 487,361, 99% of the population are Chin. The Chin are also predominantly found in Arakan range in Arakan state, Northern Sagaing and Magwe division. Total population outside the state is estimated at more than 1.3 million. | Tibeto-Burman |

| | | | | |
|---|---|---|---|---|
| Kachin | Kachin, Shan, Chinese and Burman | 34,379 sq miles | 1,254,381, a good number of Shan live in the state among others (Chinese and Burman). A small number of Kachin also reside in northern Shan state. | Tibeto-Burman |
| Karen | Karen and Mon | 11,731 sq miles | 1,347,732, a number of Mon and other groups also live in the state. A good number of Karen people live in Irrawaddy, Tanitharyi, Rangoon divisions and Mon state. The total population is estimated at more than 7 million.[4] | Tibeto-Burman |
| Kareni | Karenni | 4,530 sq miles | 276,693[5] | Tibeto-Burman |
| Mon | Mon, Karen and Burman | 4,748 sq miles | 2,518,152, they are a minority in the state. Only 39% are Mon but the total population of Mon in Burma is about 2 million.[6] | Mon-Khmer |
| Shan | Shan, Wa, Lahu, Pa-O, and Paluang | 60,155 sq miles | Total state population is 4,675,555 in which Pa-O, Paluang, Wa, Lahu and others also are included. But Shan people can be predominantly found in Kachin state. Total population of Shan is estimated at about 7 million. | Tai-Chinese |
| | Wa | NVA | Live in the eastern part of Shan state, and special region of Wa will be created if the constitution is approved. Total population is 838,000.[7] | Mon-Khmer |

| | | | | |
|---|---|---|---|---|
| | Pa-O | NVA | Live in central part of Shan state, Mon state and Tanitharyi division. Region for Pa-O will be created if the constitution is approved. Total population is 56,000 (1993).[8] | Tibeto-Burman |
| | Paluang | NVA | Live in Shan state and special region will be created if the constitution is approved. Total population is about one million. | Mon-Khmer |
| | Lahu | NVA | Live in Shan state and number about 150,000 | Tibeto-Burman |
| Sagiang Division | Naga | NVA | Live in northern tip of Sagiang Division, and Naga region (self-administration) will be created if draft constitution is approved. Total population is 100,380.[9] | Tibeto-Burman |

*Note: The areas do not fully cover the whole territories occupied by indigenous peoples as many of them are integrated into mainland Burman territory.*

Many data are unreliable as the regime tries to exaggerate, understate or hide these to suit its own purposes and agenda. David I. Stenberg states, "Burma or Myanmar is a country in which access is limited, field work generally prohibited, information hoarded, statistics often whimsical, visitors discouraged until recently and data often interpreted and released through myopic and controlled political lenses."[10] Therefore, data in this paper may be wrong, as some of them were taken from state official documents and some are put as approximates, as accurate data are unavailable. The network of military intelligence is very strong in Burma, and everyone feels that he/she is closely monitored so that it is difficult to conduct interviews particularly about government policy.

Burma is one of the most ethnically diverse countries in the world, and this diversity has played a major role in defining the

country's politics, history and demographics. According to Ethnic Nationalities Council (Union of Burma) estimates, 40 per cent of the state population belongs to indigenous peoples and they cover 60 per cent of the territory. Even though they collectively claim as indigenous peoples, they have different cultures, traditions, languages, beliefs and religions, and identities.

This study on climate change and indigenous peoples focused on Hniar Lawm, 10 miles from Haka, the capital of the Chin area. The Chin people in Burma make up approximately 1.2 million, and one-third of them live in the so-called Chin state. The study was done through personal interviews and a review of newspapers, government policies and reports from UN agencies and other institutions.

**Socio-economic situation of indigenous peoples**

Since 1989, transformations from planned/command state economies to open market economic systems have been taking place in former socialist countries. This includes Burma where a military-run dictatorship has adopted its own version of a market economy, with no substantial move to transform the other dimensions of a democratic polity. The State Law and Order Restoration Council (SLORC, which changed its name to State Peace and Development Council [SPDC]) formally abandoned the *Burmese Way to Socialism* in 1990, declaring an "open door market economy of Myanmar," in essence a *Burmese way to capitalism*. No other open policies followed. While slightly opening the door to foreign investment and embracing a stunted creation of a modern developed nation, the regime closes the door to "foreign" ideas such as democracy, transparency and human rights.

Burma's wealth of natural and human resources should be able to sustain the present and future generations of people while maintaining ecological diversity. But Burma, ruled for almost five decades by successive military regimes, is widely considered to be Asia's "principal development disaster."[11] Under a variety of names and guises, the rulers in Burma have focused

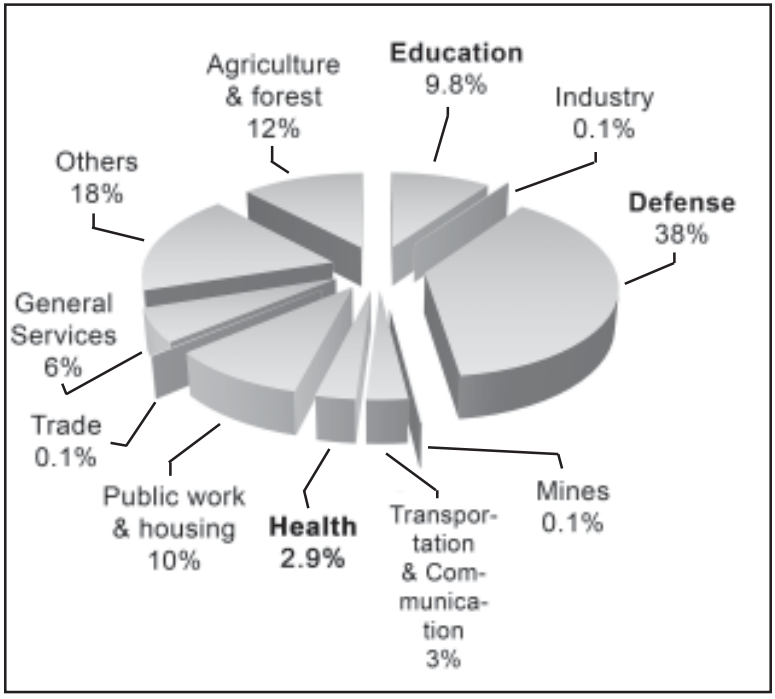
upon the perpetuation and survival of their own military status class. The current military regime claims to be the central institution of the State dedicated to safeguarding the unity and integrity of the nation and creating a "modern developed nation." The reality is that this unelected, illegitimate regime rules by force, creating widespread poverty and committing systemic acts of violence against the people.

The majority of the population depends on agriculture for a livelihood and remains poor. Poverty is more acute in the indigenous peoples (non-Burman)-dominated border areas, which directly results from violations of the freedoms of citizens by the military regime.[12] A United Nations survey (1997) found that 70 per cent of household expenditure in Burma was on food, an indicator of extreme vulnerability of the people. According to UNICEF, in 1994 GDP per head in the country, based on a purchasing power parity basis, was the lowest in Southeast Asia.

The Asian Human Rights Commission (1999) found that food scarcity was a direct consequence of militarization of the nation.[13] By whatever standards of measurement concerning quality of life in Burma, the indigenous peoples suffer through dispossession from land, forced evictions from villages, confiscation of labor and materials including cultivated lands that have been documented in a number of human rights reports. Conspicuous consumption by a small urban elite who benefit from military rule aggravates the widening gap between rich and poor. The military regime has achieved their goal of a large military force at the direct cost to the economic survival of the nation and of the resources and lives of indigenous peoples. Poverty is perpetuated by the demands placed on people by those in power. Army officials, government authorities and local village members of the SPDC exploit their connections for personal gain through bribes, "donations," taxes, and other forms of payment over and above their inadequate salaries. The World Bank shows that the burden of corruption falls disproportionately on the poor. This is greatly evident in the case of indigenous peoples in Burma.

Disproportionate distribution of resources particularly in government expenditure is another reason why the poor become poorer. In the 1999/00 budget year, SPDC spent 38 per cent on defense, 9.8 per cent on education, 2.9 per cent on health, 6 per cent on general service, 10 per cent on public works and housing, and 3 per cent on transportation and communication.

**State expenditure by sector in Burma 1999/00**




*Source: Sein Htay, 2004,* Economic Report on Burma*, Bangkok: FTUB.*

Since 1990, government spending on social sector services has steadily declined. As a result, Burma has one of the lowest levels of public investment in social services in the world.[14] Conversely, she has one of the highest rates of military expenditure, in comparison to health and education spending of any other ASEAN nation. Disproportionately large military spending at the expense of social services and infrastructure remains a

major issue. Published budget figures show that per capita spending on the military is nine times higher than that on health services and twice that on education services. This is another reason that the poor become poorer. And of the budget for health, education and other public services, only a small portion is used for indigenous peoples.

According to calculations based on 1997 and 2001 government household surveys, the proportion of people living under the poverty line increased from 23 per cent to 32 per cent over this period.[15] A UN survey in 2005 set the number at "more than 30 per cent" in the country as a whole, but much higher in Chin state (70%) and Eastern Shan state (52%).[16] It further indicated that, everything else equal, an increase of just 15-20 per cent in food prices would push "well over 50 per cent" of the total population below the poverty line, a prospect that, with continuing high inflation, could soon become reality.

This is manifest in the education and health situation, particular of indigenous peoples. General school enrolment rates for 2002-2003 were 93.1 per cent at primary school level. The percentage of pupils completing primary school during this period was 63.8 per cent, and the average percentage of dropouts was 7.2 per cent.[17] However, a statistical report released by UNESCO in February 2004 stated that only half of children who enter primary school in Burma will reach grade five, indicating a 45 per cent drop out rate. UNICEF figures state that 50 per cent of primary school students drop out before finishing the fourth standard. During the year, attendance rates continued to fall, largely due to the increase in educational fees.[18] Statistics have shown that around 84 per cent of all children who drop out of primary school are from rural areas.[19] In Karen, Karenni and Shan States, for example, the percentage of children attending school is only 10 per cent.[20]

Military universities are the only qualified institutions in the country. The government began establishing these institutes after the 1988 pro-democracy movement as a means of strengthening military power. The government does not disclose information about them; thus, statistics on enrolment and budget

allocation to them are unknown. However, a comparison between civilian and military institutes reveals most government financial assistance goes only to these highly privileged schools and universities.[21] These institutions are only for children of senior officers in the Burmese army and nobody can be promoted beyond major rank if one is indigenous and non-Buddhist.

World Health Organization (WHO) statistics from 1999 showed that Burma has 29.7 physicians, 26.1 nurses, 22.1 midwives and 2.1 dentists per 100,000 people. However, huge disparities in access to health services and information continue to exist as a result of a person's financial status, ethnicity, connection to the military and geographical location. It is particularly difficult to get access to healthcare in border areas where indigenous peoples live, which have only one hospital for every 132,500 people and one rural health center for every 221,000 people.[22]

Burma is under the category of Least Development Countries (LDC) and one of the poorest nations in Asia. According to the Human Development Report, the country ranks 132 among 177 nations on the Human Development Index and has a lower economic growth rate than its neighboring countries. Annual real Gross Domestic Product (GDP) growth per capita was estimated at 3.4 per cent in 2005/6, 3.4 per cent in 2006/7 and 0.9 per cent in 2007/8.[23]

**Climate of changes?**

In the same vein, the indigenous peoples suffer more vulnerability to adverse changes in their environment, in particular the impacts of climate change that the world is currently experiencing, and its consequences, among these food insecurity.

The year 2006 marked the beginning of a new cycle of bamboo flowering, which occurs about every 50 years in Chin State, triggering an explosion in the population of rats and resulting in the destruction of crops. The bamboos bear fruits eaten by the rats. Local people believe that the fruit stimulates the

reproductive system, and the rat can bear more in terms of both the number and frequency of delivery. The fruit is also good for humans who can not have children. Initially, the local people considered that shortage of food is due to rat infestation, but the shortage does not occur only in bamboo forests or rat infested areas but in other places as well.

In Falam in the central part of Chin State, for instance, a joint assessment team from World Food Programme (WFP) and local partners in November 2008 found that the villagers expected no crops to harvest in autumn. Farmers reportedly resorted to collecting edible food from the forest.[24] This area is not covered by bamboo forest and the food shortage was not due to rat infestation.

Subsistence farming is the main economic activity of the Chin people. Shifting or slash-and-burn farming remains the primary method of cultivation for the largely rural communities of Chin State who account for over 90 per cent of the population. The traditional methods of farming require strict adherence to a timetable to maximize their crop productivity. Farmers must cut the trees and burn them before the monsoon season begins in mid-March. The seeds must be planted at a time when they expect the rain to come. Regular attention is given to plant growth, including clearing weeds in time, and the crop must be harvested also at a specific time to avoid over-ripening and rotting.

The majority of Chin people rely on local food production for their subsistence, and for generations their farms have produced sufficient yields to satisfy the food requirement of the people in their State. However, food production has decreased since 1990s, as the farmers can no longer predict the climate or their prediction is no longer accurate like before. Climate changes are leading to wrong timing of farming activities, decreasing crop yields. The food shortage becomes more intense when crops are attacked by rats, birds and insects, some of which were never seen in the areas before. Climate change can be vividly witnessed in its various manifestations in reports of UN agencies and especially by the personal accounts of Chin farmers as discussed below.

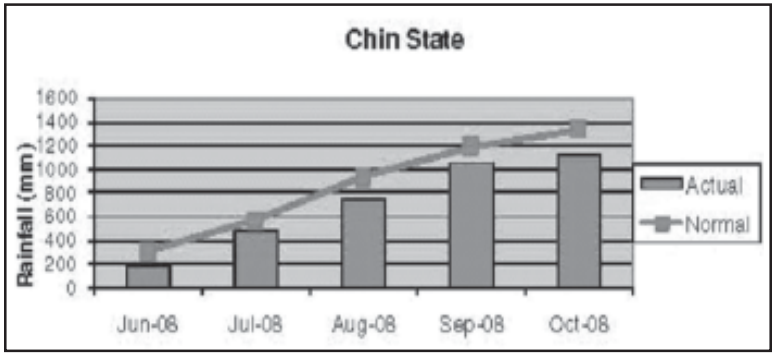
**Map of Chin State**




## Rainfall

According to reports from the Food and Agriculture Organization (FAO) based in Burma, rainfall in Chin State was significantly lower than normal for the 2008 monsoon season compared to other years. Rain is the only source of water in Chin traditional farming system; thus changes in rainfall badly affect farm productivity.

**Accumulated Rainfall of Chin State, 2008**




*Source: Calculated by the Mission based on the data from Myanmar Meteorology Department.*[25]

## Irregularity of timing of rainfall

Timing of rainfall is another important factor that determines production of food in the Chin traditional farming system. A farmer who has had 30 years of farming experience in the traditional way described the importance of the right timing and amount of rainfall to ensure a good harvest and the effects of the changed pattern over the last few years.

> Rain should come within two or three days after we sow the seeds, otherwise they will rot or birds and other insects will eat them. The amount of rainfall should be normal, neither too much or too little; less rainfall means it is not enough for the paddy and higher rainfall is also not good because it will wipe away the seeds as our farms are in the mountain. Rain should be on and off, but the interval should be long throughout the season from sowing the seeds to just before harvesting. During harvesting, rain should stop; otherwise the paddy will be ruined. When rain comes, it should not bring the wind otherwise the paddy will fall, particularly when it is tall. And there should be no wind during the harvesting otherwise farmers will lose their whole wages for the year.
>
> Now, rain is very irregular and difficult to predict like before. Sometimes, rain is too heavy and several days without halt. Sometimes, there is no rain for more then two weeks and the crops do not grow well. The rain brings strong wind which has never happened decades ago, and it badly affects the productivity of our farms.[26]

**Temperature**

Temperature is significantly higher in Chin State. The same farmer noted the greater heat they have been experiencing in their village:

> "I can say that temperature is higher compared to 20 years ago. In winter, water from small creeks froze, and we could see many small creeks near our village. When we were young, we built a campfire to warm up in the winter, particularly in the early morning, but now I don't see people make any campfire, as there is no water frozen in the creeks. We also feel very hot when we work in the field these days."[27]

**Insects and birds**

Villagers said that new species particularly insects can be found in the fields, and they attack the crops. The numbers of birds that destroyed the crops and paddy fields was significantly higher in 2008.[28]

## *Vulnerabilities: Food Security*

Traditionally, Chin people performed rituals and offerings to the gods before they opened the forest for cultivation. They slaughtered animals or chickens, and the priest prayed to the gods for good climate such as rain, sunshine and other natural elements that would be appropriate and right for the crops to yield well. If something went wrong during the period of cultivation, such as no or too much rainfall, strong winds or a cyclone, they assumed as a "curse" because farm productivity totally relied on the climate. If the climate is changed, the impacts can range from shortage of foods to changing livelihoods and way of life.

Due to climate change, the productivity of lands has lowered and farmers need to exploit more lands for cultivation in order to meet their needs. At the same time, the need is higher as the population is increasing. Since the Chin people practice

shifting cultivation, they have shorter cycles of cultivation, and soil fertility decreases, leading to poorer crop yield. In rat infested areas, "some farmers from the villages visited by the CFSAM [Crop and Food Security Assessment Mission] reported that they had lost all of their produce and others mentioned that they harvested only 10 percent of their produce."[29] The UNDP and WFP together with their partner organizations have thus been working to address food shortage in Chin State.

Chin's villages are situated on top of mountains and hills for the purposes of security and hygiene. The availability of water was an important consideration for both humans and animals when the people established the villages. Today many villages suffer inadequate supply of water, as creeks and water fountains have dried up. Waterborne diseases, such as diarrhea, malaria, skin and other diseases are higher than before, even though so-called modern medicines are introduced. Fetching water is another problem that becomes a burden for women and children.

While Burma has accomplished surplus food production at national level, there are food deficit areas, mostly located in the central dry zones, such as Shan and Chin States. Minor assessment has been made on the level of food security at the household level, with the exception of a UNDP study undertaken by a FAO and WFP mission on the Food Insecurity and Vulnerability Information and Mapping System (FIVIMS) programme (UNDP-Myanmar, 2003). The report indicated that of the national total of 324 townships, 52 were classified as being very highly vulnerable and 49 highly vulnerable to food insecurity (62 moderately vulnerable, 122 with relatively low level of vulnerability). Among the 52 very highly vulnerable townships, 29 were located in Shan State. All townships in Chin State and two-thirds of townships in Kachin State were also reported to be highly vulnerable and mostly located in remote areas.

In all 15 households interviewed in Chin State, food consumption was found to be either poor or borderline, worse than any other region visited by the Mission. The diet consists mainly of cereals and vegetables. The Mission noted the absence of a

transportation infrastructure, poor hygiene conditions, lack of potable water supplies, lack of improved sanitation, and heard reports of deaths from preventable diseases such as diarrhea. Mission observations were supported by findings of the Integrated Household Living Conditions Survey (UNDP 2007). Chin had the highest percentage of expenditure on food as a proportion of total household expenditure (UNDP 2007), which is 75 per cent of total income.[30]

Many of the villagers in Falam who experienced food shortage in 2008 were reported to be migrating to border areas in India, placing an additional pressure on the precarious economic condition on the other side of the border.[31]

In fact, the aforesaid shortage of foods and vulnerability are just the tip of the problem faced by Chin people. They are migrating not only to India but also to Malaysia and other countries. There are more than 80,000 Chins in India, 40,000 in Malaysia and 20,000 in other countries. Internal migration from Chin State to other provinces in Burma is higher than migration to other countries in search of employment and survival.

## *Cultural Impacts*

The changes are also manifested in the cultural life of the people. The Chin used to celebrate the harvest festival, which is called by different names in different places. They would bring their newly harvested rice and vegetables, slaughter pigs, drink rice beer and wine, sing and dance the whole day till late at night. Such celebrations cannot be organized today, since they have no harvest or only a small one.

Traditionally, those who had an abundant harvest gave a feast for the whole village, and in some cases invited other villagers from other places. There were many kinds of feasts that lasted up to one week depending on the feast. For example, the feast of Khuang Cawi lasts for one week and invited to participate are not only the villagers but also those of other villages

as well as relatives near or far. They had to prepare for more than three years for this kind of feast, which means they had to harvest adequately for three or more consecutive years. These feasts are a way of sharing their wealth with other villagers, and the society gives high social regard in return. No such feast has been celebrated since a decade ago because abundant harvests are no longer possible.

## National Policy on Climate Change

Burma is one of Asia's naturally rich countries. Its diverse ecosystem ranges from the Himalayas to the tropical reefs along the Bay of Bengal. Fertile agricultural lowlands once made Burma a leading rice exporter. Its fishing grounds were among the world's most bountiful. Its immense native rain forests, some of the last remaining in all of Asia, are home to numerous endangered plants and animals. Ruled by a xenophobic military junta since 1962, Burma missed the wave of development that brought new prosperity to its Southeast Asian neighbours, but which also scarred their environments through unregulated development. Since the 1980s, the junta has appeared intent on catching up on both counts. The junta's rush to acquire hard currency allows Thai and Chinese loggers to quickly cut down broad swaths of rainforest. The massive deforestation is causing serious problems of erosion, flood and landslides.

In the 62nd session of United Nations General Assembly in December 2008, the Minister of Foreign Affairs who headed the Burma delegation said,

> "The High-Level Event on Climate Change has re-ignited the international community's interest in climate change and rightly so. Climate change remains the most critical challenge that the international community faces today. The adverse effects of climate change, such as sea-level rise, hurricanes, floods, drought and desertification, particularly in recent years, are a stark reminder of the negative impacts that they have on long-

term economic and social development of the global community, particularly, the developing countries.

To address the adverse impact of climate change, we need concerted action at the national, regional and international level. We need to be mindful that climate change is not merely an environmental issue but a sustainable development issue. Accordingly, an integrated and coordinated approach is required. On its part, Myanmar is pursuing a national environment policy, based on sustainable utilization of natural resources. In 1991 we adopted the Myanmar Agenda 21 which serves as an important guideline, both for the public and private sectors. Myanmar also pursues a system of sustainable forest management. We have implemented a nation-wide programme of afforestation and reforestation. As a result, we have been able to retain 50 percent forest cover in the country. Myanmar was among the 12 nations that took part in the Asia Least-Cost Greenhouse Gas Abatement Strategy—ALGAS—in cooperation with the Asian Development Bank (ADB). The inventory of greenhouse gas emissions taken under ALGAS confirms that Myanmar has greater sink than sources of CO2 emission. The base line projection of the National Greenhouse Inventory 2020 also shows that the forestry sector will continue to be a significant sink in Myanmar in the future."[32]

In fact, environmental law in Burma under the current military regime is very weak. One of the main problems is that no up-to-date laws have been passed that regulate pollution. There are also no regulations for environmental impact assessments to examine the harmful effects of projects. Reasonably effective environmental laws were enacted under the British, but the democratic period from 1948 to 1962 did not improve these laws. After 1962, the military junta repealed and replaced the British laws. The current legislation is too general and has never significantly provided for the protection of the environment. Unfortunately, the Burmese junta shows little concern for the environment. A related problem is that environmental issues are not known, poorly understood or misunderstood in Burma (for example, there are no words in Burmese for "conservation" or "preservation").[33] Many people do not yet see the country's environmental problems as very serious. Even among

educated Burmese, knowledge about environmental problems is scarce and incomplete.

Burma is a party to a number of international treaties which concern the environment. Some international treaties require that the country signatories must take specific actions. But this is not the case with most of the environment treaties Burma has signed, as these are not very strong and do not require Burma to do anything. By signing the treaties, the junta hopes to get international recognition as a government that cares about the environment. The treaties also often provide opportunities for funding and technical assistance for the developing countries that sign them.

Burma has signed several major international environment treaties, including the following conventions:

1. Convention on Biological Diversity;
2. UN Framework Convention for Climate Change;
3. Vienna Convention for Protection of the Ozone Layer;
4. Convention on International Trade in Endangered Species of Wild Flora and Fauna;
5. International Convention for the Prevention of Pollution by Ship;
6. International Timber Agreement;
7. World Heritage Convention.

The current environmental laws in Burma are often sectoral laws, which greatly increase their ineffectiveness. The laws created by the military junta are administered and enforced by different ministries, which means that the responsibility of protecting the environment is divided among many agencies that do not work together. Examples are the Forest Law of 1992, administered by the Forest Department, and the Myanmar Mines Law of 1994, administered by the Ministry of Mines. Typically, these laws are concerned mainly with licensing industries and may only vaguely refer to environmental protection.

Even when the laws do address the environment, they do so in a very general way. For example, the New Constitution

which was adopted in May, 2008 with all opposition rejected, stipulates in its basic principles that "the State shall protect the environment." General rules like this are difficult to enforce. There can be no substitute for concrete legal regulations and remedies, which the junta has promised but failed to implement. In addition, it is unclear whether or not the environmental parts of the laws are actually enforced. No independent agency in Burma has the power to ensure that environmental laws are enforced, so it is completely up to each ministry to decide how much trouble they will take over environmental protection. Since the main purpose of most of the ministries is to promote the industries under their charge, it is unlikely that they are concerned about the environment.

Another weakness in enforcement of these laws is the National Commission for Environmental Affairs (NCEA). Formed in 1990, it is chaired by the Minister of Foreign Affairs, another sign that the Burmese military junta views the environment as a tool to win international support rather than a real concern.

The military junta issued an environment policy in 1994 and has been working with the United Nations on a national action plan for the environment. This plan is no more than a façade that makes the junta look like an environmentally concerned government.

The Environment Policy is a one-paragraph statement, which proclaims the government's commitment to the principle of sustainable development. It says,

> "To establish sound environment policies, utilization of water, land, forests, mineral, marine resources and other natural resources in order to conserve the environment and prevent its degradation, the Government of the Union of Myanmar hereby adopts the following policy. The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar's Environment Policy is aimed at achieving harmony and balance between these, through the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental poli-

> cies, but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking development."[34]

In the same UN address, the Minister of Foreign Affairs also mentioned sustainable forest management as a part of addressing climate change. But the country's forest laws and rules are for protection of timber particularly teak trees rather than the environment. The Forest Law (SLORC Law No. 8/92), promulgated on 3 November 1992, is "to implement the forestry policy of the Government…[and] to develop the economy of the State" (section 3(a)), which means that it protects the timber industry instead of the forest. The law consists of 13 chapters, of which seven are concerned with licensing industries, and the extraction of forest products.

Chapter 2 (Basic Principles) is the only part which vaguely mentions international agreements relating to conservation of forests and environment. Wherever "reserved trees" are mentioned, the law means teak trees belonging to the State. Article 43(a) says that "Whoever fells, cuts, girdles, marks, lops, taps, injures by fire or otherwise any teak tree…or moves or keeps in possession unlawfully any teak timber without a permit shall be punished with fine which may extend to 50,000 kyats, or with imprisonment for a term which may extend to 7 years, or with both." However the Minister of Forestry and the Director-General of the Forest Department may reduce, waive or exempt from payment any due fine or royalty.

Article 58 further says, "The Forest Act of 1902 is hereby repealed." However, article 55 states, "The reserved forests existing under the Forest Act of 1902 shall be deemed to be reserved forests constituted under this Law." And under article 57(b), the Minister and the Director-General may issue their own orders, directives and notifications "as may be necessary." Although SPDC published a booklet with new "forest rules and regulations" in 1998, this merely provides extracts from the

Forest Law without any better regulations concerning forest protection.

In theory, the military-run State Timber Corporation (STC) controls all of Burma's timber exports. But for two reasons it is unlikely that the military will be instrumental in protecting forests. First, timber is the second largest money-maker for the junta. On paper, Burma extracts about one million cubic meters of teak logs per year with state-owned or contracted operations. But independent environmental protection organizations estimate that this must be at least three times as much. For example, from 1989 to 1992, SLORC issued licenses to 60 Thai logging companies.

Second, the armed groups who forged a ceasefire arrangement with SPDC got logging concessions, including machinery and milling equipment. The Chinese businesses work together with the armed groups, bringing in lumberjacks and trucks, and cutting down forests. The Chinese have never done any business with STC but only with local military authorities and the armed groups. In 1997, Yunnan-based environmentalists reported that Chinese loggers had cleared 35 miles into Burma. In 2008 logging had moved 60 miles inside Burma.[35]

Many are proud to have rich natural resources. But sometimes it is a curse rather than a blessing. In Burma, teak forests are found in indigenous peoples' territories, but the teak does not belong to them but to the State. And as earlier cited, the State gives logging concessions to private business, and the indigenous peoples get the impacts of deforestation, flood, landslide and drought. In fact, the forest law is a curse for the indigenous peoples.

## *Jatropha Cultivation by Decree*

It is a surprise that the Minister of Foreign Affairs did not mention the plantations of jatropha in Burma when he pre-

sented the regime's initiative on climate change in the UN General Assembly's 62nd session. The recent rise in oil prices, diminishing fossil fuel reserves and concerns about greenhouse gas emissions impacting on the climate have all spurred a growing biofuel industry. This situation is not exceptional in Burma.

In an upcountry tour on December 15, 2005, Senior General Than Shwe, Burmese army supreme commander and head of the state's ruling SPDC, told a meeting of the country's leaders that all "States and Divisions are to put 500,000 acres under the physic nut plants (Jatropha) each within three years, totaling seven million acres during the period." His speech was broadcast on state television.[36] Since that time, the Ministry of Agriculture and Irrigation has said that the cultivated area would extend up to 8 million acres.[37]

The undifferentiated allocation of 500,000 acres in each state and division does not take into consideration the total area available, the population, or the climate and soil condition of each area. This invariably puts the smaller and less populated states and divisions at a disadvantage and poses huge questions about the wisdom of the campaign. In Chin State, in order to meet the quotas under the General's plan, every man, woman and child would have to plant more than 1.25 acres, since the population of the State is less than 400,000.

The words of the Senior General set off directives urging every citizen to take up jatropha planting as a "national duty." The state-run newspaper *The New Light of Myanmar* bannered it on its front page: "All People, Locals to carry out growing physic nut as national duty."[38]

All civil servants were instructed to plant jatropha at government offices, schools and hospitals. Village and township plantations were initiated as massive "greening" projects along highways and roads. House gardens, churchyards, monastery compounds and cemeteries were not spared from jatropha, as it was to be planted "in all empty spaces."[39]

## *Jatropha Plantations: Production of Biofuel?*

According to SPDC's official statements, the purpose of establishing jatropha plantations is to produce biodiesel as a fuel substitute. On January 16, 2006, Minister of Industry-1 Colonel U Aung Thaung said in a speech that cultivation of the physic nut and production of biodiesel was the only way out of the oil crisis gripping Burma.[40] The ruling military junta stated that it wanted to decrease its dependence and spending of millions in foreign exchange on the more than 200 million gallons of oil it was importing annually.[41] State-run media also eulogized the virtue of jatropha as a way to "narrow the development gap between the states and plains as well as urban and rural areas" and for farmers to gain extra income and to contribute to the "greening" of the country.

However, some people noted other motives behind the nationwide cultivation of jatropha; they believed this was done to avoid social unrest, to sustain the military regime and to lure foreign investment. Many claimed that it was to counter or remove a bad omen. Many Burmese believe that when a bad omen or prophecy appears, one can avoid misfortune by performing any number of rituals or spells called *Yadaya*. One of these is the *get gin nyay* or the utilization of a diametrically opposed name according to astrological significance. In Burmese the physic nut is known as *jet suu,* which in astrological terms can denote Monday-Tuesday, while democracy leader Aung San Suu Kyi's name can mean Tuesday-Monday. Therefore the act of planting *jet suu* qualifies as a *get gin nyay* to neutralize Suu Kyi's power.[42] Jet suu also means "noisy chicken" in Burmese, which is reminiscent of the Burmese proverb, "jet suu, luu ma suu", which translates as "when chicken makes noise, people will not." Accordingly, the mass cultivation of jatropha will, through inexplicable astrological influence, silence the people and quell political opposition.[43]

## *Failed Project*

Jatropha was grown throughout 2006 and 2007 across the country and yet reports from the field indicate a wide variance (25-75%) of success rates. According to the Chin State Agriculture department report released on 30 November, 2008,[44] the State had planted jatropha in 187,539 acres of the target 310,000 acres from 2006-2008. Of these, 76,796 acres of jatropha trees survived, but the harvest yielded only 685 baskets of seeds from 377 acres in the entire three years. The information on survival rate may even be exaggerated but the same cannot be done for the production because the leaders would be urged to send the seeds to the refinery.

A number of factors led to the failure of the jatropha project, and the most significant are the following:

### Lack of knowledge and haphazard techniques

The mass planting of jatropha is being implemented without appropriate field surveys, techniques, or estimation of outcomes. In order to reduce costs, people are forced to buy the seeds and grow the plants with free volunteer labor. Although there is plenty of hype and promotion of jatropha, practical knowledge and growing techniques are lacking, as well as sufficient fertilizer or seeds. Due to lack of incentive, the project is being implemented quickly and haphazardly simply to avoid punishment and comply with orders, not to ensure success. As one farmer said, "We just plant the tree because they order so, we don't care if it succeeds or not, but we like to avoid punishment."

### Ignoring local growing condition

The indiscriminate planting of jatropha, regardless of climate and soil conditions, has led to failure of the project. While some parts of Burma are ideal for cultivating the nut, the envi-

ronment in Chin State is far from suitable. According to the Centre for Jatropha Promotion and Biodiesel, the optimal annual rainfall for its cultivation ranges from 300 to 1,000 mm. However, rainfall in Chin State is more than 3,500 mm from June to October in 2008 even though it is significantly lower than normal. Rainfall in the months of September and October exceed optimal annual rainfall for cultivation of jatropha.

**Just for show**

Village and township authorities are forcing residents, civil servants including teachers and nurses, and students to plant jatropha along main roads and highways, at the entrance to villages, post offices, schools, hospitals and departmental offices to fulfill the General's call to national duty. But as one resident said, "They are just growing to show when the authorities pass by."

**Uncertain market**

Although the regime boasts of jatropha as an income generating source for farmers, villagers do not know where and if they will be able to sell the fruit, to whom and at what price. Chin State has no refinery factory or a sale centre for jatropha. Even if it had these facilities, these may not be enough incentive for farmers to grow jatropha because infrastructure in the State is very poor and it is very difficult to transport goods to the market.

## *Impacts of Jatropha Project on Indigenous Peoples*

Soon after initiating the jatropha project, complaints began to emerge from across the country of forced labor in planting, land confiscation by the Burmese army and local authorities, deforestation, loss of income due to forced purchase of seeds or seedlings, and punishment for non-participation or fine for not meeting the target. Threats to security from the implementation of the campaign and migration due to the hardship caused by forced planting ensued.

### Forced labor

Villagers from all over Burma are forced to contribute voluntary labor to jatropha plantations and highways on a one person-per-household basis. They must bring their own food and tools for the day and face reprisal if they refuse. If they are unable to go, they often have to pay someone else to replace them, but the local authority pockets the money instead of hiring someone to work. The payment usually ranges from 1500-2000 *kyats* based on the local daily labor rate. *

While forced labor is not limited to Chin State, it is worse there than in other provinces as its terrain is steep, requiring more work in cultivation. All activities from clearing the forest to growing seeds/seedlings are done manually. It is difficult to measure how much forced labor has gone into the project, but it would require more than 20 million manpower to fully implement the project in Chin State alone.[45] In some cases, prisoners also participate in the planting of jatropha.

### Land confiscation

The laws in Burma do not allow for outright private ownership of land, and rights to land are contingent on whether the land is being used productively as interpreted by the State in accordance with the 1953 Agriculture Land Nationalization Law

and the 1963 Tenancy Law that empower the state to stipulate what crops villagers grow. Non-compliance with this and other conditions set by the Village and Township Peace and Development Council can result in the authorities confiscating land.[46] Reports of land confiscation for conversion into jatropha plantations or as punishment for not planting jatropha have been documented across Chin State since 2006. There is lack of recognition of land rights, particularly for traditionally owned individual and communal lands which have been confiscated for the purpose of planting jatropha.

**Deforestation**

Initially, jatropha cultivation was implemented in empty lands not used for any other cultivation. However, the available empty lands were not enough to meet the target so that the authorities opened forests to grow jatropha. Farmers are allowed to grow paddy or other crops in these areas for the first year and for the rest, the local authorities use them for planting jatropha. In order to show favor with the higher authorities, in some cases local authorities open community-conserved forests, which have been preserved and conserved since the villages were established. This has affected the environment, particularly water resources, and this has led to scarcity of water for both domestic and irrigation purposes.

**Wasted money and lost income**

Further, people are forced not only to give labor but also to buy seeds, seedlings and branches of jatropha, chipping at their household income. Jatropha is sold by seedling, branch or by packet, tin, basket or kilogram of seeds. In some cases, villagers were forced to find wild seeds, sow them in a nursery, and then buy back the seedlings they themselves had nurtured. In some villages, people are forced to purchase an instruction manual on how to properly plant the trees, and it is written in Burmese which the majority of the villagers cannot read. The plants and seeds are not priced the same in towns and villages, as the pric-

ing depends on the distance and mode of transportation. A young plant costs 38-40 kyats in towns and 150 kyats in villages.[47] If the project is fully implemented, it will cost at least six billion kyats or US$6 million in Chin State alone, and this is just for purchasing seedlings. In addition, fines are imposed for the following: refusing to plant, not appearing at work when ordered to, if the plants die, and if animals are deemed to have encroached into the plantation.

**Dysfunctional social service system**

As has been earlier discussed, the regime's failure to adequately fund public services has led to a serious deterioration of the country's health and education systems. But even as schools and public health facilities, particularly in rural areas, are insufficient, understaffed and poorly supplied, SPDC is also forcing teachers and medical workers to plant and maintain jatropha at all state-run schools and hospitals. A nurse in Kachin State complained, "Every hospital employee is required to plant *jet suu*. We were out pulling weeds the whole day. Each of us is supposed to plant 500 seedlings, but no one can grow that many."[48]

Since 2006, government servants including teachers in Chin and Kachin States have to cultivate one acre per person. The students also help fill the quota set for the school compound. The authorities come to check and take photographs.[49] This is an additional burden, as an average primary teacher makes just 22,000 kyats ($17) per month; and a middle school teacher, $23 per month. Teachers solely paid by the State may not teach for the entire term but show up sporadically.[50]

**Food security**

"Caster oil plantation will take up all the time and there will be no time left for other work needed to be done for subsistence."[51]

The implementation of the jatropha campaign in Burma is threatening the food security of farmers and worsening that in

Chin State. First, jatropha is being cultivated on existing farm lands and in house gardens, directly competing with food crops in terms of soil and water resources. Second, the Chin people practice shifting cultivation, and land confiscation for jatropha planting is leading to shorter cycles of cultivation and thus, poorer soil fertility and poor crop yields. Third, since farmers need to contribute their labor in the jatropha plantation, they have less time to tend their own crops. Some also have reported that other crops grown too close to jatropha do not grow well.[52]

**Forced migration**

The hardship of forced labor, land confiscation, loss of income, food security, and fear of punishment caused by the jatropha campaign is taking its toll on the people, and patterns of migration are beginning to occur.

Considering its impacts, United Nations agencies in Burma have expressed reservations about the SPDC's jatropha program. A Rangoon-based UN official raised "concern over the impact on rural dwellers' already precarious food security and that the biggest weakness is the way it (the project) is being undertaken." He further said, "a lot of latitude is being given to the military to deploy for jatropha production, with little understanding of its impact in other areas such as basic community food security." The Food and Agriculture Organization, which conducted a quick assessment of Burma's jatropha program, on the other hand, urged the government to study the suitability of the plant for Burma's diverse agri-environments.[53] These concerns echo statements by FAO and WPF about how global production of biofuels is one of the factors contributing to raising global food prices.[54]

### *Tea Plantation: Chin State as Tea State?*

Apart from jatropha plantations, the Chin people suffer from another development project called tea plantation started in early 1999. In 1998, the second chief of the Burmese military junta General Maung Aye in a visit declared that Chin State will become a tea state. In pursuit of his order, the State's agriculture department kicked off a tea plantation campaign in 1999 and according to the 2008-29 budget year report, total tea plantation areas total 19,433 acres, and of these, trees in 9,977 acres have survived. So far, tea harvesting has started on 2,469 acres, and total tea leaf (dry) production in 2008 was 133,614 visses (viss, Burmese measurement of weight, with one viss equal to 1.35 kilograms).[55]

Even though this report must be inflated, it indicates that less than 45 per cent of the trees have survived and a mere over 10 per cent of total cultivated areas has been harvested after 10 years of the project. Its impacts are identical with the jatropha campaign, since both projects are forcibly imposed by the SPDC. In contrast with the State's report, a villager said, "We don't use tea tree for anything except for making soup from the young shoots."[56]

## Indigenous Peoples' Initiatives: Climate Change Adaptation and Mitigation

Since 1962, Burma has been under a military regime, and it is regretful but true that the Chin people have never expected the government to help them solve their problems. They think more of the government as the source of problems rather than one that works for its citizens. They prefer to tackle their problems by themselves, without intervention from government. And this is the case with climate change wherein the Chin people have taken a number of initiatives on mitigation as well as adaptation on their own.

## *Kitchen with New Stove: Multi-pronged Strategy*

In Burma, only the upper middle class can afford to use either electricity or gas for cooking. Till today, firewood is used for cooking by more than 80 per cent of the population. In Chin State, only the rich who comprise less than five per cent of the State population can afford to use gas for cooking. The rest or more than 95 per cent still depend on firewood to cook their daily meals and for other uses.

The traditional stove used by the Chin is triangle-shaped with three stone pillars set up on a corner of the kitchen. Firewood is used, and the heat goes to different directions and emits smoke inside the house as the kitchen does not have a chimney. Finding firewood was not a problem when the village was small and had a low population, but when it became a town and the population grew, its collection became a burden, prompting people to think up of ways to reduce wood consumption. Since 20 years ago, the Chin particularly in urban areas have started to build and use a stove made of iron with mud and cow dung as plaster. Today the stove is not only used in urban but also in the rural areas.

Using the iron stove has led to the following:

### Reduction of firewood

The heat goes directly and only to the pots, hastening cooking and thus saving on consumption of firewood. The stove can hold 2-3 pots at a time, depending on the number of holes made. Firewood consumption is twice lower than in the old typical stove. It saves thousands of tons of firewood, since every household uses it for cooking. This means decreased emission of carbon by lesser direct burning of wood and diminishing number of trees felled for firewood. Wood also lasts longer because of less oxygen in the iron stove. And it helps to keep meals warm longer, which the Chin people like, because the mud controls the heat.



*New cooking stove used by the Chin people.*

**Hygiene**

The stove acts as a chimney as well, drawing in the smoke instead of it dwelling in the kitchen. The fire and smoke hit only the bottom part of the pot, making cleaning of pots, utensils and the house in general easier. The iron stove not only promotes health but also saves time on cleaning chores.

**Fire safety**

In many cases, a house fire usually started from the kitchen because the old stove did not have walls to prevent a fire from spreading to other areas of the house if a wind blew in. But the new stove is built to prevent such.

## *Micro-hydroelectricity: Renewable energy*

Electricity is provided only in towns in Chin State and the power is generated from diesel engines except a few towns where the power is supplied from hydropower plants built by the government. In the villages, people use pinewood or bamboo for lighting, while others who can afford it use a lantern. Burning pinewood or bamboo is unhygienic, inconvenient and hazardous to fire safety. Therefore, the Chin people started to look for alternatives to replace pine torches or lanterns.

Many waterfalls that can be used to generate electricity are found in Chin State. Since 1990s, many villages started to build mini-hydro power plants from rivers near their villages. Hniarlawn village, where the case study was conducted, started the construction of a mini-hydro power plant in June 2006 and was scheduled for completion in 2009. The project was initiated by the community themselves and funded from their own contributions with an additional $5,000 from Ausaid. The power plant can produce 15 KW, enough for the power needs of 170 households. Since the power plant was built by the community, the benefits would also completely redound to them.

## *Revitalizing YMCA as Environmental Guard*

In Burma, it is almost impossible to establish a new social organization if it is not to support the military regime. If an organization is not registered, many restrictions and limitations are imposed on its activities, as every member's movements are closely watched by army intelligence. The Young Men Christian Association (YMCA) thus registered officially to do awareness campaigns on environmental issues.

Many villages in Chin State organize themselves for environmental conservation and preservation under YMCA, and the youth take the leadership but there is no restriction on age, sex, race and religion for membership. The YMCA develops guidelines, rules and regulations to conserve and preserve the envi-

ronment that serve as the village by-laws. They themselves develop these by-laws, which are abided by strictly by every member of the community. The by-laws contain:

(i) How to collect forest product—for example the law allows a person to take the fruit but not to cut the tree;

(ii) Restriction on certain means of fishing, such as use of gelatin, dynamo, chemicals as well as of catching fish in certain areas;

(iii) Total prohibition of wild fire, preventive measures against it, means of cooperation with other villages if it occurs on village boundaries as well as penalties for those who commit arson;

(iv) Scheduling of hunting season/time.

## *Slope Agriculture Land Technology*

The Chin people practice a rotational farming system in which they clear land for cultivation, cutting trees and drying and burning them, after which they grow crops. Farmers use the land for only one year and then move to another plot. Due to land confiscation, available land is getting smaller; at the same more land is required for cultivation to meet the needs of an increasing population. These shorten the cycle of cultivation, reducing productivity.

In order to address this problem, the Christian Association for Rural Development (CARD), a religious-based organization initiated by the Chin people, introduced a new technology of cultivation called Slope Agriculture Land Technology (SALT) Under this new land use technology, the people use multi-crop cultivation which can be harvested through many years, such as lemon, orange, apple and other crops. Land is also developed for cultivation of paddy that can be used over a long term. However, resources are limited such that the organization cannot expand, as the demand is high. This land use technology is

not only for production of food but also for reducing greenhouse gas emission.

## *Wet Paddy Cultivation*

Since shifting cultivation is not enough to meet the food demand, the farmers are also using a new technology of cultivation—wet paddy cultivation. Today, GRET, an international NGO working in Burma, provides financial and technical assistance to farmers on this type of cultivation. The UNDP also provides assistance in some areas.

## *Construction of Road*

A farmer from eastern Burma justifies the reason why he grows opium as follows:

> "When I bring a basket of orange to market, it brings a few kilograms of rice; if I bring the same amount of opium, it can make tons of rice and I don't need to worry that it will spoil even I keep it for days, not like orange. Since there is no road from my village to the market, I have to carry them on my back, and opium is lighter to carry."

Farmers know that their life will be easier if they grow multiple crops in their fields, but it is difficult to sell these because the infrastructure is very poor. In some cases, the only way to carry their products to the market is on their backs. Thus many farmers stick to growing what they need rather than crops that can be more productive for them. Many villages build roads that can be used at least in the summer to have access to the market. This is an incentive for farmers to grow multiple crops in their fields. The Country Agent for Rural Development, another faith-based NGO working in Burma that provides finan-

cial assistances for road construction, planned to build 72 miles of road access from the village to the main road in 2009.[57]

## Conclusion

Various governments are undertaking different measures for mitigation and adaptation to the vulnerabilities to and impacts of climate change being felt all over the world. Indigenous peoples in different countries also take initiatives, which are appropriate to their prevailing situations. Many governments however ignore these initiatives and impose their own, which leads to more vulnerabilities and negative impacts, and in some cases worsens the situation. Therefore, it is imperative for States to abide by the principles of rights-based approaches in addressing climate change impacts.

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# Understanding Interactions between Global Climate Change and Traditional Lifestyle Initiatives of the Bidayuh-Jagoi in Malaysia

by Jennifer Theresa Rubis
Building Initatives in Indigenous Heritage (BIIH),
Indigenous Peoples Network of Malaysia (JOAS) Working Group on Climate Change, Malaysia

> *It's simple really. The gods are angry at us for destroying the forest.*
>
> *- Villager, on the reasons for bad weather*

## Introduction

In the discourse that arises from the issue of indigenous peoples and climate change, the theme usually revolves around how these communities will be most adversely affected by climate changes, and how they are counted among the most vulnerable.

While this is not a wrong supposition, it tends to be based on the premise that it is the lack of cash and modern sophistication that renders lack of resilience. The cause of indigenous peoples' precarious state of affairs vis a vis surviving climate change is based not on their lack of capacity or particular lifestyles but on the very same modern day values and principles that are the causes of climate change. When this is understood, then it is clear why the participation of indigenous peoples in the climate debates and dialogues is so necessary.

Indigenous peoples are on the frontlines of climate change. They live close to the physical environment and have formed a complex set of relationships with nature, evolving out of necessity a sensitivity to changes in the landscape.

Indigenous peoples carry a wealth of historical data carried through the generations by oral tradition. This information is not easily found on paper or in libraries—the entire repository of wisdom resides primarily in stories. Nicholas (2006) asserts that "Indigenous peoples are descendants of the earliest inhabitants of a specific ecological niche—their traditional or customary lands—in which they continue to live as distinct communities." In the evolution of the set of strategies necessary to manage and exist in that niche, indigenous peoples have amassed a wealth of knowledge that should be understood not just by scientists seeking to mitigate anthropogenic global warming but by policy makers who must assure the continued future of our species.

Indigenous peoples do not need to be told that the environment is changing. But they do need to have their voices heard.

This case study, based primarily on a Jagoi village in Sarawak, seeks to understand two things, first potential impacts of and reactions to climate change among the indigenous peoples of the tropical rainforests of Malaysia, and second to present the interactions that link global climate change, local environmental changes and the lives of indigenous peoples.

## *Situational Context*

### Malaysia

Malaysia is situated in Southeast Asia and consists of two regions separated by the South China Sea. The first, Peninsular Malaysia is located between Thailand to the north and Singapore to the south. The second region consists of the states of Sabah and Sarawak on Borneo, the world's third largest island.

Malaysia is an equatorial country with uniform temperatures, high humidity and much rainfall. It is affected by two periods of monsoon: the south-west monsoon which normally

occurs during May-September and the north-east monsoon which occurs from November-March, and two intermonsoonal periods, March-April and October-November. While the north-east monsoon brings rain throughout most of the country, the south-west monsoon usually brings a drier, less wet period to Sarawak.

Malaysia enjoys a relatively high standard of living, achieved through an integrated approach of development, which saw the incidence of poverty decreased from 44 per cent in 1976, below 10 per cent at the end of 2000, to less than five per cent in 2007 (UNDP 2007). The United Nation's Human Development Report (HDR) ranks Malaysia as a middle income country with high human development.[1] The export-oriented nation's key economic sectors include manufacturing, agriculture, retailing and hospitality. Key exports are rubber, crude petroleum, petroleum products, LNG, timber and timber based products, electrical and electronic products, apparel and crude palm oil.

Malaysia's governance is based on a constitutional monarchy and a three-tier governance system that comprises the local, state and federal government. The nation of Malaysia was formed as a federation in 1963 with the Malaya Peninsular forming a union with the states of Singapore, Sarawak and Sabah.[2]

**Sarawak**

At 124,450 square kilometers, Sarawak is the largest of the thirteen states of Malaysia and contains 37.7 per cent of the nation's land mass (in comparison to Peninsular Malaysia with 39.9%). It shares Borneo with Brunei Darussalam, Sabah and Kalimantan. The capital of Sarawak is Kuching in the south of the state.

From the coast to inland, Sarawak's topography consists of flat plains that extend to a narrow belt of hills and then taper to a range of mountains that extend the length of the state, forming the center spine of Borneo. The highest peak, Gunung Murud, stands at 2,425 m in the northern Sarawak region.

In addition to being the largest state, Sarawak is also the least populated, with an average of nineteen persons per square kilometer. Its population consists of over forty different indigenous peoples who collectively form the majority of the population at 70 per cent.[3]

**Indigenous peoples of Malaysia**

The indigenous peoples of Malaysia, collectively known as Orang Asal comprise, by region, Orang Asli groups of Peninsular Malaysia, Anak Negeri groups of Sabah and Dayak and other native groups of Sarawak. Recognition and protection of Orang Asal is given in several articles in the Malaysian Federal Constitution including Article 161A (defining native) and Article 153 (safeguarding of the special position of Malays and Orang Asal).[4] Further state laws in Sabah and Sarawak with special reference to the definition of Orang Asal include relevant Interpretation Ordinances. These articles have been the basis for several government policies that are meant to uplift the economic standing of the *bumiputera*—the collective term for Malays and Orang Asal.

Although there are subnational differences between the indigenous peoples of Malaysia, they share similar experiences brought about by the failure of programmes that were meant to benefit bumiputera, especially in relation to Malay-Muslims who form the majority of the bumiputera. These result in higher incidences of poverty[5] characterized by decreased levels of education, health, income and business opportunities among indigenous peoples in comparison to other groups in Malaysia. Similarly indigenous peoples also share a traditional spiritual and socio-economic link with the land, with forests providing important non-agricultural resources including meat, medicines, housing material, herbs and spices, rattan with which to make baskets and mats, and bamboo, which makes cooking utensils. Orang Asal land and forests are well defined in customary law, which also sets a framework by which ownership is recognized, regulated and transferred. Their forests are typically communally owned and managed as a resource bank for the commu-

nity, and as such these forests are seldom used for commercial exploitation.

Orang Asal issues remain peripheral in Malaysian society, and as a community they lack the political power to be able to address them. In Peninsular Malaysia, the lack of representation is obvious—the Orang Asli's sole political representation remains one appointed Senator; Orang Asal of Sabah and Sarawak do have representation in both State and Federal Cabinets. The Federal dynamic with these States, however, has long ensured weak non-Muslim indigenous governance in these states, resulting in the domination of political cliques that personally benefit from serving narrow private sector interests rather than that of the Orang Asal majority of the States. As a result, Orang Asal continue to be in conflict with the political elite, most notably over the effective recognition of their rights to their traditional lands and resources.

**Malaysia and global climate change**

In 1994 and 2002, Malaysia ratified the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol respectively and, in fulfillment of her obligations, submitted the Initial National Communication in 2000. The Second National Communication was set to be completed by 2009.

The National Steering Committee on Climate Change is the main government body that coordinates climate change activities and is composed of senior officials from 10 ministries and agencies, headed by the Ministry of the Natural Resources and Environment. The Malaysian government has a draft National Policy on Climate Change that includes five principles including development on a sustainable path, sustainability of environment and natural resources, integrated planning and implementation, effective participation and common but differentiated responsibility. In respect of the Second National Communication there are three working groups that focus on National Greenhouse Gases (GHGs) Inventory, Vulnerability and Adaptation and Mitigation.

With respect to civil society participation in climate change issues, the Climate Action Network in Malaysia is led by Environmental Protection Society of Malaysia and includes the Centre for Environment, Technology & Development, Malaysia (CETDEM) and the Malaysian Nature Society. The Indigenous Peoples Network of Malaysia (JOAS) in 2008 formalized a working group on climate change.

In general, Malaysia adopts a "precautionary principle" and "no regret" policy, that action, justified in their right, could be taken to mitigate or adapt to climate change, even though there are scientific uncertainties (Salmah 2005).

While UNDP's Human Development Report lists Malaysia as the world's 26th highest emitter of carbon, Malaysia's National Communications states that the nation is a net sink, based on the value of the nation's forests (MOSTI 2000).

In respect to Reducing Emissions from Deforestation and Forest Degradation (REDD), the Malaysian government is supportive of the concept that curbing deforestation would result in benefits for the climate and supports both national and project-based approach to this mechanism (FRIM 2007). Malaysia is currently not participating in any REDD-readiness schemes.

Malaysia hosts 37 projects under the Clean Development Mechanism (CDM). Of these, thirty or 81 per cent of the projects benefit the oil palm sector while the other projects are related to landfills, hydropower and manufacturing (UNFCCC 2009).

There are currently four voluntary carbon market projects that are forest-related. Three of these are sited in Ulu Segama-Malua Forest Reserve, Sabah[6] and the fourth is in the South-East Pahang Peatswamp Forest, Pahang[7] (FRIM 2009). Replanting is the main activity of the three projects, and the investors are from energy industries and aviation with the fourth a pooled carbon initiative set up to attract investors from different sectors.

**Indigenous peoples, land, forest and the State**

It is necessary to understand that interactions between Orang Asal and the state of Malaysia take place in the environment of a strong administration that actively seeks to weaken Orang Asal tenure over forests and promote private sector interests in the name of development.

Matters pertaining to land, forests and its resources are under the purview of the subnational governments (i.e., the states). While the federal government does have a Ministry of Natural Resources and Environment, individual states are able to make independent decisions over resource use and allocation. This has led, "in practice, to practical contradictions between federal and state policies on lands, forests and the environment. The states have pursued their own land and forest policies, even where they appear to contradict federal policies, and vice versa" (Ozinga 2004, 1). In regards to environmental management, while the federal Environment Quality Act 1974 outlines a comprehensive legislation for environmental management in Malaysia, in Sarawak, the Natural Resource and Environment Ordinance 1993 has another set of laws that also gives the power to the Natural Environment Board to oversee the management (including enforcement) of environment and natural resources in Sarawak. Similarly, while environmental impact assessments (EIAs) are mandatory at the federal level, they are not in Sarawak.

There are varying statistics on the forested area of Sarawak. The state Forestry Department (2009) declares that the forested area is 10 million hectares while the Federal Department of Statistics (2007, 116) estimates it at 8.1 million hectares or 61 per cent of the state's total land area.

While the provision for rights over forests differ among the states and therefore the three subnational Orang Asal groups, it may be said that ownership, management and, in some cases, legal access to forest and forest resources are denied to the indigenous peoples of Malaysia. This is whether through limitation of constitutional rights through policy and amendments of law (for Anak Negeri and Dayak) or the Aboriginal Peoples Act which effectively vests authority over Orang Asli land to the

state. The manipulations by the federal government (in relation to Orang Asli) and the Sabah and Sarawak state governments to limit rights of Orang Asal to their customary land and resources have long been the source of negotiation, contestation, civil action and physical and judicial conflict.

In Sarawak, the interpretation of Native Customary Rights as "weakly secure use rights on State lands" has led to 173[8] cases in court challenging the state government's claim with at least just as many in the pipeline. In many more cases through Malaysia, however, the resources needed for self-mobilization and internal capacity building and national limitations on fundamental human rights including freedom of information and expression have long limited the Orang Asal's ability to assert their rights through the judicial process, resulting in eviction, relocation, resettlement and, at times, violence.

## Case study area: Dayak-Bidayuh-Jagoi village of Duyoh in Sarawak

The village of Duyoh is found at the foothills of *Gunung*[9] Jagoi (354 m), ancestral home of the Jagoi people (also known as Bijagoi[10]), a group of over 10,000 people and 10 villages in Sarawak, with four villages across the border in Indonesia. Bijagoi are part of the Bidayuh group, the second largest Dayak group in Sarawak.

Bidayuh is a Malaysian term to describe a diverse group of people that live in the Sarawak Divisions of Kuching and Samarahan and the upper portion of the Indonesian province of Kalimantan Barat (in the lower basin of the Kapuas river) and share, to varying degrees, common linguistic and cultural traits.[11] According to their histories, they are one of the original peoples of Borneo. In Sarawak, Bidayuh population is an estimated 193,000 or 8 per cent of the state's population and 0.8 per cent of the nation's population (Department of Statistics 2008).

Sellato (2002, 72) describes Bidayuh as

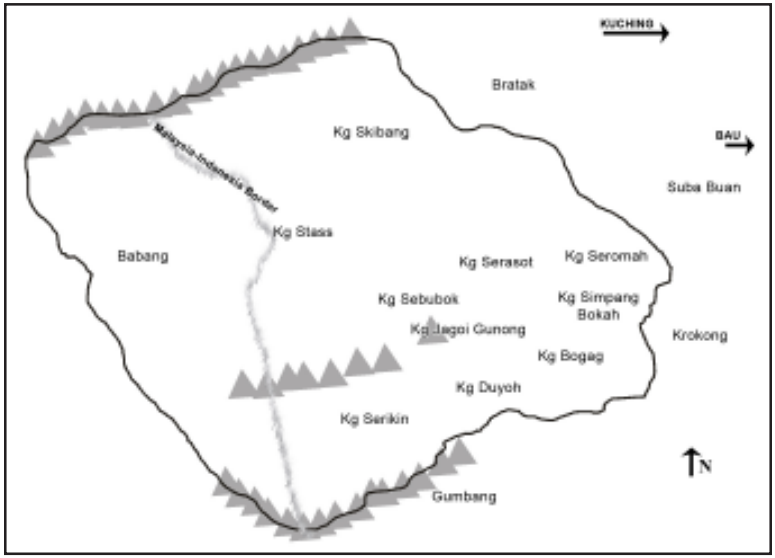
> "variegated and poor known groups, collectively gathered under …ambiguous names. Within Sarawak, there are over thirty

different Bidayuh groups. They differentiate themselves from each other based on their geographic origin, native territories and language. Traditionally no socio-political or ritual organization exists above the village level."

Bidayuh are largely egalitarian; however some may select their chiefs from amongst certain descent groups. Former headhunters, the most distinctive architectural feature of many Bidayuh groups is the ceremonial headhouse, a single structure in the village where heads were stored and once upon a time provided a common sleeping area for young, unmarried men. Many Bidayuh groups are also known for their *dayung borih*, women who are at once priestesses and healers, able to communicate between the physical and spiritual world.

The Bijagoi native territory covers approximately 20,000ha in the Bau district of the Kuching Division, up to and over the Malaysian-Indonesian border, sharing boundaries with the Gumbang, Krokong, Broih and Bratak peoples (see Figure 1). Their forests are a mix of hill dipterocarp and secondary forests. As one community with Krokong, Serembu and Bratak peoples, they inhabited the upper region of what was known as the original area of Serawak,[12] concentrated around a mountain peak called Bung Bratak. Chang Pat Foh in his *History of Bidayuh in Kuching Division* (2004) narrates that, in the early 1800s, a small group left Bung Bratak and settled in *Gunung* Jagoi, driven by a bad omen.[13] From this group would descend 10 Jagoi villages, including Duyoh.

**Figure 1.** Sketch map of Jagoi lands




Duyoh was first established in 1910, at the foothills of *Gunung* Jagoi, during the rule of the first White Rajah, HH Sir James Brooke. The 2000 census quotes a population of 952 with 151 families in Duyoh (Chang 2002, 194) that by December 2008 had reached 185 families. Duyoh village is approximately 10km from the nearest town, Bau and 40km from Sarawak's capital, Kuching City.

### *Bijagoi relationship to land*

For Jagoi, as it is for other Bidayuh and Dayak groups, land is a source of sustenance and life (Chang 2002, 18), providing not only farm lands but forests that are a source of timber, herbs, medicines and materials for daily use. Table 1 shows a break-down of the different land types in Jagoi *Adat*.[14]

**Table 1.** Jagoi land classification system

| Land Type | Land Use (in Adat) |
|---|---|
| Tolun tana' | Territory (e.g., Tolun tanah Jagoi) |
| Tu'an | Primary Jungle |
| Obud | Primary and secondary jungle, usually denoted as a place where spirits reside |
| Tinungan | Area in the jungle designated for cremation, burial. Includes area where they collect wood for cremation |
| Tiboie | Area under secondary growth, not yet fit for cultivation |
| Damon | Area under secondary growth fit for cultivation |
| Umoh | Padi field |
| Lison | Orchards (fruit trees) |
| Toyak | Gardens (e.g., vegetable gardens, cash crop gardens, corn fields, etc.) |
| Kupuo | Village |

Broadly, the Jagoi village can be classified into areas of cultivation (whether currently being cultivated or left fallow) and areas of conservation (see Figure 2). Duyoh village covers over 800 ha with areas of cultivation primarily along the low lying lands, including those fed by mountain rivers that flow into Sungai[15] Sarawak Kanan[16] and lowland dipterocarp forests covering the mountain ridges that form the north and south boundaries of Duyoh. In addition to these areas, some of the Duyoh communal land was converted into an oil palm estate in 1990 under a joint-ownership model between the villagers and a state agency, Sarawak Land Consolidation and Rehabilitation Authority (SALCRA).

**Figure 2.** Sketch map of Duyoh land use




## Methodology

There is a paucity of methodologies dealing with climate observations from communities — the exception is World Wildlife Fund's Climate Witness toolkit (2008), which provides a structured methodology for insights into climate change impacts at the community level.

This study used a combination of different participatory methodologies to illustrate observations as well as changes at the local community level. It drew upon two rapid appraisals, conducted among representatives from 30 indigenous peoples throughout Malaysia and the second at the village level in Duyoh,

Jagoi, Bau. At the village level, the survey was done with a group of villagers while a second set of semi-structured interviews were conducted with a focus group that consisted of community informants and elders.

### *National-level appraisal on indigenous peoples and climate change*

The first appraisal, during a briefing on climate change for representatives from the Indigenous Peoples Network in Malaysia (JOAS), was to establish the depth of climate change experience among the indigenous peoples of Malaysia. Though climate change as an issue was relatively new to the community representatives, it drew on their experiences as peoples living closest to nature, thus most suited to track and observe the changes in their environment.

The purpose of the second appraisal, conducted at the village level, was to establish general trends and observations with regard to weather and the dependence on weather. The appraisal also enabled the selection of indicators which would best track the impact of weather upon the Bidayuh-Jagoi community.

The indicators, together with observations on weather events, were then used to create a timeline of the climate history of the community. Participants were asked to rank rainfall on a perceptual scale, with 0 indicating periods of drought and 12 indicating heavy rainfall with incidences of flood.

In addition to contributing towards the case study, the sessions enabled conversations on the nature of climate change, empowering villagers with an understanding of the global phenomenon that is climate change.

The case study was conducted over December 2008.

**Limitations of scope**

In adopting a methodology based on indicators, the study in essence limits itself to a discussion based on those indicators. This methodological design in particular chooses to focus only on those indicators most important to the community at hand. What are not discussed within the parameters of this study are other variables and indicators which could have been used including: animal populations, various non-timber forest products (NTFPs), disease indicators (especially water-borne diseases), temperature, water availability and haze. For many of these indicators, there would have also been too many other factors more responsible for the state of these rather than climate change per se. These impacts are mentioned in the national level appraisal.

# Impacts of Climate Change

## *Observations on Climate*

> *How can people in the town know if it is too hot (when) they always have the air-con turned on.*
>
> *- Respondent, Sabah*

Environmental change, whether brought about by local logging and plantation industries or through global warming, has long been a concern for the indigenous peoples of Malaysia.

The indigenous peoples have observed the following broad changes in the season, first an increased variability in temperature, where hot periods are hotter than before, even during the day and the rainy periods are cooler. The second broad observation is that the weather pattern has changed and not uniformly. Table 2 records the observations and impacts from the three different subnational regions of Malaysia.

**Table 2.** Climate observations and impacts from subnational areas

| | | |
|---|---|---|
| Sabah | Rainy season erratic | • Planting season used to be in May (when the rains came) but now the rainy season in May does not come, so people cannot plant on schedule<br>• Increased rain brings more landslides |
| | Dry season is hotter than normal | • Heat makes it harder to work in the fields, easier to get sick (especially children)<br>• Harvest (for fruits and rice) is less<br>• Easier to have (out of control) fires, leading to haze<br>• Drought |
| | Other observations | • Quality and quantity of fruit/harvest has decreased and many fruits are spoilt. Fertiliser is now needed to get higher yields. |
| | | • Changes in the seasons affect traditions |
| | | • Emergence of new species which interfere with the environment |
| | | • More pests |
| Sarawak | Dry season is hotter than normal | • When there is no rain, weather is hotter |
| | Increase in flood events | • More floods – over wider areas and longer periods |
| | | • Bumper crop less frequent |
| | Change in species | • Before, used to catch udang galah (freshwater prawns), but now can catch udang batu (an inferior species) |
| Semenanjung | Changes in the season | • Rubber trees usually shed leaves in August/September after which the tree flowers. Changing weather patterns have caused the leaves to shed in Jan/Feb. The impact is less latex. |
| | Impact of increased rainy season | • Increased incidences of landslides |
| | Forest products not following seasons | • Example: before petai was a seasonal vegetable but now it fruits all year round. |
| | Increase in flood events | • Increased cholera outbreaks<br>• Disrupts daily routines (interferes with work, etc.) |

The following have also been observed from the changes in the weather and temperatures: increased rainfall, increased severity of floods and hotter temperatures during the dry season. The changes in weather led to and were corroborated by the following indicators: an increased number of pests, emergence of new species or those that have previously lived in other ecosystems, decreased harvest yields (in quantity and quality) and, in some cases, a change from a seasonal to year round harvest, increased incidences of disasters including landslides, haze, floods and drought, and increased outbreaks of environmental diseases affecting humans, animals and plants. All these were disrupting the lives, livelihoods and traditions of the indigenous peoples.

**Indicators for tracking climate change**

The rapid appraisals indicated two general categories of indicators that could be used to track climate changes. The first related to weather and observation of weather events. The second category related to agroforestry indicators on plant and animals. For the case study area, the weather indicators used were rain and flood, while ecosystem indicators used were padi, trees and vegetables.

**Weather indicators**

> *"Normally water lasts one day, but now the floods stay for three days.*
>
> *- Respondent, on the increased severity of floods in Bau District*

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report projects both increased precipitation for Southeast Asia as well as an increase in extreme weather events 'including heatwave and intense precipitation events' (Cruz et al. 2007, 479). In addition, it projects that even the

most conservative prediction will result in a forty centimetre rise in sea level by the end of the century (Cruz et al. 2007, 484).

Kuching Division is one of the cooler cities of Malaysia, with temperature ranges from 23.3-31.9 degrees centigrade. It is also one of the wettest regions in Malaysia, and typically sees 246 rainy days with rainfall that averages 40 centimetres annually (Department of Statistics 2007).

Much of the rain falls between December and March, accounting for more than half the annual rainfall in Sarawak (Meteorology Department Malaysia 2009). Some areas in northern Sarawak receive the highest annual rainfall in Malaysia.

Beginning October 2008 to January 2009, the nation began receiving above average rainfall (Malaysia Meteorological Department 2009). In Kuching Division, in a 24 hour period on 24 January 2009, over 223 millimetres of rain fell.

**Floods**

Sungai Nolan, which flows through Duyoh land, is one of the rivers that feeds into Sungai Sarawak Kanan, part of the Sungai Sarawak river basin. One of 22 major river basins in the state, the Sungai Sarawak river basin covers an area of 2,459 $km^2$ with a combined length of 120 km of river (DID 2009). The many rivers from the mountain forest lands of the different Bidayuh groups converge into two tributaries (Sungai Sarawak Kanan and Sungai Sarawak Kiri), which merge together on the plains, travelling through the capital city of Kuching to the South China Sea.

While the Sungai Sarawak itself has been historically prone to floods, the upper reaches of the river, where Bidayuh groups live, are rarely affected. However, since 2003, floods reaching these areas have increased. Table 2 shows a breakdown of large floods, as reported by the people of Duyoh with numbers for peak height confirmed through historical and media records.

**Table 3.** Table of flood events in Bau

| Year | Month | Peak height | District |
|---|---|---|---|
| 1963 | Jan-Feb | 6m | Statewide |
| 2003 | Feb | 1-2m | Bau |
| 2004 | Jan | 1-2m | Bau |
| 2007 | Jan | 0.3-2m | Bau |
| 2009 | Jan | 4.5m | Bau |
| 2009 | Feb | 4 m | Middle and Northern Sarawak |

State Disaster Relief Committee Chairman, Deputy Chief Minister George Chan attributed the floods to a combination of heavy rains and high king tides (Chan 2009). While not caused by climate change per se, the king tides can demonstrate the impact of increased sea level and allow for a glimpse of the effect of future sea level increases upon the upland indigenous peoples in Sarawak.[17]

## *Livelihood Strategies Indicators*

### Padi

Since the beginning of their oral histories, Jagoi have been padi[18] farmers. The grain is such an important part of their food security that it plays a major role in the Jagoi cosmovision, with special roles set aside for those who ensure the security of the rice harvest.

Padi farming, according to adat,[19] is not just work that results in the production of food. It comes with a series of ceremonies, as necessary to the success of the harvest as the physical labor that is needed to work on the farm. Geddes (1954, 72) describes it as a

> "necessary consequence of things…The world is not his [Land Dayak] alone, but is shared by him with other order of beings…Also, like himself, padi is a living thing with its own

> soul. Therefore mere nourishment and physical care cannot ensure its prosperity if it is not planted on propitious ground and kept under spiritual guardianship."

The value of rice, relative to other crops, is thus preserved. No other crop is accorded a soul.

The rice planting cycle occurs within a set calendar, beginning in June when the communal festival has ended and the farmers are ready to plant the new crop. The cycle is closely tied to the weather patterns, taking advantage of the relatively drier months of July and August to burn undergrowth, the first step in preparing the fields for cultivation. Table 4 breaks down the different tasks, both physical and spiritual, the periods in which they are done and the conditions needed to ensure the viability of the year's crop.

**Table 4.** Operations and conditions needed during the padi cycle

| Physical Action/Task | Adat/Spiritual/Cultural Action | Temporal Period | Conditions Needed |
|---|---|---|---|
| Decision making on land used | Omens to determine whether land is favourable for farming that year. (Bird calls) | March/April | presence of endemic species |
| Cutting undergrowth | Omens guide individual farmers in whether the days are appropriate to go to the field or stay at home (presence of birds, animals). Bans on eating certain types of food as well as hunting animals in the area. | June | presence of endemic species |
| Felling trees/bamboo | | June/July | Dry period needed to dry the undergrowth before burning (3-7 days) |
| Burning cut growth, clearing away remains, adding fertility to the soil and reducing pests | After burning, *nyipotih*[20] may be made in reparation for destroying the spirits' land | July/August | Dry period needed (at least 3 weeks)<br>Plants for rituals |
| Planting seed | New seed is blessed<br>*Gawea*[21] *Sowu, Gawea Nyuluk* | August/September | Little bit of rain, not overly dry |
| Fencing and building farm shelter (as necessary) | August/September | | Timber from forest |
| Weeding and cutting grass | *Gawea Pak* may be performed in the period before ripening to limit the damage due to pests | October/January | Too much rain may affect in terms of pest, too dry may affect growth |
| Harvesting padi | | March/April | Rain during this period may turn the padi mouldy |
| Threshing, drying and winnowing padi | | March/April | Like harvesting, dry weather is best |
| Transporting padi from the farm huts to the village house and storing it | *Gawea Pali Pu'un* is performed before eating the new rice to ensure that the elders do not fall sick | March/April | |
| Community rests | *Gawea Sowa*, communal rice harvest festival | June | |

Padi, especially hill padi which, according to tradition, is the preferred variety, is a resilient crop, able to take in occasional bouts of flood. It however is not so resilient against sustained and high floods that cover the grain stalk that will lead to stunted growth, appearance of fungus and rotting of the padi. As well, disruptive weather patterns during critical periods in the padi cycle can spoil the year's harvest.

Using padi and the padi cycle as their guide, interviewees were asked to rank rainfall during the months of specific periods (eg clearing, planting, weeding, harvesting) for each decade from 1960 to 2000 and then for each year for 2005 to 2008. They were also asked to identify yields for the same years and possible causes of increased/decreased yields.

**Trees**

The Bidayuh relation to trees depends on knowledge of the usefulness of trees. Those that do not facilitate a food or timber function are usually not managed, either actively or passively. From among the species of trees that are considered relevant to Bidayuh peoples, two were chosen as indicators for historical monitoring—the durian tree and the engkabang tree.

Fruit trees are usually found in *lison*.[22] While they supplement the diet of the Jagoi people, they are primarily used as a form of cash income. For most Bidayuh peoples, the most important of fruits is the durian, a thorny crop that flowers once a year. Fruit trees belong to the farmer who planted them and are also inherited by succeeding generations—old durian trees therefore may belong to an entire community by virtue of the familial links between them and the original planters of the trees. Because trees belong to the person who planted it, the land owner and the tree owner may not be the same person.

Table 5 identifies the typical fruit cycle in Duyoh. Most fruits ripen and are harvested between the months of November, December and January. The fruit cycle is important not only in the value of the fruit but also because an active fruit season helps maintain the forest animal population, most notably the

**Table 5.** Typical fruit cycle and weather conditions

| Month | Weather | Fruit cycle |
|---|---|---|
| January | Wet | Ripening of *langsat, tembedak* |
| February | Intermediate | End of fruit season |
| March | Intermediate | |
| April | Dry | |
| May | Dry | |
| June | Dry | |
| July | Dry | |
| August | Intermittent rain | Flowering (rambutan, mangoes) |
| September | Intermittent rain | Flowering (durian, *langsat, Cempedak* and other trees in the forest) |
| October | Wet | |
| November | Wet | Ripening (mangoes, rambutan)<br>End November, durian ripens |
| December | Wet | Ripening of durian |

wild boar, a traditional source of protein.

Respondents were asked to track durian harvests from 1960, to identify changes in durian harvest and the factors responsible for them.

Like durian, *engkabang* (otherwise known as illipe nut) is a species indigenous to the forests of Sarawak. It grows wild in the forests (*obud, tolun*) but is also cultivated in the lison. The illipe nut is edible but its primary use to the community was, together with damar resin, as candles for lighting the homes. Illipe nuts may also be sold and commercially is often used in the production of cocoa butter.

Engkabang produces a bumper crop every four to five years, and these bumper crops are of great significance to the communities. Weather is a critical factor in a bumper year. A year after a good harvest, animals and insects provide increased pollination of engkabang. This gives the precondition for a bumper year, with at least two weeks of no rain followed by light rain during the flowering period. After a bumper crop, the animal population in the forest increases.

Respondents were asked to identify bumper crop years for engkabang.

**Vegetable gardens**

Vegetables form another part of the Jagoi food security basket. They are grown in *toyak* (garden) areas for consumption, with excess sold in markets for cash income. Traditional vegetables grown include ferns, cassava, beans, loofah, yam and others.

Respondents were asked to track vegetable harvests and identify changes in the harvests.

## *Observations from Indigenous Peoples on Impact of Climate and Related Adaptation Strategies*

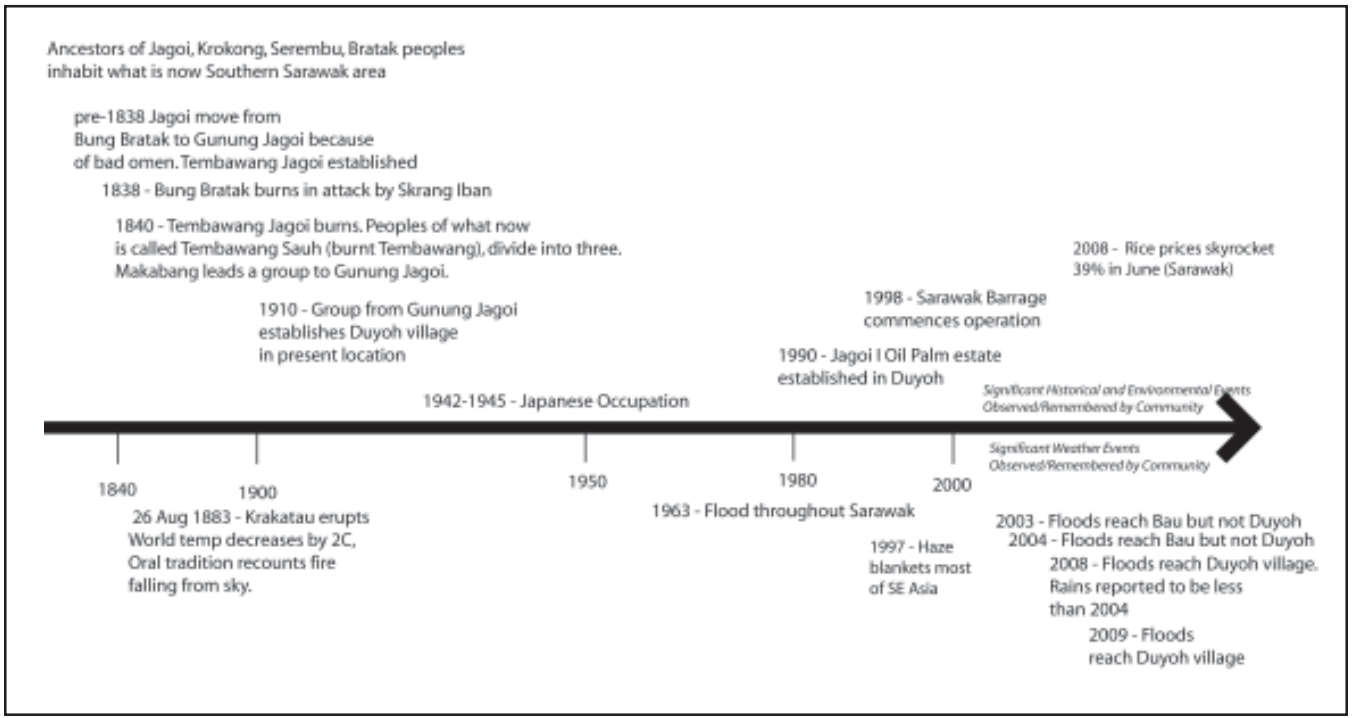
**Weather indicators and climate timeline**

Observations from respondents on weather changes were depicted on a climate timeline alongside other events they had felt impacted upon their own food security and lives.

Weather events that were remembered by the community included floods in 1963, 2003, 2004, 2008, and 2009, and the 1997 haze that covered much of Southeast Asia. An older respondent was able to recall histories from the 1883 Krakatau[23] eruption. In addition, there were other events that respondents identified as significant to the creation of famine or food insecurity, the most notable of which was the Japanese Occupation from 1941-1945.

The observations were confirmed by data from historical sources (e.g., the yearly Sarawak Almanac).

**Figure 3.** Community climate timeline

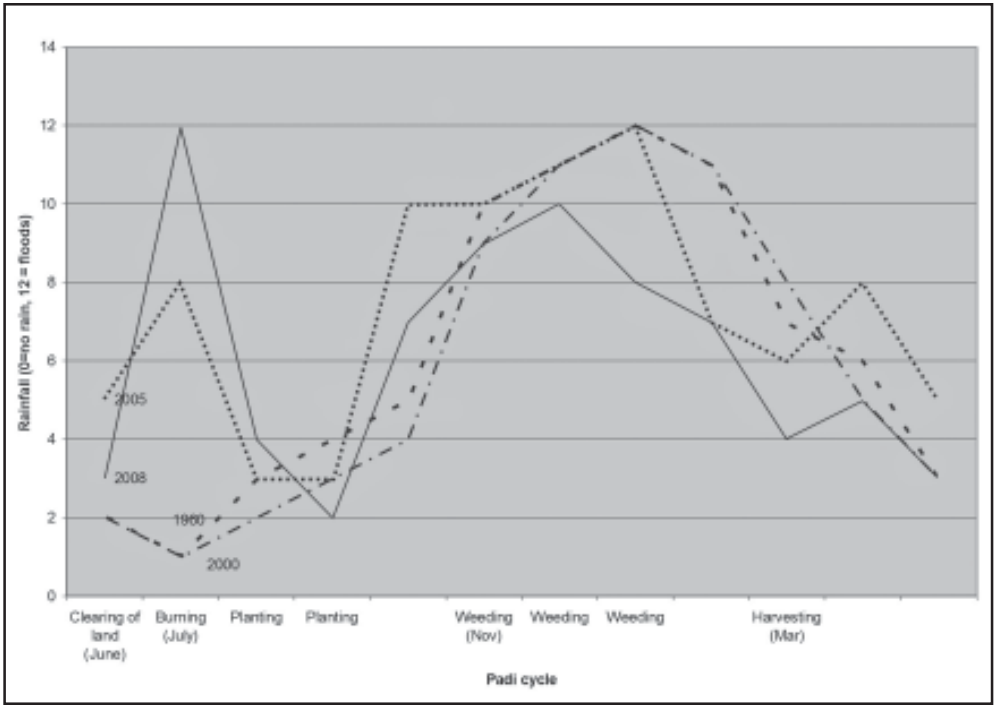


For the respondents, in respect of flood events, they felt that it was not just rain that was responsible for increased severity and longevity of floods. They noted that in 2004, the rainfall was worse than it was in 2008, yet the floods were worse as they had spread to the Duyoh area.

## Padi

Figure 4 illustrates the observations of rainfall during specified activities. Respondents described the data as being similar from 1960 to 2000. When asked about rainfall during the last 10 years, respondents observed rain during crucial burning periods as well as a decreased amount of rain during the harvesting month. They also noted that rains came earlier in the padi cycle.

**Figure 4.** Chart of observed rainfall per activity 1960-2008



The weather patterns from 1960 to 2000 are in accordance with the padi cycle recorded in Table 4. Activities fit into the general weather pattern, enabling the farmers to maximize the weather conditions. A new pattern of rainfall emerges from the period of 2005-2008 characterized by a sharp increase in rainfall during the clearing and burning periods. The yearend northeast monsoon season starts about a month earlier than it used to, and the rainfall during the monsoon is perceptually higher than before.

## Yield

**Table 6.** Table of observations related to changes in yield

| Year | Average farm size (8 people per family) | Average yield |
|---|---|---|
| 1960 | 2.5 hectares | 1920 kg |
| 1970 | 2 hectares | 1510 kg |
| 1980 | 2 hectares | 1440 kg |
| 1990 | 1 hectare | 600 kg |
| 2000 | 1 hectare | 900 kg |
| 2005 | 0.5 hectare | 500 kg |

Based on oral history, there was no significant decrease in the yield, despite identifying changes in weather. Respondents cited an increased use of fertilizers as the reason yield did not decrease. Other factors that affect yield include the planting of different padi strains. This strategy to increase resilience of the padi field is further discussed in the following section on best practices.

Respondents, however, identified two periods of famine—the first after the 1963 flood and the second during the Japanese Occupation.

**Other observations**

In 2008, unexpected rains during July meant that the farmers had to wait until there was a four-day dry spell before the fields could be burnt. If the dry period had not occurred, then the padi could not have been planted. If the farms are burnt at a later date, it also means that the padi harvest will be younger during same period where pests are mature and thus, a higher probability that the harvest will fail.

Respondents also noted an increased presence of field mice and other pests, which the villagers attribute both to warmer weather and the nearby oil palm plantations, both factors enabling the increasing population of the rodent.

**Trees**

espondents noted that the durian season has become erratic, deviating from the normal harvest between November to December. The durian trees now flower year round. They have noted though that this did not benefit the community as the yield per tree per year has declined and the quality has decreased.

For engkabang, on the other hand, the last big bumper crop was noted in 1967 and the last 'average' bumper year occurred in 2002.

**Vegetables**

The respondents did not track significant declines in vegetable harvest due to weather events. They, however, cited the cultivation of higher yield, non-native vegetable crops and use of dedicated areas for vegetables as factors for increasing the yield of vegetables.

In 2008, however, it was noted that increased rains affected vegetable production, especially chili and long beans. The effects were felt statewide, with local markets in Miri, Sarawak reporting increases in the prices of vegetables.

## *Traditional Strategies for Coping with Climate Change*

### Addressing food security through multi-cropping

Dayak farmers are multi-croppers by tradition, preferring to grow a variety of staples and cash crops rather than encouraging monoculture of any one crop. In years where preferred crops like rice are unavailable, the community can fall back on corn, tapioca and other staples. The same strategy holds for vegetables where produce that is perhaps deemed less appetizing will still be grown among other crops because of its resilience and ability to survive climatic variations. In addition, vegetables like pumpkin and *gomang* (a local gourd) are planted and stored for later consumption.

Table 7 shows a sampling of different crops found in Dayak's hill padi farm. Respondents ranked different produce according to three criteria—most valued, most planted and what was actually consumed over the last 30-day period.

**Table 7.** Ranking of typical crops grown on Dayak farms

| Farm produce | Ranking (1 - Least important, 5 - Most important) | Most Planted (1 - Least, 5 - Most) | Eaten in the last month (November) |
|---|---|---|---|
| **Carbohydrates** | | | |
| Padi | 5 | 5 | Y |
| Tapioca | 5 | 5 | N |
| Yam | 3 | 3 | N |
| Maize | 4 | 5 | Y |
| Bananas | 3 | 1 | Y |
| Sweet Potato | 3 | 2 | N |
| **Vegetables** | | | |
| Pumpkin | 4 | 3 | N |
| Cucumber | 5 | 5 | Y |

| | | | |
|---|---|---|---|
| Sesame | 3 | 1 | Y |
| Brinjal | 3 | 2 | N |
| Gourd | 4 | 4 | Y |
| *Ensabi* | 4 | 5 | Y |
| Loofa | 3 | 3 | N |
| *Changkok (Sauropus albicans)* | 2 | 1 | Y |
| Beans | 2 | 1 | Y |
| **Spices** | | | |
| Ginger | 2 | 2 | Y |
| Chillies | 3 | 3 | Y |
| Lemon grass | 3 | 2 | Y |
| Turmeric | 3 | 2 | Y |
| **Others** | | | |
| Sugarcane | 4 | 1 | N |
| Tobacco | 1 | 1 | N |
| Betel leaves | 1 | 1 | N |

The Dayak desire for biodiversity over productivity is a key distinction between the Dayak concept of resource management versus one based on capitalism (Bamba 1997). Monocultures remain an anathema to Dayak culture—even a most modern Dayak farm in which cash crops dominate over subsistence crops will show a variety of orchards from rubber trees to oil palm to pepper gardens.

The strategy, which sacrifices the potential for short term income, is a legacy of the Jagoi (and Dayak) tradition of self-sufficiency and ensures the family's food security in the long term. This strategy was cited as the key response to survival during times of food stress—most notably after the 1963 flood and during the famine brought about during the 1941-1945 Japanese Occupation.[24] When rice was unavailable, tapioca, yam, sago and sweet potatoes were used as staple food. During this period, Bidayuh peoples were not only able to survive rela-

tive to non-indigenous communities, they were also able to adopt and take care of children from other communities.

### Diversification of padi varieties

The desire for increased diversity also extends to ensuring multiple varieties of padi are available. There are at least seven common varieties of padi found at the village level, including *podi silasan siak, podi silasan bilieh, podi kabang, podi kasuo, pulut monung, pulut bojig* and *pulut pandan*. While certain strains can withstand pest and adverse weather, the yield is less and the taste is not as good, however they are still planted because of their resilience. A family will plant at least two different varieties of rice. Like the strategy for increased diversity of crops, the tradeoff is a reduced yield compared to planting one strain of rice.

### Maximising soil fertility through rotational agriculture

Rotational agriculture, otherwise known as swiddening or shifting cultivation, is a method of soil conservation described as a "complex system of land use and cultivation requiring sophisticated knowledge of the stability of soil types to crops grown, climatic variation and soil fertility" (Hong 1987, 19). This knowledge is passed orally through the generations and grew out of a need to adapt to the poor soils of the land, a condition brought about by constant rain, which leeches nutrients out of the soil.

The methodology involves a system of cultivation and fallow periods over different areas of land, with the objective of allowing the land to regenerate fertility and replenish nutrients in the soil. To maximize land use, a variety of crops, vegetables, other traditionally important plants (including those used for ceremonies) may be grown on fallow land.

Due to competing pressures for land and resources, the overall amount of land available for farmers has been reduced. As a result, within the last three years farm lands have been used for two or three harvests, without the traditional fallow

period. This is compensated for by an increased use of fertilizer and weedicide (see Table 8).

**Table 8.** Fallow periods 1960-2005

| Year | Average farm size (for 8 members per family) | Fallow period |
|---|---|---|
| 1960 | 2.5 hectares | 8 to 9 years |
| 1970 | 2 hectares | 6 to 7 years |
| 1980 | 2 hectares | 6 to 7 years |
| 1990 | 1 hectare | 5 years |
| 2000 | 1 hectare | 5 years |
| 2005 | 0.5 hectare | none |

## Religious/social structures for coping with environmental events/stress

The Jagoi cosmovision acknowledges one source for all life. This source, God, is Topak. From Topak comes the entire world, equally made up of the seen and unseen. Spirits, like humans, inhabit the world and are part of the daily lives of the people. The spirits (*ieng)* reside locally in the forests and fields of the community and thus every interaction with the environment is also an interaction with the spirits.

In this context then, almost every act undertaken must be done in regard to these spirits. An important set of rituals and taboos is connected with rice farming because it is essential to preserve the connection between the rice spirit (*ieng Podi)* and the community, ensuring the continued fertility of the rice harvest. Bird and animal omens are important in determining whether farm land will be suitable for cultivation, whether the times are right to embark on certain tasks, even whether it is safe to go to the farm and work.

In addition to the rituals that must be undertaken at different stages of the padi cycle, there are ceremonies that need to be undertaken in unusual weather events. For example, if the

rains fall during the period needed for burning the undergrowth, a ritual can be performed. This ritual, called *Gawea Pinganga*, is described in Rubis (2008) and is an act of penance needed to ask the spirits to stop the rain. In another example, in 2007, a set of mini-cyclones appeared in the hills of the neighbouring territory of Krokong. This was interpreted as a sign that the spirits had not been hosted with a *Gawea* and the restless *ieng* had to be placated with a cleansing ceremony.

In the Jagoi cosmovision then, all acts of nature derive from the spiritual world and these acts are in retribution or reaction to human acts. Human endeavours that please the spirits are rewarded with good harvest or favourable environments while those that disturb them will upset the balance and will thus be rewarded with an equally destructive act. The belief that for every action there is an equal and opposite reaction results in a responsible stewardship of the environment.

Equally important in the Jagoi cosmovision is the concept of shared responsibility. Major rituals are undertaken as a community and each individual household contributes and plays a role in decisions that affect the shared environment.

**Alternative energy**

Although not present in Bidayuh communities, alternative energy strategies are found in different indigenous communities through Malaysia. These include microhydros[25] that enable remote villages to power communal initiatives and the use of local tree sap by the Semelai of Tasik Bera as an alternative fuel source.

## *Link between Global and Local Environmental Destruction*

> *You could say it is climate change. But I also think the cause is manmade.*
>
> *- Villager, on the occurrence of floods in Duyoh*

Observations from the indigenous peoples, both at the national level and from the case study, show that rain patterns are changing and already impacting on the communities, described by changes in rice and fruit harvest and the increased frequency of floods. In areas outside of the case study, additional challenges come in the form of increased disease, landslides and adverse impact on daily lives. Changes to the weather pattern are noted as unusual and in need of reparation, expressed in the cosmovision as acts of penance (*ngipoti*).

At the case study level, the most destructive weather events observed are floods. While increased rain does play a role in the severity of floods, increased king tides are another factor. While respondents attributed changes in weather patterns to imbalances in the natural order of things, the cause of flood events is said to be directly related to human exploitation. They cited the following as factors for extreme floods—growing siltation of Sarawak river, the Sarawak Barrage which began operating in 2003 as a flood mitigation measure, the creation of additional roads and construction along the river that blocked the floods from spreading in the lower reaches of the Sarawak River basin and forced the waters to pool upland in the Jagoi area.

In regards to the effect rain has on harvests, as a result of increased pests, respondents also noted the presence of the oil palm estate as a facilitating environment for pests and rodents. The use of fertilizers, pesticides and weedicides is said to also unfavourably impact on harvest and food.

Throughout the study, in the interactions with the different actors, whether indigenous peoples' representatives, NGOs or elders, the following point was raised, the gist of which is as follows:

> "I am sorry, I don't know if it is climate change or logging/oil palm/(or other project of development), but this is what I notice."

Always apologetically, always with the diffidence that comes with trying to understand a difficult topic but with the need to make the point that local factors are as at least responsible for some part of the changes that indigenous peoples are noticing in their lives.

The first point then is the significance and link between local environmental destruction and pollution versus global destruction and pollution. All local environmental destruction, it may be argued, comes from a global source vis a vis the market but it is the local changes that are more critical to degradation of the local environment. Anna Tsing (2004, ix) in describing the connections between commercial logging and communities in the rainforests of Kalimantan, traces these local-global pathways through "friction," explaining the connections as also being a story

> "of North American investment practices and the stock market, Brazilian rubber tappers' forest advocacy, United Nations environmental funding, international mountaineering and adventure sports, and democratic politics and the overthrow of the Suharto regime."

The processes that link global anthropogenic destruction of the climate are also responsible for the local physical destruction of forests. In this context, indigenous peoples confront climate change as a new struggle in the continuing war over the same resources.

In their environment, Jagoi people have created a set of strategies for coping with unusual weather events. The first is the self-sufficiency of the family through increasing diversity of food sources rather than maximizing productivity through monoculture. The increased diversity includes increasing the vari-

eties of each type of food—although padi is cited as the key example in this case study, it must also be noted that Jagoi people also have multiple varieties of fruits, e.g. durian and vegetables, e.g., corn. These strategies include spiritual and social obligations when reparations are needed, as when the environment is disturbed. These strategies are based primarily on traditional knowledge and it is in these sets of strategies where their resilience is based.

Vulnerabilities to climate change, however, include the loss of this knowledge—due both in part to the decreased value placed upon this knowledge and both those societal and physical changes in the environment that have made this knowledge seem less valuable. Included among these changes is the external pressure and competition for land and resources. Land is critical to the security of indigenous peoples. Decreased access to land and resources has changed the Jagoi (and Dayak) strategy for survival and food security. For many households in the Jagoi village of Duyoh, strategies include the growing dependence on cash income to replace subsistence farming and the use of chemical fertilizer on farmland to achieve the same level of fertility.

In many villages throughout Sarawak, the situation is more desperate as these villagers do not have the same access to alternatives as the Jagoi villagers. In these areas, conflict over land and resources becomes a greater struggle, and the need to reaffirm land tenure, in different platforms, results in a newer set of strategies for Dayak communities throughout Sarawak including community mobilization, mapping strategies and engagement with the judicial process.

For indigenous peoples the struggle is to recognize those strategies, laws and traditions that have held both local community and environment intact. The most known of these struggles is, of course, the Penan struggle for control over their forests. Despite a decade's long engagement with the subnational and national processes, Penan people have yet to realize any significant victories. This is not a statement on their capacity but on the ability of a community on the periphery of political and

administrative power to influence key decisions that relate to the safeguarding of that community and their immediate environment.

The second key issue is then if, at that level of familiarity and engagement, the communities are unable to be assured of rights, what then is their ability to influence a debate when it is situated away from a subnational or national centre to an international one. A quote often found in climate change literature is that it renders the most harm to those least responsible. As examples from logging and oil plantations show, the key sources of destruction are not only from the physical act of forest destruction but from the buyers in the North that are willing to consume the products that are produced. Vulnerability is then expressed not only in the immediate physical and societal threats posed by climate but by the negotiations and programmes that emanate from an international forum.

Throughout the nineties, the increased pressure to find a replacement for fossil fuels led to increased policy emphasis on agrofuels as "cleaner" sources of fuels. The markets reacted and the pressure on indigenous forests and lands grew. As a result, Dayak communities came under heightened pressure from commercial interests to abandon their traditional livelihood strategies in addition to losing tenure security. As these communities depended more on modern farming techniques and cash income, they became more vulnerable. The farm lands are increasingly less fertile because the traditional rotational agricultural system is replaced by multi-year farming on single plots of land. The short-term adaptation is greater use of fertilizer; however the spin off effects include more dependence on cash needed for fertilizer, greater vulnerability to price increases in chemical pesticides and the long term effect of chemicals on the land, water and biodiversity. These local level effects are in addition to those brought about by the forest destruction needed to create the plantation, further exacerbated by the increased cost of commercial rice which increases the need of the villagers to increase yield for the next harvest. A policy decision, therefore, can have unintended repercussions among those

peoples least represented by national and commercial interests.

Although climate mitigation proposals like REDD are intended to reduce deforestation and degradation, the intended conservation approach may not be achieved, without appropriate safeguards, in areas where indigenous populations are rights holders. The few "forest for climate" projects in Malaysia are sited in protected areas, making indigenous communities more vulnerable to being stripped of their customary rights over their forests and having these gazetted as state land. It could also lead to many unintended consequences. These include heightened pressure for these forests—from wanting to take what can be taken before REDD schemes get implemented, to claim "ownership" of these forests away from indigenous peoples in order to benefit from these schemes, and to benefit from these forests if other countries (e.g., Indonesia) participate in REDD.

The misguided opinion that indigenous peoples are solely responsible for degradation could lead to their losing the right to access and use forest resources and placing them in an even more vulnerable position vis-à-vis their resilience to climate changes.

## Recommendations

The following are recommended for indigenous peoples.

1. Increased documentation on traditional resources, including traditional knowledge and oral history by indigenous peoples as a response to future climate changes. Elder respondents hold lore regarding the Krakatoa eruption in 1883; however the specific strategies used by the community to survive the year of famine have been lost;

2. A facility should be established for indigenous peoples to track data relevant to climate change, part of the empowerment process to enable them to plan for changes in temperature and climate. These should include being able to observe and document changes in harvest quality and yield on an annual basis;
3. Indigenous peoples, even within a nation, have different capacities and vulnerabilities. Comparative studies on impact and vulnerability enable them to learn from each other's experiences.

The following are recommended for institutions, agencies and decision-making bodies.

1. Increase capacity building on the roles that indigenous peoples play in managing the environment, including the forest environment;
2. Scientific data and reports on climate change should also include human and social factors. Most climate change impact studies and reports are often made within the academic environment and concentrate on physical and scientific measures. Data from indigenous peoples can complement and enrich existing data with an understanding of the different impacts and potential solutions;
3. The pre-existing rights and responsibilities of indigenous peoples should be considered within the planning and implementation of climate mitigation schemes;
4. Information should be disseminated regarding the impacts of future climate change to local communities. Capacity building of related institutions, agencies and organisations on climate change impacts and plans at the national level would need to be circulated effectively to the local level;
5. Protect the rights of indigenous peoples at the highest possible level to provide, at least, the foundation for consideration of their rights to land, resource and security of their lives.

## Conclusion

Indigenous peoples of Malaysia have been interacting with the different changes in environment for decades. While global climate change is seen to impact the agricultural livelihoods, the impact is part of many causes that include local environmental destruction and degradation due to commercial pressures. In return, indigenous peoples have adopted a set of interactions with these changes; however the traditional knowledge that gives them the greatest resilience to climate change is greatly under threat. While the resulting strategies to mitigate climate change may pose the same threat to indigenous peoples as commercial extractive industries, they also provide an opportunity for government to reassess their policy towards indigenous peoples and provide a greater level of respect and protection for them and their traditional livelihood strategies.

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### Endnotes

[1] Malaysia ranks 16 out of a list of 108 developing countries on UNDP's Human Development Index and 63 out of a global list of 177.

[2] Singapore would later withdraw from this federation in 1965.

[3] Figures from Indigenous Peoples' Network of Malaysia.

[4] The specific term used in the constitution is "Malays and natives of any of the States of Sabah and Sarawak."

[5] Sarawak has the fourth highest level of poverty and Sabah, the only other

Orang Asal majority state, has the highest level of poverty.

[6] Face Foundation (Netherlands), New England Power (USA), Borneo Tropical Rainforest Foundation (UK).

[7] Malaysia Airlines' Voluntary Carbon Offset Scheme.

[8] Unofficial figure from Sarawak Dayak Iban Association.

[9] Gunung literally translates to mountain.

[10] "Bi" is a term found in many Bidayuh languages in the Bau area denoting "of," lit. "of Jagoi."

[11] For example the Selako, which comes under the Bidayuh grouping, has very little in common by way of descent, culture and language with other Bidayuh groups.

[12] The first name, what would eventually become known as Kuching Division in Sarawak.

[13] In 1838, the prediction came true and Bung Bratak burned in an attack by Skrang Iban. The survivors of the attack settled in the different areas around Bau. This story is not openly narrated by Jagoi elders.

[14] These categories of land use are broadly similar across Dayak and other indigenous peoples of Borneo.

[15] Sungai - river (Bahasa Malaysia).

[16] Sarawak Kanan River, that is, the right hand tributary of Sarawak River, a major river basin in Sarawak.

[17] IPCC indicates a projected sea level increase by 18-79cm or more in this century.

[18] Rice padi or paddy.

[19] Custom.

[20] Rituals of penance.

[21] Festival– usually performed in families, except for the Gawea Sowa which is a communal village festival.

[22] Orchard.

[23] Otherwise known as Krakatoa.

[24] Often referred to as 'Musim Jepun' lit. Japanese season

[25] Pioneered by Partners of Community Organisations in Sabah.

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# Reclaiming Forests and Coasts: Indigenous Peoples Cope with Climate Change

by Leah Enkiwe-Abayao (research consultant),
Jo Ann Guillao, Mikara Kaye Jubay-Dulay
and Helen Magata
Tebtebba

For years, indigenous peoples have had to confront the impacts of a rapidly changing climate. Considered as highly vulnerable to climatic change, especially those living in coastal and forest areas, the strategies for coping and adaptation that indigenous peoples have developed through the years have necessarily been based on modalities that are local and practical. Such strategies are informed by an indigenous worldview that puts premium to sustainable development practices and the protection of cultural identity.

Attentiveness to fluctuations and changes in their ecosystem is integral to the lifeways of indigenous peoples. The mechanisms and actions that they have developed to address climate change are integral to the wealth of traditional knowledge that has been passed on from one generation to the next. These knowledge systems and practices are critical to indigenous peoples' survival, and are increasingly being recognized as viable and alternative solutions to many of the modern world's problems.

Indeed, the United Nations Permanent Forum on Indigenous Issues (UNPFII) recognized the role of indigenous peoples and their traditional knowledge when it pronounced that "Indigenous peoples are vital to, and active in, the many ecosystems that inhabit their lands and territories and may therefore help enhance the resilience of these ecosystems…[T]hey interpret and react to the impacts of climate change in creative ways, drawing on traditional knowledge and other technologies to find solutions which may help society at large to cope with impending changes."[1]

As articulated by the UNPFII Chairperson Victoria Tauli-Corpuz, "indigenous peoples have demonstrated their resilience and their capacity to adapt to changes happening in their communities and they have accumulated substantial experiences and knowledge in this process."[2]

In the past, these knowledge systems were the indigenous peoples' defense against the onslaught of colonialism and the pernicious effects of modernization and globalization. Today, these knowledge systems are being revitalized, and in certain cases, revived in the face of the devastating impacts of climate change.

These case studies were done in two indigenous communities in the Philippines. The general objective is to describe indigenous peoples' perspectives, approaches and mechanisms to address climate change at the village level; and to demonstrate how securing stewardship and legal ownership of ancestral domain helps efforts in climate change adaptation and mitigation.

## CASE STUDY 1: Revitalizing traditional knowledge systems and practices in climate change adaptation among the Calamian Tagbanua in Coron Island

Stretching for about 32,400 kilometers, the Philippines has the longest coastline in the world (Perez 1994). About 70 per cent of the country's municipalities share this coastline and there are approximately 50 million people living in Philippine coastal areas that are at risk from the impacts of extreme climatic changes such as sea level changes and degradation of coastal and marine ecosystems.

In an assessment conducted by Perez (1994), the most valuable ecosystems consisting of mangrove and coral reefs would

be severely affected with increasing rainfall and upstream run-off. Mangroves in the country have decreased from 450,000 hectares to 100,000 hectares. And while coral reefs have also been affected by rise in sea surface temperature, other man-made stresses are considered to have had a greater contribution in the destruction of the corals. The most serious anthropogenic stresses include sedimentation, pollution, and physical alteration of coral reefs (Ibid).

Recent reports and studies nationwide depict unstable changes in weather patterns that may result to natural disasters. With unprecedented increase in precipitation and rise in temperature, the Philippine coastal resources sector is expected to be exposed to more frequent and intense coastal hazards because of sea level rise, strong storms and tide.

In 2004, the Working Group on Climate Change and Development published reports that the province of Palawan in the Philippines ranked as second most vulnerable province in terms of land areas that are at threat from sea level rise. Located at the southwestern portion of the Philippine archipelago, Palawan is composed of 1,800 islands and is also known as the "last ecological frontier" (Sampang, n.d.) in the country. It is bounded by the South China Sea on the west and the Sulu Sea on the east. A one meter rise in sea level is projected to inundate 6,428 hectares of land in the province (Jabines and Inventor 2007).

Inhabiting a coastal region that is part of Palawan, the indigenous peoples of Coron Island are inevitably exposed to and affected by natural disasters attributable to climate change. This study documents the traditional lifeways of the Calamian Tagbanua and how people make use of their indigenous ecological knowledge to cope with changes in their ecosystem even with the advent of climate change.

## *Coron Island, Palawan*

Coron Island is part of the Calamianes group located in the northernmost section of Palawan. The Calamianes Group comprises three major islands namely: Busuanga, Culion and Coron. Coron being the capital of the province is also considered as the gateway to Palawan.[3] It is a limestone island that is home to the Calamian Tagbanuas (Farhan and De Vera 2004) and a constant attraction to tourists, local and international. It is covered with unexplored rainforests, cliffs and secluded lakes.

Generally typhoon-free, the area has two seasons: wet and dry. The island is under the influence of two monsoons dividing the wet and dry seasons. The southwest monsoon, which is usually the rainy (wet) season, is from June to November. The northeast monsoon is the dry season and starts from December to May. The Tagbanua call the southwest monsoon and northeast monsoon *kamian* and *abagat,* respectively. The months of September and October are characterized by gradually decreasing amounts of rain.

Coron can be reached by small aircraft with daily 55-minute Manila to Busuanga flights. From Busuanga, a service van can take visitors on a 45-minute ride to mainland Coron town. The place can also be reached by boat for a ride that could take more than 12 hours.

Coron Island was designated as Tourist Zone and Marine Reserve by virtue of Proclamation No. 1801. It is composed of two *barangays* (villages), namely, Banuang-Daan and Cabugao. The latter has an island sitio called Delian located at the southeastern section of Coron.

This study was conducted in the villages of Banuang Daan and Cabugao. The two villages are accessible by public and private pump boats from central Coron. Using the pump boat, it takes about 30 to 45 minutes to Banuang Daan (composed of 6 sitios) and about 60 to 90 minutes to Cabugao (composed of 7 sitios). The entrance to these villages especially Cabugao is through a small cove lined with mangrove forests.

**Figure 1.** Boat used by Calamian Tagbanua for local transport within Coron Island.



Each village has a number of government-run facilities like a day care center, health center, elementary school, a village hall, and basketball court. Some churches were also established in the community by missionaries. There is no electricity in the island, although some of the sitios have generators that operate from 7 to 11 in the evening and some make use of solar powered light bulbs. At the time of the research, only two families had television sets which were open to the public.

The literacy rate in these two villages is low—only less than 20 per cent of those who are able to attend school finish elementary education, and even fewer proceed to secondary school. Poverty is certainly a reason for the inability of students to finish school, but the fact that there is only one public elementary school in each barangay, with only up to 5th grade, is also a factor. Because of this, parents must send their children to the mainland in order to finish both elementary and second-

ary education[4] and this usually is a costly venture for many of the families.

Official census data as of year 2000 show Banuang Daan had a population of 546 people, consisting of 101 households, and Cabugao had a population of 1,696 people, with 319 households.

## *The Calamian Tagbanua*

The Calamian Tagbanua people who live in the two villages of Banuang Daan and Cabugao are different from the Tagbanua who inhabit the villages of mainland Palawan. The Calamian Tagbanua are traditionally a seafaring people who obtain most of their resources from the sea rather than form Coron Island's forests. In contrasts, the mainland Tagbanua people are shifting cultivators. The anthropologist Robert Fox has established that Calamian Tagbanua have inhabited Palawan and Calamianes group of Islands for nearly 3,000 years (Fox 1982).

The Calamian Tagbanua have a strong regard for their ancestral domain, the importance of which is beyond its physical features. They consider their ancestral domain not only as a territory but also as part of their history and cultural identity (Aguilar n.d.). It is an embodiment of their experience, struggles, social relations, and identity as Tagbuana.

As a seafaring people, the lives of the Calamian Tagbanua revolve around the *awuyuk* or *aawuyuk* (lakes), *talu* (corals), *teeb surublien* or *teeb sorableyen* (ancestral waters), *leyang* (caves), and *geba* (forest).

Most of the Calamian Tagbanua engage in two important livelihood activities as sources of income: fishing (*pangangawil*), and swiflet's nest gathering (*pagbabalinsasayaw*). Other sources of livelihood like swidden farming (*pagkakaingin at pagtatanim*), seaweed cultivation (*pagtatambalang*), mat weaving, and ecotourism are also practiced. Hence, although the Calamian

Tagbanua base their livelihood activities mainly on subsistence, they also engage in some market-based activities. These economic activities vary depending on the two seasons of *kamian* and *abagat*.

The first season *kamian*, which approximately lasts from December to May, is a period of hard work. This is the time when people get busy with various agricultural activities like preparing and clearing land (*pagkaingin* and *pagdulok*), planting of crops (banana, cashew, *kamoteng kahoy*, *kamoteng baging*, and *langka*), and weeding of cashew farms. This is also the season for pagbabalinsasayaw for those who have clan caves.

Abagat, the second season from June to December is devoted to work in the sea where pangangawil and pagtatamblang are done. Men do fishing by groups in three reef areas: *talung dakulo* (big reef), *talung gesye* (small reef) and the reef known as *nataktakan*. Together, the fishermen may explore farther areas during low tide and return at high tide (Mayo-Anda, Cagatulla and La Viña n.d.)

The community harvests more from the sea than from the forest. This generally involves subsistence fishing, getting only what they need for the day (only a few families are involved in commercial fishing).

To catch fish, fishermen use simple methods and tools like *kawil* (hook and line), *pana* (spear) and *lambat* (small nets), and these effectively limit the harvest. This means that families just have enough for household consumption. They also preserve fish (through a traditional method using natural sunlight and salt) to prepare for the period of *habagat* when fish catch is scarce.

There was a time when fisherfolk can catch 30 kilos of fish even with the use of simple tools like a bamboo fishing rod or a spear. Today, they consider themselves very lucky if they could bring home a 5-kilo catch after sailing farther away from the shore.

Traditional knowledge guides fishing and foraging. Certain areas are delineated as fish sanctuaries and sacred areas such as the *panyaan*, and these have been incorporated in the Ances-

tral Domain Management Plan (ADMP). Fishing within the panyaan is prohibited, and is in fact avoided by some because of the belief that a giant octopus (*pugita*) lives there (ADMP 2003). The people do fishing during abagat because this is the season when the sea is calm.

The Tagbanua also subsist on pugita (octopus) and on *kurut* and *kapari* (edible wild tubers), which they gather through foraging. Kurut and kapari, like rice, are staple food for the Tagbanua. These edible root crops form a significant proportion of the diet for majority of the population. Other root crops like *kabuan*, kamoteng kahoy, t*agya* (cassava), *ube* (yam) and *arado* (flour plant) are also sources of carbohydrates for the people.

**Figure 2.** Kurut/burut, is a major root crop for the Calamian Tagbanua and is important during habagat when fish is scarce.



The sale of nests of Pygmy swiftlets (*Collocalia troglodytes*), or balinsasayaw, is the most important source of cash for the people. These edible birds' nests of the balinsasayaw are highly sought by the Chinese middlemen in central Coron who export them to Asian countries. The swiftlets' nests are owned by the person who discovered it. Ownership means exclusive rights to the nests in a cave, and these rights are passed down through generations.

The nests can be harvested by climbing the steep caves nestled on top of rugged cliffs (Dalabajan n.d.). After the eggs hatch, the Tagbanua carefully gather the first nest and allow the balinsasayaw to build a new nest on the same spot (if not properly done, the bird will not build another nest). They can sometimes harvest three nests one after the other in the same spot. As an important resource, the people are keen on protecting the numerous limestone caves in Coron Island by observing community norms and values (like declaring some areas as sacred and should be left "untouched").[5]

To protect their forest and to ease their problem on irrigation only small patches of land are devoted for *kuma* (swidden farm). Rice and cashew are grown in the kuma. Cashew (*Anacardium occidentale L.*), locally known as *kasoy,* is the main crop for trade and income generation[6] while rice is usually cultivated only for family consumption. Other crops are likewise cultivated within their backyards like *kamoteng baging* (sweet potato) and root crops like burut or kurut. The people have learned to domesticate these crops from the forest to cope with food shortage during habagat.

On the other hand, mat weaving is traditionally done by women to supplement family income. Most of them do this at home while looking after their children and while their husbands are out to catch fish or gather swiflets' nest.

Recently, *tambalang* (the seaweed carrageenan), was introduced by a migrant as an alternative source of livelihood year round. The people have eventually adopted pagtatambalang as an additional source of livelihood seeing its potential to generate cash for the family. Around 300 hectares of cove water in Barangay Cabugao have been planted with the seaweed. Pagtatambalang is a family-initiated livelihood activity (each family is estimated to cultivate an average of two to three hectares of seaweed farms) involving most of the women in the community. Seaweed cultivation does not only provide income for the families but also helps prevent pollution. Families with seaweed farms also help secure the area from illegal fishing activities.

Because of its natural beauty, the territory of the Calamian Tagbanua people has been bustling with tourism-related activities. To protect their lands and waters, the people agreed to open the Kayangan Lake[7] and the Barracuda Island[8] for tourism in 2004, but only on a limited scale where they collect fees from the visitors and allow them to stay only for several hours.

Such a pattern of how people use and manage their resources shows a natural cycle of living that sustains a collective way of life among the Tagbanua.

**Figure 3.** The Tagbanua's annual subsistence cycle

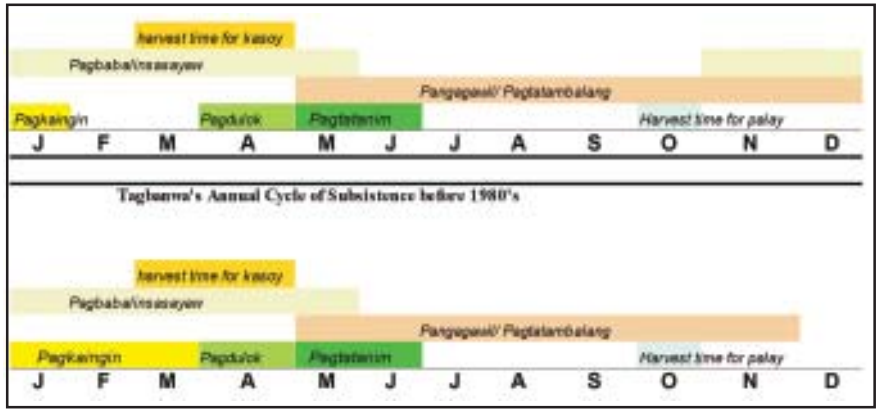



Figure 3 shows roughly a trend in the annual subsistence activities of the people before and after the 1980s. The following significant changes may be drawn:

- Fishing activities now end in the month of November due to observed rough conditions of the sea in December (some individuals still attempt to catch fish during this month but they only venture near the coast);
- Nest gathering has also changed. It used to start as early as November but is now done at the latter part of December because the sea is not as calm as it used to be (they need to cross the sea to get to some caves in the area). If the sea is still turbulent, they do it in January.

- Kuma or pagkaingin (swidden farming) is now extended up to the month of March due to unpredictable weather; and
- Seaweed cultivation has become an important livelihood for the Tagbanua.

## *Securing the Ancestral Domain*

The story of the Calamian Tagbanua shows a people who have endured intimidations and abuses from powerful forces whose intention was to exploit and gain from the rich resources of indigenous peoples. The struggles of the Tagbanua to defend their territory are reflected in the epic tales of two heroes, *Ti Makarere* and *Ti Natambak*. These are important accounts about Tagbanua warriors who had defended their territory from foreign Muslim and Spanish invaders.[9] Since then, the people have stood in unity against any invasion from outsiders in order to protect their territory and their traditional way of life.

To defend Calamian Tagbanua integrity and identity and protect their cultural heritage, and after years of being ignored of their rights, the Calamian Tagbanua community fought to obtain their legal claim on the land and waters that have been nurtured by their ancestors.

The first thing they did was to form a people's organization, the Tagbanua Foundation of Coron Island (TFCI), through the assistance of the Philippine Association for Intercultural Development (PAFID) in 1985. TFCI is led by the founding members, the council of elders and the barangay officials of Cabugao and Banuang Daan. This organization played an important role in their claim for their ancestral territory. The application process for the Certificate of Ancestral Domain Claim (CADC) started in 1996 and it took two years before they got the certificate numbered R04-CADC-134 in 1998.[10] Table 1 shows the highlights of the Calamian Tagbanua CADC/CADT application.

**Table 1.** Highlights of the Calamian Tagbanua struggle for their ancestral domain

| Date | Events |
|---|---|
| 1967 | To protect its valuable resources, Coron Island was declared a Natural Reserve by virtue of Proclamation 219. |
| 1978 | Proclamation 1806 declared the island a Tourist Zone and Marine Reserve. This led to the transfer of management of the island to the Philippine Tourism Authority which later implemented a tax policy that caused the Calamian Tagbanua to lose their ownership of the clan caves where they gather swiftlet's nest.<br><br>Proclamation 2152 declared the entire province a Mangrove Swamp Forest Reserve. |
| 1985 | Through their organization, the Tagbanua Foundation of Coron Island (TFCI), the people filed an application for a Community Forest Stewardship Agreement (CFSA) to the Department of Environment and Natural resources (DENR) covering the islands of Coron and Delian. This was in response to the public bidding (auction) of the clan caves initiated by the municipal government in the 1970s. |
| 1990 | A CFSA was issued by the DENR to the TFCI, covering about 7,748 has. The granting of CFSA to TFCI inspired neighboring Calamian Tagbanua clans living in other villages. |
| 1992 | Passage of NIPAS Act, which made Coron Island a priority protected area. The passage of the Act strengthened the plan of the Calamian Tagbanua to include vital areas that are part of their ancestral domain which were not initially included in the CFSA. |
| 1993 | On February 19, 1993, 7 Coron barangays applied for CADC with the CENRO (Community Environment and Natural Resources Office) and asked support from the Palawan Council for Sustainable Development (PCSD), the mayor and other municipalities. This year marks the beginning of a unified action of the Calamian Tagbanuas in securing their right for ancestral domain through the forming a federation called SARAGAPUNTA (which is derived from the word *saragun*, meaning "let us gather"). |
| 1997 | Passage of the Indigenous Peoples' Rights Act (IPRA). |
| 1998 | On June 5, Coron Island was recognized as an ancestral domain with the issuance of CADC No. 134 to the Calamian Tagbanua consisting of 22,400 hectares of land and waters.<br>The awarding of CADC to TFCI etched a historical milestone in the life of the Calamian Tagbanua. For them, this is the start of a more meaningful stewardship over their resources. |

| | |
|---|---|
| 2001 | On February 15, the Calamian Tagbanua of Coron Island finally obtained their certificate of Ancestral Domain Title (CADT), a victory not only for the Calamian Tagbanua but to all the indigenous peoples in the country. |
| 2002 | Implementation of the provisions in the CADT was delayed because of criticisms from some sectors. Eventually, the NCIP (National Commission on Indigenous People) issued AO no.1 series of 2002 which upheld the validity of the CADT. |

The CADC gave the Calamian Tagbanua a legal leverage to confront the *dayo* (outsiders) such as tour operators and migrant fishermen who continue to disregard Calamian Tagbanua traditions and customary laws pertaining to water resource use. Covering 22,284 hectares, the Calamian Tagbanua's CADC holds the distinction of being the first ancestral waters claim ever granted in the Philippines. The Calamian Tagbanua's CADC covers the 8,000-hectare Coron Island, including a 236-hectare portion of Delian Island.[11]

The Calamian Tagbanua's ancestral waters include sacred areas, ancestral fishing grounds, fish sanctuaries, diving areas, tidal flats, sand shoals, atolls, and deep sea areas around Coron and Delian Islands. The map in Figure 4 was produced by the Tagbanua community with the assistance of PAFID.[12] The ancestral land areas included settlements that contain the home of the Tagbanua's ancestors (Zingapan and De Vera 1999). Three years after being awarded the CADC, in 2001, the Calamian Tagbanua finally received their Certificate of Ancestral Domain Title (CADT)—an instrument that finally recognizes customary tenure. For fishing and foraging communities like the Calamian Tagbanua in Coron Island, securing the right to their ancestral domain is vital to their everyday life. The CADT is thus an important instrument that the Calamian Tagbanua could use to fully assert their traditional rights over their ancestral domain.

**Figure 4.** Map of the ancestral domain of the calamian tagbanua.



## *Calamian Tagbanua's Perspective on Climate Change*

The Calamian Tagbanua acknowledge that there has been a change in the climate especially in the 1980s. They have identified the following as indicators of climate change, and the year they think the change started happening in the community: irregularity of rainfall (1980); warmer weather (1981); drying of wells (1987); rise in sea level (2008); and warmer sea (1990s).

A related indicator has to do with rest and leisure. For instance, three of the women respondents lament today's inability to enjoy sleeping in the beach to relax even during noontime because of the intense heat of the sun. This used to be a favorite recreation by the people in the community. They said that the weather has become warmer and the sun has become more intense (*Ang kinit ay masyadong makinit, pwerte pagkinit yang kaldaw*).

The intense summer sun is also causing their plants to dry and die. Gone are the days when they wake up to fog and the smell of the forest especially in the month of December. They believe that the heat of the sun has also caused the drying out of most of their water sources. According to a Tagbanua elder, these changes in the climate are happening because "the world is getting old."

Both natural and human activities are blamed for climate change. The respondents believe that human activities contributed a lot to the destruction of some resources, and these are often committed by the *dayuhan* (outsiders) or non-Tagbanua. However, the Tagbanuas admit that some of them have done damage to their resources with the influence of dayuhan (e.g., dynamite fishing).

Community respondents identify the following human activities that aggravated the destruction of the leyang (caves), the talu (corals), the teeb surublien (ancestral waters) and the geba (forest):

- Destruction of rocks by the migrants where the balinsasayaw lives;
- Extraction of sand in the beaches for personal use especially in the western part of the island;
- Use of dynamite and other chemicals in fishing;
- Over fishing; and
- Illegal logging.

In general, the Calamian Tagbanua relate climate change with other environmental and social problems. The scarcity of coastal resources due to climate change is causing so much destruction and irreparable damage to the inhabitants of the island. They see the impacts of climate change as some sort of punishment for people's greed, selfishness, lack of spirituality and disrespect for sacred places or violation of taboos such as fishing near the awuyuk (lakes created by sinkholes atop the cliffs deep enough to connect to the sea), panyaan (sacred marine areas found in various locations around the island), and the *sanktuario* (nesting ground for fish). For them, climate change is a warning to the people who are causing so much destruction to nature.

## *Impacts of Climate Change*

Like all indigenous peoples, the Calamian Tagbanua's life is inseparable to their natural environment. Hence, the impacts of climate change to the Calamian Tagbanua could be seen in the way they understand and interpret signs from the environment. For example, the people's day-to-day activities are guided by what they can predict and analyze about the weather (see Table 2).

Such reliance on traditional knowledge is important as this has been handed down to them by their ancestors (*ninuno*). Unfortunately, climate change has gradually compromised some

**Table 2.** Calamian Tagbanua traditional weather forecasting

| Reference | Interpretation |
|---|---|
| Stars | • The reference star is big, red in color and bright.<br>• When this star does not shine brightly in the night then this means that the sea is not calm.<br>• When the star shines brightly then the sea is calm. |
| Moon | • When the moon is not shining brightly then it means that the sea is not calm and the weather will not be good the following day. |
| Sunset | • When the sun sets, the clouds turn red. If this color disappears quickly, then it means that a bad weather is expected and the sea will not be calm the following day. |
| Bakawan Tree | • Leaves of the Bakawan tree turning yellow means bad weather is coming. |
| Any Tree | • A tree that suddenly falls without cause means there will be bad weather the next day. |

*Source: Rice, 2000*

of these knowledge systems. Because of the increasing unpredictability of weather conditions, the elders are losing confidence in their ability to interpret their environment. The decreased reliance of the people on their local understanding of nature is one indication of the many changes taking place in the Tagbanua world.

According to the respondents, the most significant impacts of climate change to the Calamian Tagbanua are the following:

- unpredictable weather patterns;
- warmer weather and drought;
- sea level rise;
- warmer sea; and
- increased vulnerability to environmental hazards.

## *Unpredictable Weather Patterns*

The Calamian Tagbanua make predictions about the weather using local knowledge and experience. However, the people lament that the weather has become unpredictable and difficult to understand: *Magulo ang panahon ngayon; minsan madalas ang ulan, minsan wala namang ulan* (The weather is now unpredictable; sometimes, it often rains, sometime it does not). The unpredictability of the weather was first observed in the early 80s but they say that weather changes have become more frequent in the 90s up to the present. The manifestations of these, according to the respondents, are the irregular occurrence of rain (sometimes the rain comes earlier than expected or much later as it used to) and the increasing intensity of the sun.

With these changes came notable decrease in crop yields especially during the drought in 1989. Most of their crops like banana and kamoteng baging dried up even before harvest time. The quality of some crops was also adversely affected. According to the respondents, their staple food kurut has decreased in size and even the taste has changed. The intense summer sun also dried out their crops especially some green leafy vegetables like *talinamnam, pechay*, and kamoteng baging which are grown in the backyard.

To cope with the early occurrence of rain, those who have kuma finish their land preparation and land clearing in the month of January and wait for the first drop of rain before planting. Unfortunately, they have not developed a way of protecting their cashew farms from the early onset of rain especially when the cashew trees are in the flowering stage. They simply make it a point to visit their cashew farms as often as possible during the rainy season in order to monitor their growth.

## *Warmer Weather and Drought*

The increasingly warm weather that is being felt in the region started in 1981, and the people blame this for the 1989 drought (this phenomenon was felt in the entire country). The drought was considered by the people as one of the most disastrous climatic events in their history. This crisis brought so much worry and concern to the people. It resulted to shortage of fresh water in the community. The respondents said that the intense heat of the sun seemed to have absorbed all their fresh water in their wells (*Parang hinigop ang aming mga balon*). The wells dried up for several days and they resorted to looking for other sources of water. Elders of Cabugao shared that they spent sleepless nights gathering water from other distant sources. The men in the community were also asked by the elders to look for other water sources while the women stayed in the community to look after their children. The people admit that water scarcity is a growing problem in the community, especially during the dry season.

There were other problems, too, like decrease in crop yield and decline in fish catch. Interviews with community elders generated the following sentiments which summarize the impacts of the drought on the Calamian Tagbanua:

> "We have experienced warm weather in the past but the one we felt in 1989 was remarkable. It was one of a kind; maybe this is already El Niño as we heard from the news."
>
> "The temperature was so intense then that it could burn the skin. Almost all of us stayed inside our houses especially at noontime."
>
> "Our trees dried up; young trees died and some of our agricultural crops like kamoteng baging and bananas were damaged."
>
> "We had watched our wells dry and spent sleepless night taking turns in fetching water from distant water sources that had managed to survive the drought."
>
> "When this El Niño arrived, it had spread a swath of devastation leaving us helpless, though no human life was lost."

Illegal fishing[13] and excessive use of chemicals (like cyanide) and dynamites, used to be just their main concerns. These problems are being addressed but now, even after the devastating drought in 1989, climate change continues to aggravate the situation.

Even today, the intense heat of the sun causes the people to end their fishing activity earlier than usual because they feel as if their skin is being burned (*parang sinusunog ang balat*).They also observe that the condition of the sea is becoming unsuitable for navigation like they used to do especially during the month of December. The respondents believe that one way of reversing the declining trend in fish catch is for the people to go back to the use of traditional ways of fishing. They argued that if traditional methods had been used continually then there could have been less damage to marine life.

The tambalang (seaweed) farm of the people likewise suffered from the effects of climate change and pollution.[14] In 2005, the seaweed farming activity of the Tagbanua was interrupted because their coast water was contaminated with cyanide, making it unfit for growing tambalang. Seaweed cultivation was stopped for two years as they waited for the coast water to undergo natural cleansing. The respondents are worried that if the people will not stop using chemicals in fishing, then this will permanently damage their seaweed farms, and that this source of livelihood will eventually vanish. Coral reefs in the island have also been severely damaged[15] contributing to the decline in fish harvest.

The warming weather is also blamed for the decline in the harvest of swiflet's nest, as it pushes the birds to build their nests elsewhere. This makes it more difficult for the *busyador* (a trusted family relative assigned to gather the nests from clan caves) to perform this task.

## *Sea Level Rise*

The rising sea level was first observed in 1987 which they based on the waterline that marked the limestone cliff around the island. They said the most recent increase in sea level that they observed was in 2008, they estimated that the increase was from six feet to 8.4 feet.

The rise in sea level that took place did not cause casualties or considerable damage to property. However, there is fear that worse things might happen like flooding, if the rise in sea level continues. A *mepet* (an elder) believes some islands might be submerged with continuing sea level rise. One *mamepet* (council of elders) admitted being disturbed by the flooding that occurred in 2007 at villages Turda and Delian, in which some houses and agricultural lands were destroyed. The flood followed several days of raining. No lives were claimed because the people were able to evacuate from their houses, moving out to higher places.

## *Warmer Sea*

With the warmer weather, people also notice a rise in sea temperature. The change was most felt in June of 2008. Some informants claimed that they actually felt the heat of the sun warming the sea water almost four meters down from the surface. They said that this has never happened in the past. According to the respondents, the increase in sea temperature created a feeling of discomfort among the people because they believed that such a change could harm marine life. They know that a warmer sea could destroy breeding grounds as well as the coral reefs where fishes and other marine life feed on, and this could eventually lead to a decline in fish catch.

## *Increased Vulnerability to Environmental Disasters*

Environmental disasters are likewise considered as another threat to many coastal communities due to a rapidly changing climate.[16] The respondents said that they have not experienced strong typhoons yet but they are aware that they are becoming more susceptible to typhoon-related risks. They said that the community will have to prepare for possibly devastating typhoons in the future especially since the weather has become so unpredictable. For now, the respondents said that they want to appease nature by avoiding acts that might cause damage and bring disaster to their communities.

## *Traditional Knowledge on Water Resources*

> *We can not live without our ancestral land and waters. They are part of our lives.*
>
> *- Apo Ben Aguilar*

Cordon Island, the Calamian Tagbanua ancestral domain, has invaluable resources that are utilized according to traditional beliefs and practices.

**Figure 5.** Identifying the different parts of Calamian Tagbanua's ancestral domain with the elders in Brgy. Cabugao.



The island is divided according to important traditional landmarks, which include the sacred sites (panyaan), nesting grounds (sanktuaryo), lakes (awuyuk), and reefs (bahura). The panyaan around Coron is believed to be the home of the manlalabyut[17] (giant octupos). The presence of manlalabyut implies that the ancestral waters are still uncontaminated and rich of marine resources. The place is sacred because these are the burial places of their ancestors. There are seven panyaan in the island namely:

- *Amlaran*: A wide stone located in the southern part of the island believed to be a drying area of the manlalabyut;
- *Pakerpan*: Derived from the word *kerep* o *makerep da*. Pakerpan literally means *Hindi na nakita ang bangka* (the boat has not been found). People pass through this

place without creating noise to avoid attracting the attention of the manlalabyut;

- *Pinsahe*: A square-shaped living stone standing beside the sea. This is found in the northeast part of the island.
- *Talay*: The name is derived from the beautiful flowers that abound the place with the same name. It is another sacred place avoided by the people because of the presence of deities;
- *Sanlaon*: This place is feared because of old stories about boats being attacked by the giant octopus. The elders believe that the monster was mad at the presence of intruders in the area. The people are warned not to venture into this place;
- *Maliis*: The word means brave and dangerous. The danger believed to be in this place could be tamed if the bawalayan will appease the spirits living in the area;
- *Lalawangan*: The place of the name was based on the shape of the precipice fronting this area, which looks like a *pandayan* or anvil.

Aside from being a burial ground of their ancestors, the panyaan also serves as a *mohon* (or landmark of their ancestral domain) that sets the boundary of their territory. The place is protected by the Calamian Tagbanua because of the bahura (reefs) that are found in the area.

The sanktuaryo is a favorite place of the Calamian Tagbanua to catch squid. While on board their small canoe, the Calamian Tagbanua throw the *ulang* (a wood attractively colored and shaped like shrimp) which serves as bait for the squid. Located in this area are the mangroves and other reefs that is a home for fish, seaweed and sea shells.

Awuyuk is another resource worth preserving for the Calamian Tagbanua. There are 13 awuyuk found in the island with distinct characteristics and hold unique names that embody their special features. The prominent ones include the Kayangan Lake and the Barracuda Lake which are the only lakes

open for tourism. Kayangan Lake is likewise rich in different species of fish like *kanutyukan* (needle fish), *ulang* (shrimp), and *bitanga* (shell). Artifacts like jars and other relics of their ancestors are also found in Kayangan. In the case of the Atwayan Lake, the place is rich in *nipa* and *atuway* (shells). Another awuyuk known as *Awuyuk ang Dakulo* (a giant octupos lives here) or Mother Lake, is the domain of the bravest supernatural being known to the Calamian Tagbanua as *Urso*. This is seldom visited by the Calamian Tagbanua. Another interesting lake called *Inaliteb* is characterized as the golden lake because its color turns gold when it is full moon and its water is flammable (Belen 2009).

**Figure 6.** Kayangan Lake is a natural wonder sustaining a generation of Tagbanua



The Calamian Tagbanua have also identified burial sites of their ancestors which are generally prohibited for them unless they are going to harvest balinsasayaw. These include *Ditingaw*, *Ataway*, *Sasalaran* and *Indanan*. These places are not open to the public and regarded as sacred, too, as a show of respect to their ancestors.

The Calamian Tagbanua live in the principle of sufficiency and greed for the bounty of the sea is a not a virtue of a Calamian Tagbanua. The people are guided by the following norm that has been handed down to them by their ancestors: "fish just enough for a day's meal with a little extra to share with the neighbors" (Rimban n.d.).

Everyone in the community is allowed access to the resources (including cliffs of the island, the valleys, the lakes, the rivers, as well as the mangroves) for as long as these are not abused. Forest resources are communally-owned and are governed by certain rules. For example, cutting trees near streams, springs, wells and the coast is prohibited. The Calamian Tagbanua recognize the value of these resources as watersheds which ensure irrigation for their crops and prevent soil erosion. The Calamian Tagbanua know the value of the mangroves as part of their ecosystem and are therefore given high value.

Saltwater is also an important resource. The Calamian Tagbanua have traditionally used saltwater as a treating agent (Mayo-Anda et al. n.d.). It is used in removing the poison from kurut, which is usually soaked in saltwater for days, washed, dried and soaked again until it is ready to be peeled, cooked and eaten. Seawater is also important in Calamian Tagbanua traditional herbal concoctions. It is cooked with guava leaves used to hasten the drying of wounds and also to counter drowsiness and vomiting. Saltwater is also used by the people to prevent *bukbuk* (wood boring insects) that normally attack two important materials for house construction: the nipa and the bamboo (ibid). These materials are soaked for at least one week to make them last for three to four years without infestation.

## *Implementing the Calamian Tagbanua Customary Law and the Ancestral Domain Management Plan: A Mitigation Strategy*

> *We, the indigenous Tagbanua of Coron Island found in Northern Palawan, imploring the guidance and authority of Father Creator, in order to be empowered with security, liberty and equality, and become an exemplary group of cultural minority who believes and understands the law of nature, and possesses a unique way of nurturing, protecting and managing the inherited ancestral domain for development, peace and continuous enjoyment and protection of all blessings, diverse life forms and natural resources embodied therein, do ordain the writing of this body of laws (ADMP 2003).*

In fulfillment of DENR's Administrative Order No. 34,[18] the Calamian Tagbanua prepared and submitted an Ancestral Domain Management Plan (ADMP) together with their CADC application. The ADMP contains the following important sections:

1. The Calamian Tagbanua Ancestral domain;
2. Resource utilization including identification of sacred places including certain spirits dwellings found in caves, lakes, corals, forests;
3. Traditional practice of private ownership and inheritance/transfer of properties;
4. Mechanisms and approaches to development projects;
5. The access and use of water and marine resources;
6. Indigenousness of the Calamian Tagbanua;
7. The composition of the Calamian Tagbanua Council of Elders[19] and the role of the *asemblea* (assembly of Calamian Tagbanua villagers) as the most powerful decision-making body, and the *Mama'epet* (tribal elders) as the governing body;

8. Calamian Tagbanua positions and responsibilities and TFCI committees;
9. Traditional punishments for illegal activities; and
10. Taxation for non-Tagbanua.

The making of the ADMP involved traditional processes allowing the Calamian Tagbanua ownership of its content. The tribal elders called for and got the full participation of all Calamian Tagbanua which was also useful especially when they decided to revive traditional systems and strategies of ancestral social control, sanctions and penalties (Dalabajan n.d.). In the ADMP, the Calamian Tagbanua delineated rules specifying prohibited fishing methods and other types of resource extraction within their domain. These rules are also congruent with Philippine national, provincial, and municipal legislations, for example, the prohibition on the use of cyanide and dynamite in fishing. The ADMP also strictly prohibits the following:

- The use any part of the ancestral domain by non-Tagbanua without permission;
- Catching yields by non-Tagbanua that exceeds sustenance or for commercial purposes;
- Selling and leasing of portions of land within the ancestral domain to non-Tagbanua without consultation and approval from TFCI;
- Fishing in sacred areas, lagoons and lakes.

These mechanisms are meant to counter illegal fishing activities that have been a perennial problem to the Calamian Tagbanua to avoid depletion of this marine resource. In a 1992 study, PAFID and Silliman University noted that, "the fish yield data indicates an average catch per unit effort (CPUE) of three kilograms per trip." It added that this finding supports the claim of the local fishers that harvest has been decreasing in Coron.

The ADMP also regulates all projects to be implemented in the Tagbanua Ancestral Domain. It calls for all projects, whether sponsored by the government, private corporations, or non-government organizations, to be approved by the TFCI in a

decision-making process that should involve at least 51 per cent of members (ADMP 2003). The ADMP further specifies punishment for illegal activities including types of fishing, deforestation, hunting, and seaweed farming. It also specifies the responsibilities and accountability of the Tagbanua and traditional penalties to be given out when found to have violated the rules. This includes the following (1) panglaw, a humiliating reprimand in front of the community; *(panglaw* is a traditional punishment where the offender squats with a bamboo pole at the back of his knees, and the bamboo pole is filled with grated coconut meat to attract ants); and 2) *bordon*, in this case the offender receives lashes from a mepet with the use of *yantok* (rattan cane). Even Non-Tagbanuas who commit violations are reprimanded by the panglao and bordon, or else pay an appropriate fine (ADMP 2003).

The key responsibility of the Calamian Tagabanua is to "protect, manage, and control the land and water, all natural resources and biological diversity found within the ancestral domain" (ADMP 2003). Thus, they assigned tasks to patrol the forest and the sea to prevent and to stop illegal activities. Committees within the TFCI Council are created and tasked to address the following issues: 1) paralegal officers for land-based activities; 2) patrolling people for the forest and sea; and 3) Trainings with indigenous experts such as holders of health knowledge, sacred places, etc. (ADMP 2003). To further preserve the "sacredness" of their homeland, they have formulated the following rules:

- The burial grounds are prohibited to use for other pursposes and are not open to the public;
- Fishing in sacred places is prohibited;
- It is prohibited to gather nest of balinsasayaw if its *inakay* (brood) are still very young;
- Ownership of caves where the balinsasayaw lives is through inheritance only unless these are discovered caves.

Similarly, in order to regulate the use of lakes and beaches the following rules are strictly being observed.

- Only small canoe is used for touring around the island;
- Beaches are regarded as sacred hence must not be exploited; and
- Quarrying or destruction of limestone rocks is prohibited.

The ADMP also stipulates the use of forest resources. It bans commercial logging in Coron Island, including the mangrove forests. It also prohibits the Calamian Tagbanua from cutting trees near streams, wells and coastline. At present, about 6,000 hectares is considered as sacred forest. These undisturbed forests are maintained by the community to protect wildlife and act as watershed for the replenishment of the lakes and the limited water resources in the villages. Specifically, the following are observed in the preservation of the forests and its resources:

- It is prohibited to gather all the root crops like kurut and kapari;
- Gathering of tubers must be from the root; the root system must be left intact and viable in order that the plant can continue to produce;
- Cutting of mangroves along the coast is prohibited;
- It is prohibited to uproot, damage and burn herbs and other medicinal plants;
- The use of *pandan* leaves must be regulated and this plant must not be over used; and
- It is prohibited to hunt *beyek, kalasyaw gesye*.

Enforcement of the above laws lies in the hand of the council of elders with the help of the barangay officials, the Calamian Tagbanua Tribe of Coron Island and the community as a whole. When an individual is caught violating any of the above provisions, a process of "investigation" is followed according to a traditional litigation system called *panglaw*. This starts with a complaint by any Calamian Tagbanua who had witnessed a violation or abuse. This is then reported to the council of elders

(mamepet). If the head of the mamepet finds the case to be meritorious, the head of the elders will call a meeting and discuss the merits of the case. An investigation of the case will be carried out and put the offending party into trial. Any offender found guilty is meted out the appropriate punishment. While this process is strictly observed, the introduction of the barangay system of political governance has brought a change in the strength of the panglaw.

After the Calamian Tagbanua obtained their CADC in 1998, an offender—whether Calamian Tagbanua or non-Tagbanua—is given a choice if he/she wants to be punished under the panglaw system or through the existing legal system.[20] It is, however, a priority of the elders to implement the panglaw system especially if the offended party calls for the traditional system to be implemented. Solomon Aguilar, one of the elders and a research respondent, strongly advocates for the revival of the panglaw system as he believes that this is more effective in punishing violators of illegal fishing and other abuses done by man to nature. He is also sad that respect for the elders is slowly diminishing and he is afraid that elders like him will no longer be part of decision-making processes. He attributes this to inability of the people to avoid the dominant legal system as well as the fact that the people have lost respect for the elders.

## *Challenges*

The political and economic issues besetting the community are now interfaced with problems attributable to climate change. Because of the complexity of the problem, the people realize the importance of improving their adaptive capacity. But in order to move forward in addressing the need to improve their adaptation and mitigation efforts, there are certain urgent issues that they need to resolve. These include:

- Ownership claims over a portion of the ancestral domain by a certain clan. The said clan does not recognize the decision of the mamepet declaring their claim to be moot and academic because the land is part of the ancestral domain. While this issue brings mixed feelings of dismay and discomfort to the community, the people are hopeful that will eventually be resolved;
- Excessive and intense commercial fishing that use destructive fishing methods, including the use of cyanide as well as dynamite fishing;
- Lack political will of the government to punish abusive individuals;
- Respect and recognition for their customary laws and indigenous punishment; and
- Problems brought about by ecotourism. Ecotourism as a development strategy is being promoted by both the national and the local government (LGU), leading to the construction of infrastructure and roads. Tourism activities like snorkeling and diving, and noise and pollution[21] caused by visitors, have adverse effects on the traditional livelihoods of the Calamian Tagbanua.

## *Conclusion*

The Calamian Tagbanua possess rich but vulnerable marine and coastal ecosystems that need to be protected from overexploitation. Like fellow indigenous peoples living in various ecosystems in the Philippines, they are sensitive to the different changes occurring within their territories. Some of their traditional problems like destructive fishing and ecotourism are now compounded by the impacts brought about by climate change. The 1989 drought, sea level rise, increasing sea temperature and warmer weather are just some of the climatic changes that have brought devastating impacts in their lives.

As shown by this study, the people have recognized that their best weapon in protecting their territory is through the adherence to their customary laws and practices, and with guidance from the community elders. Their customary laws and traditional knowledge on the sustainable use of resources are embodied in the ADMP which they themselves helped formulate, even though the implementation of some of its provisions are compromised by the national government's imposition of its priority agenda, especially in its pursuit of ecotourism in the area.

Fortunately for the Calamian Tagbanua, they have a history of resilience and collective struggle that have brought them victories in the past. One of this is their being able to obtain the CADC and CADT for their ancestral domain. With these experiences, the Calamian Tagbanua are hopeful that their knowledge systems and their collective spirit as indigenous peoples will see them through the problems brought about by climate change and other challenges.

## CASE STUDY 2: The Ikalahan, their Forest and Climate Change

In 1974, the Ikalahan became the first group of indigenous peoples in the Philippines to establish their legal tenure over their ancestral land through a communal lease agreement with the government. They were the first holder of a Certificate of Stewardship Contract (CSC) in the Philippines. In the process of developing their forest reserve, they set aside watershed, animal and other wildlife sanctuaries within their forest. As such, they have provided environmental services not only to their own village but to their neighboring communities as well. However, they have not received any acknowledgment or any form of reward for these good practices.

As forest dwellers who want to maintain and protect their forest, the Ikalahan bear the burden of providing for their economic self-sufficiency. This section aims to highlight how the Ikalahan were able to manage and sustain their forest for more than three decades while taking care of the needs of their people. Likewise, this paper will describe the process of the setting up, and present updates on the initial stages, of the carbon sequestration and carbon trading project of the people.

This study focuses on the Ikalahan people who are under Cluster I of the entire Ikalahan ancestral domain and whose forest management is under the Kalahan Educational Foundation (KEF). The discussions will include mainly the events from the 1970s sometime before the signing of Memorandum of Agreement (MOA) No. 1 to the present negotiations on their Clean Development Mechanism and voluntary carbon markets. MOA No. 1 was the first agreement ever signed between indigenous peoples and the government on forest management. The MOA states that the government relinquishes the management of the Ikalahan forest reserve to the local community and in return, the Kalahan people are to protect their watershed. The MOA is a result of years of struggles of the Ikalahan in asserting their right to access, control, and management of their reforest reserve.

## *Introduction*

The Ikalahan[22] (people of the forest) are one of the many groups of people living in the Cordillera and Caraballo ranges (Rice n.d.). They came from the proto-Benguet group of people. They are found in northern Luzon of the Philippines but are mainly concentrated in the province of Nueva Vizcaya and some part of Nueva Ecija.

Some accounts in myths, folk stories, family genealogies, and previous studies have it that the Ikalahan first established their community in Tinoc, along the slopes of Mount Pulag, which now serves as the boundary of Ifugao, Benguet and Nueva Vizcaya Provinces. After some time, some of these people moved to the lowlands and some settled in Pangasinan. Others moved north to Ifugao province; then sometime during the mid-19th century, some Ikalahan families moved southwards again to Kayapa then to Salacsac, now a sitio of Maliko and down to Imugan. Increase in population, pressures on resources, search for livelihood opportunities, and World War II drove some Ikalahan to parts of Ecija and other barangays of Sta. Fe (Aguilar 1982).

The Ikalahan people have their own culture and history, while their language is similar to the Ibaloi and Pangasinan languages. However the Ikalahan and the Kalanguya of Ifugao speak the same language, and they recognize each other as belonging to a single ethnolinguistic group (Kaneko et al. n.d.). Despite Spanish, American and Japanese occupation and domination of the Philippine archipelago, they managed to retain independence.

The Ikalahan have always believed in the presence of a supernatural being that is the source of everything on earth. Even before the missionaries arrived in the area in 1960s, the people already had a great belief in *li-teng*. Li-teng, according to the elders, could not in any way be translated into another language without altering its true essence. In English, it could only be parallel to completeness or peace. For the Ikalahan, the

lands and other resources that they have protected have been very vital to the li-teng that they have been aiming for.




*Source: Provincial Panning Development Office, Nueva Vizcaya, 2009.*

The Ikalahan elders (*nangkaama*) have always held significant positions in the community. They have always been sought for their advice, not only on community issues, but on personal relationship conflicts, as well. They may not have a tangible and physical set up of a traditional court system but they do practice the *tongtongan* where community conflicts are being talked about and resolved under the elders' chairmanship and guidance. The position of an elder in the Kalahan is an achieved one. The people usually select (not through an election but by mutual trust and agreement) their elders according to their acute and critical judgment. Likewise, as privatization of property was not yet popular, wealth was somehow equated to a man's diligence and accomplishments in life (Aguilar 1982). As such, being well off could also be a requirement to become an elder.

The authority of the elders, however, slightly weakened with incorporation of the Ikalahan community to the lowland society and the emergence of new positions of authority such as the barangay/village officials. According to Aguilar (1982) in his study, there were instances when the elders could not cope with problems brought about by interactions with the lowlanders that needed dealing with government institutions and state laws. Similarly, under KEF (Kalahan Educational Foundation),[23] the roles of elders were slightly diminished. Villagers started to refer community problems to the Bord of Trustees of the KEF instead of the elders because the people were not able to make a distinction between a Trustee and an elder (Ibid). Hence, the tongtongan was placed under the chairmanship of the barangay officials. Nonetheless, the community court system remains a solid and well-respected institution in the Kalahan community.

The main manner of land acquisition is through use-rights, meaning, a parcel of land that a farmer has been tilling may be awarded to him through a stewardship agreement. Others, on the other hand, got their lands through cash purchase transactions from other members of the community. The most popular mode of land acquisition is through inheritance.

## *The Ikalahan and their Natural Resources*

The whole Ancestral Domain of the Kalanguya-Ikalahan (see next page) which is about 48,000 hectares, covers 26 barangays from the municipalities of San Nicolas, Pangasinan, Sta Fe, Nueva Viscaya and Caranglan (38,000 hectares in the province of Nueva Viscaya including the Kalahan Forest Reserve plus about 10,000 hectares in the province of Nueva Ecija (Kaneko et al. n.d.). The whole of the ancestral domain was subdivided by elders in the 1970s into four clusters for easier administration. Their clustering was based on geographical proximity and not on political boundaries.

Management of the whole domain is done by cluster. Each cluster is represented by its Constituent Peoples Organizations (CPOs) and activities are done according to their cluster plans and policies. Part of the total ancestral domain was the 14,730 hectares of the forest reserve that was recognized through Memorandum of Agreement No. 1 and was under Cluster 1 of the whole domain, managed by the KEF.

The area covered by the MOA was once considered to be public forest lands and is located in the Western parts of Sta. Fe and Northeastern parts of San Nicolas, Pangasinan (ADSSDPP 2005).

Cluster 1 covers six barangays, namely: Bacneng, Baracbac, Imugan, Malico, Sta. Rosa, and Unib which are among the 16 barangays of the municipality of Sta. Fe. This domain covers 18,896.33 or 47.19 per cent of the whole municipality that has a total area of 39,981 hectares. Along the Sta. Fe River and its tributaries are the barangays Baracbac and Bacneng. The barangays Imugan and Unib are found along Imugan River. On the mountaintop at the southern divide of the municipality, barangays Malico and Sta. Rosa are located.

**Ancestral domain of the Kalanguya-Ikalahan**

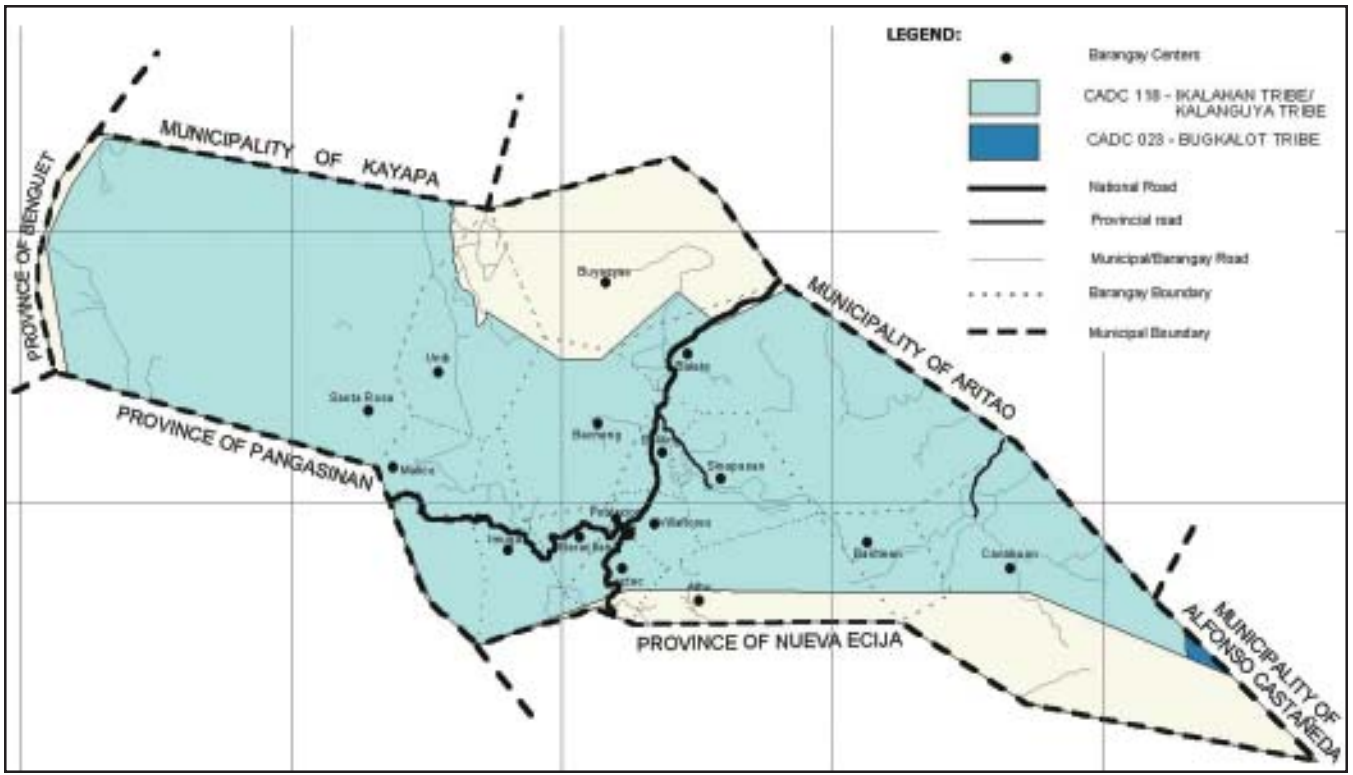


**Table 3.** Land area per barangay of Cluster 1

| Barangay | Land Area (in Hectares) | % of the total land area of the municipality |
|---|---|---|
| 1. Bacneng | 1886.76 | 4.72 |
| 2. Baracbac | 552.45 | 1.42 |
| 3. Imugan | 1304.41 | 3.26 |
| 4. Malico | 1617.86 | 4.04 |
| 5. Sta. Rosa | 10801.12 | 27.01 |
| 6. Unib | 2733.73 | 6.84 |
| **Total** | **18896.33** | **47.19** |

In 2003, a population census of the National Commission on Indigenous Peoples (NCIP) revealed that the total population in the whole ancestral domain is 15,554 with total household of 3,275. In the same survey, it was found out that the average density of the population was 505 persons per $km^2$. The population density is significant in determining the relationship between the population and the available resources.

The Kalahan Reserve, which totals to nearly 15,000 hectares, receives an approximate amount of rainfall from 3,000 to 5,000 mm per year. It is located in the steep mountain lands from 600-1,700 m above sea level. The reserve contains three major types of forests—pine forest on the western portion; dipterocarp forests comprise the eastern part; and mossy forest on the central portion (Murdiyarso and Skutsch 2006).

The soil in the entire reserve consists of thin, acidic topsoil on top of igneous materials (Rice 1994). These soils are highly erosive in quality but otherwise suitable for vegetable and root crop production when protected from erosion. Within the reserve, sanctuaries were set aside for watershed and for wildlife protection. Small swidden farms of up to three hectares each are interspersed with the forest stands.

A biodiversity analysis in the Kalahan Reserve in 1996 sponsored by the Biodiversity Conservation Network and the KEF revealed that at least 30 species of birds and 10 species of other animals, mostly bats and reptiles, are either on the CITES[24] or the IUCN[25] list of endangered species (WWF 1996). Likewise, a KEF inventory of flora and fauna has already identified 1,553 species of plants and more than 150 species of birds. Ten species of plants are considered endangered species and around 20 species of birds are in the process of identification. The inventory was one of the major arguments used by the KEF in rejecting the government-proposed national highway linking Nueva Vizcaya and Pangasinan and for it to be rerouted away from the Kalahan Reserve. Because of their data, backed up arguments, they won the case.

There are five watershed areas in the Domain namely; Sta Fe Watershed, Imugan Watershed, Buyasyas Watershed, Pampang Watershed, and Marang Watershed. In terms of catchment area, the largest is the Pampang watershed. It is a section of the larger catchment that originates in the north at Kayapa, another municipality of Nueva Viscaya. The Sta. Fe watershed is composed of many rivers and creeks that converge to the Sta. Fe River northward. The main channel of this area extending from Baracbac to Balete (another barangay in Sta. Fe) is highly deposited as the river valley experiences annual swelling, thereby, flooding banks and adjacent fields (MCLUP 2003-2013). These watersheds drain to the Pampanga and Agno River and to the Pantabangan and Magat Dam to the east.

The Kalahan Forest Reserve is providing benefits to the community as watershed and production forest. The Kalahan Reserve also serves as a sanctuary of more than 150 endangered species that include birds, orchids, trees, wild animals, and insects.

## *The Ikalahans' Battle to Land Tenure*

In 1968, approximately 200 hectares of land between San Nicolas, Pangasinan and Sta Fe were titled to lowlanders. The titled lands were part of the Ikalahan ancestral domain. These unfortunate events caused panic to the Ikalahan. The people filed a case in court to nullify the titles given to the moneyed owners. Initially, they lost the case. But in August 1972, with the help of the Commission on National Integration (CNI), an agency which was under the office of the President whose mandate was to protect the welfare of the indigenous cultural communities, they made an appeal and won.

Subsequently, in 1970, the government planned to develop 6,300 hectares of the Ikalahan domain to a vacation center to be called the "Marcos City," after then President Ferdinand Marcos. Some moneyed people showed fake land titles to the villagers for the purpose of grabbing land. Once again, the Ikalahan community filed a case in court for the government to recognize their land claims. The case was dismissed at the lower court but with the help of a retired lawyer Julian De Vera of the CNI, the people pursued the case in the upper courts and this resulted to the revocation of the lowlanders' land titles and abandonment of the plan for a vacation center in 1972.

In 1973, the Kalahan Educational Foundation (KEF) was established and was registered as a people's organization under the Securities and Exchange Commission by the elders with the help of an American missionary. Seven months after registration, the Kalahan Academy was built in answer to the people's need for education. The school was put up with the mission to maintain the cultural identity of the Ikalahan and prevent cultural erosion.

In 1974, the Ikalahan acquired legal land tenure from the government through MOA No. 1 for a 25-year forest lease with the government through the Bureau of Forest Development (now Forest Management Bureau). The agreement acknowledges 14,730 hectares of land to be managed by the occupants

through the KEF for a period of 25 years, renewable for another 25 years, in exchange for the protection of the watershed.

In 1996, Ikalahan elders submitted a petition for Certificate of Ancestral Domain Claim (CADC) to the Provincial Environment and Natural Resources Office (PENRO) in Bayombong, Nueva Vizcaya with the help of the Philippine Association for Intercultural Development (PAFID). In that same year, the PENRO recommended the granting of a CADC to the Ikalahan (Resurreccion 2003). The CADC covers 16 villages including Imugan where the KEF is located. Through 1996 to 1998, the KEF has attained domain claims in the adjacent provinces of Nueva Ecija and Pangasinan and has expanded their management activities to nearly 55,000 hectares in 1999.

All the stakeholders of the whole Ikalahan ancestral domain claim met and jointly, they did their Ancestral Domain Sustainable Development Plan and Program (ADSDPP) with the help of concerned government agencies. In this activity, the elders were consulted on the inter-barangay and inter-cluster boundaries. Upon completion of the ADSDPP, it was submitted to the NCIP in support of their petition to convert their CADC to a Certificate of Ancestral Domain Title (CADT). Finally, the Ikalahan CADT was approved in 2006.

## *Building the Kalahan Forest Reserve*

Like the other indigenous peoples in northern Philippines, the Ikalahan then did not distinguish between primary forests and secondary forests because their primary concern was watershed protection and not biodiversity (Rice 1994). However, after MOA No. 1, the Ikalahan elders and community members agreed to work on the protection of their watersheds as was explicitly mentioned in the memorandum. The KEF also had to come up with an agroforestry development plan, which was finished and submitted in 1977. Based on the plan, the KEF's reflected main thrusts include:

- The development of a balanced ecosystem which will provide adequate livelihood for the upland residents and generate funds for the Foundation;
- Utilization of new technologies in the processing and marketing of local products to enhance their value, which will eventually reduce the pressure on the land through improvement in incomes and employment; and
- The establishment of educational facilities which will emphasize forest resources management and ecology.

Then a newly established organization, the KEF had no funds to start with their reforestation activities. Their agroforestry started with donated labor, and subsequently, their efforts for research and forest improvement were maximized when they received funding from the Ford Foundation. They used their meager funds in acquiring needed seedlings and manpower for their reforestation project. Aside from Ford Foundation, they were also recipients of financial support from the Canadian International Development Agency (CIDA), PACAP Australia, Misereor (Germany), ICCO (Netherlands), USAID (USA), IDRC (Canada), and some other smaller funding agencies (Rice 2003). The members of the KEF board also decided that they hire local people and just work on the development of their skills rather than hire outsiders who are technically competent.

In coordination with the other communities, the Foundation continued the strict implementation of existing policies related to the protection and conservation of the forests within the area. They came up with a Natural Resources Development Program and Agro-forestry Rules and Regulations. The community rules include securing permits for new swidden farms, cutting trees and operation of chainsaws. In addition with this, there are also community rules for fishing, sanctuaries, watersheds, and hunting, as well as forest fires and illegal entry to the reserve.

The two primary forest areas within the Kalahan Reserve are surrounded by secondary forests and fallow fields. In 1975

the Ikalahan elders set them aside as Forest Reserves and watersheds in order to prohibit agricultural activities and soon established one of these areas as wildlife sanctuary in 1993 (Rice 1994). Accordingly, food seminars made people realize that many of the forest species are important to pest management in the area like many of the birds which are predators (WWF 1996).

## *Controlling Forest Fires*

Forest fires and illegal logging were rampant in the 70s and these were the first concerns addressed by the Ikalahan. The community elders, together with the KEF board, formulated community rules and ordinances to regulate if not totally stop forest fires and illegal logging. In addition with this, the KEF created 10-meter fire lines (*gaik*) around the reserve, especially those areas bounding the non-Ikalahan settlements (as they have noticed that most fires came from the boundaries), by cleaning all growth to prevent fire from escaping. However, they found out that this strategy was very costly. As such, the KEF revised its policy and instead, they employed forest guards to act as a firefighting team and to create 19 kilometers of 10-meter fire lines in strategic areas and plant *maguey* and giant *ipil-ipil*, indigenous plants that are known to be effective in controlling fire, as green breaks annually. Community regulations on forest fires were likewise strictly implemented to the extent that they imposed fines. This was necessary to show their intent on enforcing the rules. At least five years after the MOA signing, the people attest that forest fires indeed decreased by approximately 80 per cent or almost totally eliminated.

Another concern that the KEF had to face was the individual land claims. Because of previous cases of local residents claiming large tracts of land, the community called for meetings to settle family and individual land holdings. To do this, the locally-trained foresters made a survey on each land claim and properly delineated them with the help of the claiming parties.

A family was entitled to at most 15 hectares. As stewards of the land, claimants signed a Land Claim Certificate or Registration (LCC) where the exact location, boundaries and maps of their land holdings were included. Land claimants were expected to follow the Agroforestry rules and regulations. The claims were made based on the peoples' fallow fields and current *oma* (swidden farm), and on the lands they have acquired through cash purchase or inheritance. It was learned in their experience that disputes on land claims were easily settled within the tongtongan system which ensured the participation of the community.

## *Reforestation Efforts*

Part of the commitment of the farmer members is to create fire lines along their farms and to plant fruit trees also. Accordingly, the KEF and the elders made land use plans that became the model for the farmers. Upon learning about the MOA, the regional BFD gave its support to the Ikalahan especially in terms of seedling supply and free training of the agroforestry staff. As such, the KEF established a good relationship with the government forestry department.

Similarly, the KEF, in consultation with the elders added in their regulations that each family must plant at least 50 trees in a year. The implementation of this ordinance was strictly supervised by the KEF until the barangay office took over and led in the said activity. In connection with this, the KEF and the barangays identified priority sites for tree planting such as the critical watersheds and wildlife sanctuaries. The KEF, on the other hand, set up two nurseries under its management for planting of good quality of seeds. Together with the KEF nursery, some barangays have put up their nurseries as well. Together, the nurseries can produce up to 200,000 assorted seedlings per year.

Since the accounting of trees started during the MOA signing, the agro forestry office of the KEF was able to identify indigenous trees that were considered by the people as endangered (based on low count). Consequently, the KEF staff and the people collected seeds of these plants and trees and these were prioritized in planting. Most of them are production forest trees intended to produce lumber and other products for the generation of cash for the villagers, like *towal* (*Bischofia javanica*) *halapadan*, *dalakan* (*Garcinia venullossa*), *kaluminga*, *white lauan* (*Shorea contorta*), *guijo* (*Shorea* guijo), *tanguile* (*Shorea* polysperma), *alnus* (*Alnus nepalensis*), *narra* (*Pterocarpus indicus*), *litoco* (*Calamus urnatus*), *mahogany* (*Sweitenia macrophylla*), some citrus trees, and other fruits.[26]

Likewise, the Foundation embarked on addressing good livelihood support for the population so that pressure on the primary forest will be lessened. The community had a lengthy experience of trial and error in the search for cash for additional family consumption. Their products have been out in the market as early as 1980. According to the KEF, the period of trial and error was probably necessary to enable the Ikalahan to study their resources and develop a philosophy and concepts concerning development.

The Ikalahan tried a menu of livelihood activities such as raising cattle and pigs, milk processing, vegetable processing, and more. Finally, they tried processing wild fruits. They soon learned that some wild fruit from weed trees like *dagwey* (*Saurauia bontocensis*) could be processed into jams, jellies and raisins. The initial markets were personal friends until they entered the Metro Manila market with the help of the Asian Institute of Management (AIM) who did sampling of the products and market analysis. After that, the KEF worked with several NGOs and established a marketing arm. They have also tried advertising through feature stories. These mechanisms have proven to be effective, allowing the community to earn the much-needed cash from the forest products. The people realized that this was a better option than converting their forests to agricultural lands.

After the 1990 earthquake that eroded a significant area of their domain, the Ikalahan felt an urgent need to reforest. According to Valentin Baccay, a foresty specialist of the Community Environment and Natural Resources Office (CENRO) in Aritao, Nueva Vizcaya, the KEF made at least 10 reforestation contracts with the DENR due to constraints in resources. The PENRO provided funds for the KEF to buy seedlings and plant these in the eroded areas. Accordingly, the community provided indigenous seedlings for the reforestation, and at least a hundred hectares were replanted within the contract. Aside from reforestation projects under the DENR contract, community and individual efforts were able to completely restore the eroded forest.

MOA No. 1 became a landmark agreement between an indigenous community and the government. Soon after the establishment of the Kalahan Reserve, other indigenous peoples like the Mangyans of Mindoro and Mindanao followed and filed petitions to own, manage and take control of their resources, too. Finally, the Bureau of Forest Development established a major program taking the Ikalahan case as a model. The program was called Community Forest Stewardship Agreement, which later evolved to the Community-Based Forest Management Program. DENR and DAR (Department of Agrarian Reform) jointly issued Department Administration Order No. 2 recognizing the right of indigenous peoples to file their legal claims for ancestral land. This Administrative Order was instrumental in the passing of a law recognizing the CADC as a legal land title in the name of the community.

## *Climate Change and the Ikalahan*

Being a farming community and a people with very close relationship with the forest, the Ikalahan are sensitive to changes that are happening in the reserve, although their perceptions about these changes may sometimes differ. According to the

older key informants, the forests of the Kalahan Reserve in the 1970s were almost totally deforested. This was why some residents claimed that for sometime, there was a shortage of drinking water in some parts of the reserve. The acquisition of land tenure inspired the people to engage in reforestation activities and improve their management and protection of the forests. These efforts led to the total reforestation of their forest, which has helped mitigate the impacts of climate change.

**Warmer temperatures**

To the Ikalahan, the most obvious change that they felt is the rising temperature in the reserve. Elders in the community say they do not have thermometers to check the temperature everyday but they are pretty sure that it is much warmer now than 20-30 years ago. One of their indicators is that majority of farmers could no longer work under the sun at noontime. Now, they feel that the heat of the sun is "scorching to the skin."

In sitios Imugan and Unib, which are located at middle elevation, the warmer weather is evident because of observable changes in their plants. Trees that could not bear fruits due to cold weather have started to do so. For example, the santol trees in the area did not bear fruits until the early 90s, while in another sitio Baracbac, they have been able to grow coconuts for almost a decade now. Likewise, because of cold weather, the farmers could only plant rice for one cropping until the early 90s. Now people can plant up to 2-3 croppings of rice per year. Other plants that are now being cultivated in these communities suitable to the warmer weather include tomatoes and other lowland vegetables. Because of these, some farmers consider the warming of temperature as beneficial to them.

*Camote* or sweet potato (*Ipomea batatas*) has been the staple food of the Ikalahan (especially those that are of higher elevations where rice is difficult to cultivate). While in the late 1980s, some farmers were able to cultivate more rice in their paddies because of warmer weather, some still continued to cultivate camote. They observed that in 70s to 80s, camote crops were

bigger and sweeter than the one that are being harvested now. It was very rarely that they harvest inedible sweet potatoes. However, they added that probably because of warmer climate and more rains, the camote crops are smaller and sometimes even eaten by pests such as rats, insects and worms. Camote that are infested by worms are usually bitter and impossible to eat.

In general, the rise in temperature has both impacted the people in some good and bad ways like the increase in pests.

**Increase of pests**

One negative impact which the people attribute to the change in climate is the appearance of pests that are causing more damage now than before. For example, *calamansi* (citrus) fruits in the lower parts of the reserve are not being harvested because the fruits have no juices. This phenomenon has been observed by the community to be happening for two years now. They say that when the pest *dangaw* (an insect slightly smaller than house roaches with an elongated olfactory organ and with an odorous smell) starts to visit one tree, the other trees would easily be affected too, especially when the fruits are beginning to mature. Thus, the fruits are no longer harvested, and are left to ripen and rot.

Farmers also claim that field rats have multiplied and started to damage more crops than they used to. Not only are they eating rice and sweet potato, the rats have began destroying other cash crops such as ginger, *gabi* and soft brooms, which were then assumed to be inedible to rats. The elders said that the field rats never did this before the 1990s. This is why they are keen on preserving the forest to "invite the natural predators of rats" such as snakes.

**Unpredictable weather conditions**

Traditional weather predictions ceased to work for the Ikalahan. Now, they claim that there are more typhoons, prolonged summer period, prolonged rainy season, and stronger typhoons.

According to the elders, the unpredictability of the weather conditions brought confusion not just to the people but to the animals too like the migratory birds that have started to visit the reserve in odd seasons. This has also affected their agricultural activities leading to more damaged crops, unsynchronized planting and harvesting, rendering their agricultural calendar/cycle ineffective.

Until the early 1980s, the farmers follow synchronized farming activities because of predictable weather conditions. This old agricultural calendar (see Table 4) shows how the weather dictates agricultural activities for the whole year. The data were obtained from the FGD (focus group discussion) with elders in Baracbac and Unib, in Sta. Fe.

From the 1960s until the 1980s, typhoons were very much predictable in the Kalahan Reserve. The following is a description of the whole knowledge embedded in the agricultural cycle that is dependent on a "predictable" weather.

There are at least 3-4 typhoons a year that pass in the area, and these are identified by the kind of birds sighted after the typhoon (see Table 4). Aside from these major typhoons, the people usually experience monsoon rains in November and December. These rains, called *laowang,* are very light and no gusty winds accompany them.

The months of January and February are usually cold. These months allow the people to clear their swidden farms in preparatory for the next cycle of planting. Some slash the weeds, shrubs or even trees and leave them to dry under the sun. Some parts of the farms are cleaned especially for composting.

By the time the summer months arrive, the slashed weeds are already dry and ready for burning while the smaller ones are already decomposed and act as fertilizers. Planting season

**Table 4.** Agricultural calendar (1960-1980)

| Month | Weather | Agricultural Activity |
|---|---|---|
| **January** | *Dayatdat* or frequent drizzling and very cold weather. | - clearing of swidden farms; slashing of trees |
| **February** | *Tiyaggaw* or summer. | - burning of slashed trees |
| | | -uprooting of newly grown grasses and weeds |
| **May** | Start of afternoon rains (*bakah ni udan*). These rains are usually very good for planting. Farmers start planting in their swidden farms. | - planting season |
| **June** | Rainy *puwak ni titi* (Typhoon of *Titik*); t*itik* are migratory birds that stay in the area for a few days after the typhoon. | |
| **July** | *Puwak ni Aladog* (typhoon of Aladog). | - regular weeding |
| **August** | There are usually no typhoons but there could be occasional rains that are not damaging to crops. | |
| **October** | *Puwak ni walo* (Typhoon of Eights); 8-9 days of continuous mild rains. | - harvest time |
| **November** | *Puwak ni Kiling* (typhoon of Kiling). | |
| **December** | *Dayatdat* or frequent drizzling and very cold weather. | - clearing of all plants (*ludon*) and preparing natural fertilizers/compost and farm drainages (*gengen* and *day-og*) |

usually starts in May in time for the rain. They believe that the first rains during summer act as natural fertilizers because crops planted during this time are usually healthy.

When the first typhoon (*puwak ni titik*) arrives, the plants are already rooted and are able to withstand the typhoon. The same is true when other typhoons are due. The *puwak ni walo* (typhoon of Walo) is expected to arrive in early October or late September when the the plants are almost ready for harvest but since the particular typhoon is not damaging, the farmers are ensured that they will have a good yield.

A very well known typhoon in the community is the *puwak ni Kiling* (typhoon of kiling). This typhoon usually occurs in October or November. The typhoon kiling usually is the strongest typhoon that visits the area and it lasts for only 24 hours or one day and one night. The *puwak ni walo* serves as an early warning to the communities. They know that after this, the strongest typhoon will happen next. The communities would usually prepare and fix their vulnerable crops and/or properties for the strong typhoon.

After the typhoon, flocks of birds, locally called kiling, are observed to flock the community's vicinity. After sometime, the birds leave again and return to the forest, which is their natural habitat. For the people, this is a sign that the strong typhoon has ended. The birds are native to the Ikalahan forests and not migratory (the reserve is on the route of migratory birds from Korea and North China) (Rice 2001).

Furthermore, the people would know when there will be available water for irrigation and when to make make canals for the irrigation of their farms.

This traditional weather prediction has worked for the Ikalahan for ages. The elders said it is difficult to do these predictions now since rains have started occurring in odd days, like rains that appear during summer time (March or April).

For example, one notable change (an adaptation to the unpredictability of the weather) is the gradual shift to wet rice agricultural. Planting of upland rice is usually done at the end of

summer, in time for the rains to nourish the plants. They do this by puncturing the soil using pointed sticks (*ahad*) and making holes where the rice seeds are being put and covered by soil again. Today, only a few of the farmers do upland rice planting and are getting more into wet rice cultivation. Wet rice cultivation is seen as more certain in terms of yield and agricultural cycle as you only have to need water in the rice fields. Dry (upland) farming needs intricate and good timing of either the dry and wet season, but the unpredictability of the weather has made this difficult.

**Damaging rains and typhoons**

Apart from unpredictable weather patterns, the community elders claimed that typhoons now are more damaging. Aside from the increase in frequency, typhoons are also more violent and last for longer periods.

However, the worst calamity that ever hit the community was the 1990 earthquake. The entire reserve was shaken as it was along the Digdig fault. Immediately after the earthquake, it rained hard for more than a month (some say 40 days). Since the quality of the soil was highly erosive, at least 50 per cent of the agricultural forests were eroded. Some of the community members recount that at least 11 died during the earthquake while 12 others died during the torrential rains that followed the catastrophe.

In 2001-2002, during the rainy months of November and December, the forest was saturated with large volume of water that it cannot hold any longer because of nonstop raining. The water gushed out from the forest bringing with it trees with roots still intact. This resulted to landslides in Imugan but there were no major damages to the forest and, fortunately, there were no casualties either because it was not near the residential area.

**Peoples' perceptions on climate change**

The Ikalahan have always believed that the forest is a gift from God and that they should take care of it. An elder in Unib said that when the earthquake and the continuous rains that followed it happened in 1990, they were very afraid. He added that the people were asking why such a calamity befell on them when they had done their part in taking care of the forest. He believes that the Ikalahan should get what they need from the earth (*daga*) and should ask blessing from the heaven (*dumawat iti grasya manipud idiay langit*). The people are just dependent on the heavens—the heavens decide on what the people would become.

Climate change is a very new concept for the Ikalahan. Although the impacts of the changing climate is being observed and felt, the people do not relate these to the many changes that are happening in their agricultural life, for instance in the quality and quantity of crops they produce (which they attribute to pests and other factors).

The elders have always been able to predict the weather but now, they are becoming confused; this leads them to look for explanations to questions they themselves could no longer answer. One elder said that maybe typhoons multiplied because *nangasawa da* (they got married) and are now bearing children (resulting to more typhoons). To him, this could possibly explain why there are more typhoons now than before. He further laments that typhoons now even have foreign names! As for the rising weather, some members of the community think that this may be because of the introduction of new and non-indigenous plants such as *alnos* (*Alnus nepalensis*).

The schooled members of the community, however, believe that climate change is caused by human activities such as emissions from huge factories. In return, these emissions bore a hole in the ozone layer that makes the heat of the sun enter the earth. In return, the icebergs are melting and are causing sea-level rise that causes flooding to low-lying communities. Likewise, they believe that the hole in the ozone layer causes the heat of the sun to be more damaging and could cause skin can-

cers. When asked if they also consider smoke from swidden farms to be contributory to the damaged ozone layer, the farmers said otherwise. The smoke created from swidden farms are very minimal and could not possibly affect the ozone layer very much.

Some think that there are more rains now in the community because of more trees in the forest. The trees are trapping the moving clouds and as a result, the clouds bring more rain to the community. The people are thinking that pests are increasing probably because the forests adjacent to the Kalahan Reserve are deforested. Thus bigger insects that eat smaller pests are gone. They also think that rats multiplied because their predators such as the eagle, wild cat and pythons are already endangered, if not totally extinct.

## *Ikalahan Efforts at Climate Change Mitigation*

Mitigation is defined by the Intergovernmental Panel on Climate Change (IPCC) as measures to reduce emissions of greenhouse gases. As such, mitigation measures happen in different sectors of the community.

### Low carbon way of life

The Ikalahan have been and continue to lead a low carbon way of life. While two regular jeepneys transport people to the center of the municipality everyday, the main mode of transport in the reserve is still by foot. Similarly, a large area (almost half of the reserve) still does not have access to electricity. Thus, houses are designed to receive maximum natural lighting at daytime and with enough open spaces and windows to provide natural refrigeration of their goods.

As largely a farming community, the farmers do not use machines in their rice fields. The swidden farms are manually plowed with draft animals and products are hauled by the people

to the nearest road to the market. Likewise, organic farming is encouraged in the reserve to avoid destruction of their natural resources due to the introduction of harmful inorganic fertilizers. Organic wastes are mixed with animal manure to become organic fertilizers.

**Forest management**

> *We, the Kalanguya-Ikalahan tribe, invariably equate land and the resources within it with life itself. We nurtured our indigenous systems for our land and resources management that have endured the test of time. For this reason, the recognition of our indigenous ability to sustainably manage our ancestral domain was made a matter of policy (ADSSDPP 2005).*

Prior to the signing of the MOA, the Ikalahan people were allowed to make their oma in any part of the forest. As a result, there were rampant uncontrolled forest fires and widespread conversion of the forest to agricultural lands. Back then, even if they observed fallow periods, the recovery of soil fertility usually took a long period of time.

After the Ikalahan took stewardship responsibilities over their resources, each family were allocated 6-10 hectares of agricultural land or *dappat*. These lands were to be managed and protected by the farmer-members. To fulfill their obligation to the memorandum that they have signed and ensure protection of their resources, the elders came up with simple but definite community rules and regulations in recognizing individual rights in the reserve. The board of the KEF was very instrumental in drafting the rules. After which, the draft was circulated to all the barangays covered by the reserve. Community discussions and meetings were conducted to gather comments and additional suggestions on the rules. When these things were done, the community rules were finalized, approved by the villagers, adopted and implemented in the whole reserve.

The rules formulated by the elders were sensitive to individual rights of the farmer-villagers. As such, farmers were allowed to use their landholdings according to their needs as long as these were agreeable to the terms set by the community policies. The initial rules made by the elders in the 1970s were recognized and adopted. It was the basis of the community rules and regulations being implemented today in the reserve.

There are foresters employed by the KEF who are tasked to check on areas being proposed by farmers to farm, trees to cut, and areas of the forest to burn. They verify whether these lands are not critical to the watershed or the wildlife sanctuaries. The foresters process the permits and issue them in 2-5 days. When asked if people do not find it difficult to secure permits for their farms, the farmers believe that the actions of their Agroforestry office are rightful and just.

Likewise, forest guards are designated to check on the forest reserve regularly. They see to it that animals, trees and plants that are either destroyed by nature and human activities are reported right away to the Agroforestry office. They also do tree planting, replacement of diseased and fallen trees, and maintain the nurseries of the KEF.

**The hunting season**

The KEF and the village government have implemented a hunting policy in the reserve. Hunting months start from July to August, when people are free to hunt for animals in the forest but only for their own consumption and not for commercial use. However, the community laws provide that the watershed and sanctuary areas are off limits to hunters. The months of November and December are also declared as hunting seasons for birds. The hunting seasons were decided based on the observed nesting and mating season of the animals. In addition, the Agroforestry office of the KEF provided a list of animals, birds and plants that are banned from collection and/or hunting. Likewise, doing the *akik* (night bird catching) is strictly prohibited even during hunting period. This is to ensure that migratory birds are not caught.

## Maximizing land use

Since each family has at least 6-10 hectares of land under their stewardship, some portions of the forest reserve is being taken care of by the farmers. After a series of community consultations, the Ikalahan elders together with the BOT (Board of Trustees) of the KEF came up with a land use plan that is still being followed until today. The restoration of the degraded areas of the reserve is testimony to the people's adherence to their community-formulated land use plans.

**Table 5.** Land use plan in Kalahan

| Land Use Plan | Area (hectare) |
|---|---|
| Titled land | 300 |
| Sanctuaries | 3,500 |
| Fruit production | 60 |
| Vegetables | 40 |
| Upland farms | 250 |
| Fallow areas | 750 |
| Old growth outside sanctuaries | 20 |
| Pine forest | 3,000 |
| Pine and grass | 3,000 |
| Dipterocrap | 1,170 |
| Dipterocarp and grass | 1,810 |
| Grasses | 2,000 |
| **Total** | **15,000** |

Table 5 shows how the entire land claim of the Ikalahan is being utilized. It is noteworthy that the vegetable lands, fruit production and upland farms are very much limited compared to the sanctuaries, the forests and grasslands. It was noted during the KEF inventory of flora and fauna that several of the bats were responsible for seed distribution and germination of the trees that are important to the watersheds. With this realiza-

tion, the community voluntarily enlarged the sanctuary from 400 to 4,000 hectares and is working to improve the nesting sites and food availability for the important seed-dispersing species.

The villagers claim that until now, the community follows the land use plan except for minor adjustments (like the expansion of the sanctuary to 4,000 hectares). There have been cases of violations, but these are isolated and are usually settled within the tongtongan system or the traditional system of accountability and decision making. The KEF agroforestry and extension work on education is sustained and this has become the major reason that has influenced behavior and encouraged people to adhere to the land use plan.

**Indigenous and innovative forest regeneration techniques**

To ensure the sustainability of supply of wild fruits, not only for wildlife but also for the cash economy of the Ikalahan, the people developed systems of monitoring and evaluating the status of their forests. The foresters did a survey of actual guava produce from the forest and the actual quantity of guava harvested by the people for the food processing. The same process was made for all the other fruits that are being harvested for food processing. The activity revealed that the people were actually gathering 15 per cent (at the most) of the total available fruit from the forest. This means that at least 85 per cent of the total fruit in the forest are being left for the consumption of the animals and birds. For guavas, however, the market continues to grow and the KEF has started planting good quality of seeds in their nurseries and they should be bearing fruits before the 15 per cent demand is reached.

The Ikalahan used to have large swidden farms. Almost half of these were for family consumption and the other half were devoted to cash crops. However, after realizing that the forest can augment their financial needs, the farmers decided to reduce their swidden farms and increase their forests instead.

In order to reach the maximum quality of the forest, the Ikalahan are undertaking the Modified Timber Stand Improvement (TSI) (Aguilar 1982) or assisted natural regeneration. Modified TSI refers to the felling of deformed or diseased trees in the forest (unless it is the only tree of its kind in the vicinity). The amount of trees to be removed depends on whether the forest is dense with trees or lightly vegetated. The timber harvest is usually of low quality and accounts to 25 per cent of the annual growth rate or approximately less than one cubic meter of wood per hectare per year (Rice et al. 1994). They do the Modified TSI annually to ensure rapid growth of the forest trees. The Modified TSI is now called the Forest Improvement Technology (FIT).

In another case where the canopy is already closed and sunlight does not reach the forest floor, the foresters identify the mature trees for topping and felling in order to reopen the canopy and allow the seedlings to grow. They leave the branches and leaves behind to render extra nutrients to the forest. The timber harvest from this procedure is usually of high quality. The Ikalahan claim that the program of improving timber stand should come to its peak in approximately 25 years, and is expected to continue at that level indefinitely.

It has been agreed by the community that the whole reserve is a watershed area. Aside from this however, the village leaders declared two mountains—Mt. Akbob and Bantay Lakay—as watersheds to be used solely for that purpose. As such, these areas are off limits to all agricultural and harvesting activities (Rice et al. 1994).

Indigenous peoples live harmoniously with nature and use their indigenous knowledge and traditional practices to help them face the challenges of the modern world, but by revitalizing their sustainable forest management practices, the Ikalahans are now reaping the fruits of their efforts.

**Sustainable swidden farming practices**

Contrary to claims that upland farming causes forest degradation, the Ikalahan yet again prove that indigenous farming practices are sustainable.

Swidden farming (*panag-oma*) has been the primary source of subsistence for the Ikalahan. They first scout for forested areas that are suitable for an oma. Slope and soil condition are usually considered in site selection. As much as possible, they avoid the steep mountain side because these are more prone to erosion. Some usually look for areas near a *balete* tree because it is usually an indicator of good soil fertility.

At present, when clearing is needed for a new farm, the residents consult the KEF for permit. The staff issues the permit for the new swidden farm, for tree cutting and burning provided (a) the area to be cleared is not near a watershed, (b) the tree to be cut is not endangered, (c) the area has a fireline, and (d) the area to be burned would not damage other properties. When clearing is permitted and done, male farmers usually gather the felled trees to be used either as firewood and fencing material (for branches) around their oma.

The Ikalahan also still follow their traditional mode of burning, where they start the fire at top portion of the field. This allows them to control the fire easier. They also depend on the wind direction. Unburned matters are later collected to be used as firewood.

The camote or sweet potato (*obi*) has been the staple food of the Ikalahan for centuries even after the introduction of upland rice in the 1940s. The obi is planted in the oma of the Ikalahan. These are usually interspersed with *aba* or gabi, citrus trees, soft brooms and other fruit trees. Ginger is also planted in the oma both for family consumption and as cash crop. This is done only once during the swidden cycle because ginger is known to deplete the quality of soil. In order to ensure enough food supply for the whole year, the farmers usually plant camote in a staggered manner which they harvest quarterly.

Women are usually the ones who make natural fertilizers like *gen-gen* where they gather the uprooted obi stalks and leaves and bury them in a pile along the contours of the field. They also do *day-og*, a traditional in-situ composting method to restore fertility after an earthquake. Depletion of soil fertility is signaled by the growth of *gulon* (cogon grass) in the field and when their obi yield becomes smaller and watery. When this happens, the farmers leave their fields to fallow. However, community rules and regulations stipulate that farmers are not allowed to leave their farms to fallow without planting trees first.

Fallow period is usually between 4-7 years or depending upon the ability of the soil to regain its fertility. The Ikalahan would know that the land is ready for yet another cycle of oma when the soil turns black and the gulon are no longer in the fields. The last person who tilled the oma is usually recognized as the rightful owner of the field. The land in fallow is referred to as *kineba*; thus, a kineba can not be cultivated by a person unless he asks permission from the "property owner." Because of the increasing demand for agricultural land, however, the people had to think of a strategy to shorten their fallow period without sacrificing the quality of the soil.

The tree alnos (*Alnus nepalensis*) was introduced to the community. While alnos is being questioned by some because of its very high transpiration rate,[27] the community foresters say that it is a good plant because 1) it is not invasive and does not kill other indigenous plants; 2) it is fast growing and by the time the fallow period is over, the community people can harvest the tree; 3) it shortens and expedites the fallow period because of its nitrogen-fixing bacteria; 4) it is a good source of firewood (which allows people to preserve other indigenous trees); 5) it is a good substrate for shiitake mushroom; and 6) it serves as a nurse plant (Rice 2004). The *alnos* trees are being inter-cropped with other plants like coffee and soft brooms. The foresters defended that *alnos* could be very beneficial because of the above mentioned reasons.

The people are now venturing into organic farming and as such, they buy carabao dung from the nearby province of Nueva Ecija, add it to their biomass and sell the products to farmers in the Kalahan reserve or even to people at the town center.

The people have also defined good oma (good swidden farming) as swidden farms that are utilized for 2-3 years, and then left to fallow for a certain period. A good oma also means that at least 30-40 per cent of the total crops in the farm should be for family consumption and the other percentage could be cash crops to augment family expenses.

## *The Ikalahan and the Way to Carbon Trading*

Various scientific researches reveal that $CO_2$ is the most abundant among the greenhouse gas emissions and is responsible for more than half the radiative forcing associated with the greenhouse effect (Watson et al. 2000; Schimell et al. 1995). As the issue on climate change and its mitigation gets hotter, the IPCC Summary for Policy Makers has recommended the use of tropical forests for carbon pools, expansion of carbon sinks and substitution of wood products for fossil fuels. According to the IPCC, tropical forests have the largest potential to mitigate climate change for they have the biggest long term potential to sequester carbon in the atmosphere through forest land protection, reforestation, slowing down the rate of deforestation and agroforestry (Brown et al. 1996) and because of carbon conservation.

The Clean Development Mechanism (CDM) of the Kyoto Protocol has started its partnership with potential reforestation project partners. However, CDM is limited to afforestation and reforestation, known as AR CDM. In short, they permit planting of new trees to add to carbon sinks but they do not consider the reduction of emission from existing sinks through sustainable forest management.

With the Ikalahan's overall practice of managing the upstream, the Kalahan forests recharged the aquifers which benefited downstream farmers (but the Ikalahan caretakers of those forests are not able to recover their costs in providing that service) (Rice 2004). Based on their initial computations, the forest reserve likewise sequesters as much as 30,000 tons of $CO_2$ every year and the rate seems to be increasing by more than 20 per cent anually. This means that the forest reserve serves as carbon sink to emissions of transportation and industry outside the Kalahan forests. The CDM, voluntary markets for carbon and other environmental services are seen as an opportunities for the Ikalahan to be rewarded for their contribution to climate change mitigation.

**Initial stages of carbon survey and other resources' inventory**

In 1994, the KEF foresters and a visiting Scandinavian student did a blocking survey to measure their old growth forest biomass and growth of their trees. This was part of efforts to have an inventory of their resources. They set up blocks of homogenous trees using satellite images in 10,000 hectares within their domain. A sample block is ¼ hectare or 500 x 500 meters and they set up plots within the blocks. Each block has at least 2-6 plots. The trees that were included in the survey were those that have at least 10 cm-diameter breast height. They computed the board feet and from there, they calculated the weight of the tree. They arrived at an average of 45-49 per cent carbon content per cubic meter volume of timber. As initial attempt to calculate carbon content and potential carbon sequestration, they recognized that the method was crude and uncertain.

In 2002, the Rewarding Upland Poor for Environmental Services (RUPES)[28] offered to help in the development of a formula to measure carbon content. The KEF asked assistance from Prof. Rodel Lasco, a carbon expert from the University of the Philippines Los Banos (UPLB). They found out that the community formula they have been using to estimate carbon stocks resulted to at least 60 per cent less than the actual carbon con-

tent of the forest. This was because the formula did not account for the carbon stocks from the leaves, branches and roots of trees. That same year, they have estimated around 38,383 tons of carbon dioxide that is recycled within the Kalahan forests. Since then, the KEF has been analyzing and updating their data using the improved formula, and to date, forest inventories have been carried out in 62 blocks or approximately 10,000 hectares (Villamor and Lasco 2006). They have organized the RUPES Kalahan team for the continuing project of carbon measurement.

**The KEF enters the carbon market**

In 2003, Ikalahan was chosen by RUPES as a site for action research. RUPES assisted the KEF in the continuation of the carbon stock measurement study. The main objective of RUPES is to examine the rate and extent of carbon sequestration potentials of the Kalahan Forest Reserve, and to look for potential buyers of this ecological service.[29] An interview with the KEF director revealed that RUPES provided for their funds but the whole course of research was largely done by the KEF agroforestry office.

With the help of RUPES and the World Agroforestry Centre (ICRAF)-Philippines, the efforts of the Ikalahan to sequester carbon were recognized and may possibly be rewarded through market-based mechanisms. The research with RUPES likewise analyzed the capacity of the Kalahan Forest Reserve to provide water downstream as an ecological service for electricity and water irrigation (Villamor and Lasco 2006).

In 2005, the RUPES Kalahan team prepared the CDM Project Design Document to access international carbon markets. The Kalahan forestry team, with technical assistance from ICRAF, also prepared the "Forestry Project Idea Note (PIN) on Sequestration Project in the Ancestral Domain of Ikalahan." The PIN proposed a carbon sequestration project on the 900 hectares of abandoned agricultural and marginal grassland portion of the domain. The PIN estimated that carbon emission reductions

over 20 years would amount to 89,776 tons of $CO_2$. The computation was done based on tree growth rates using the Philippine-derived values (Ibid).

In 2006, an external organization was commissioned by the KEF to do a study of the carbon storage of the grassland areas in Ikalahan ancestral domain. The study revealed that the grasslands stored a very meager amount of carbon. In the Philippines, grasslands are often burned, thereby releasing huge amounts of carbon to the atmosphere. The study recommended that for the grasslands to contribute to climate change mitigation, it should be developed into tree plantation and/or agroforestry area. Otherwise, it would not contribute at all to carbon sequestration (Pulhin 2008).

RUPES helped the Ikalahan estimate the projected net cumulative $CO_2$ removals by the proposed Kalahan Reforestation Project. The idea was to assist the Kalahan in obtaining funding for the carbon sequestration services that they provide (RUPES and UPLB personnel gave the people the idea of enrolling in the CDM project).

The KEF became busy in its networking efforts to look for a possible carbon buyer out of their carbon sequestration project. In 2007, the Mitsubishi UFJ Securities (MUS) Co., Ltd. entered the picture and served as an agent of the KEF for the project. Under the agreement, the KEF would provide all the raw data that the MUS will need for the CDM project. In return, the MUS will do all the paperwork needed for the project.

In February 2008, the MUS completed its Proposal for CDM Advisory, and this was passed to the KEF Board for review. The proposal stated that the MUS will provide consultancy services and support to KEF in the development of the Project Design Document during the validation process. This will ensure registration and help market the project to potential buyers. The MUS proposal provided that it will cover the costs of some CDM transactions, and that it had the option to purchase the generated Certified Emission Reductions (CERs) of the project until December 31, 2012 at US$8 per tonne, with payment to be made upon delivery of the CERs 12 months upon the execu-

tion of the agreement. In 2008, the KEF finally signed an agreement with the MUS.

On the other hand, ICRAF is involved in the project by enhancing the negotiating capacities of the KEF members to negotiate for acceptable payments for their carbon stocks. They are likewise helping in the preparation of pertinent documents needed for CDM registration. Consequently, the Ikalahan have started planting seedlings on the target areas.

In the quest for credible data, the KEF again adopted a new formula in 2008 (developed by Prof. Lasco, the same UPLB faculty who earlier helped them with the previous formula). With this new formula, the people are able to get the carbon content of specific trees provided that they know the specific density of the tree. Likewise, in 2008, they found out that the blocks they had been using since 1994 were not as homogenous as they should be. So, the KEF staff went back to the forest and relocated the same plots using Global Positioning System (GPS). They did some adjustment of the blocks in order to achieve the homogeneity they needed for the project. KEF was then in consultation with PAFID for the adjustment of their maps, which they hoped then to finish in six months time.

**Ikalahan explore the voluntary market**

Aside from the CDM, the Ikalahan are likewise eyeing the voluntary carbon off-set markets. As such, they are keen on maintaining a 10,000 hectare portion of their secondary forest for production and carbon sequestration. At the time of the research, a Project Idea Note was being prepared for this purpose.

According to members of the KEF, the project is still in its initial stages. They have learned, however, that it was hard to look for a buyer of carbon only. They were given an option to market carbon and other energy saving processes like hydroelectricity. The KEF had no funds to start building community dams. So, they have decided to go on with the project and let the carbon buyer also be the one to pay for the hydro project.

In 2008, they had a verbal agreement with the *Sibol ng Agham at Teknolohiyang* (SIBAT), a non-governmental organization engaged in the promotion and development of appropriate technology at the village level. SIBAT would help them with the technical aspects of the project, needing data on rainfall and water flow for them to be able to do the paperwork for the project. SIBAT then prepared a project proposal for the KEF which was approved by the organization in early 2009.

Some barangays signified willingness to take part in the endeavor. Aside from the partnership with SIBAT, the KEF had another option of partnership with the Aboitiz Power Company,[30] which promised to commit but no specific and clear contracts have been finalized at the time of the research.

The Ikalahan believe that the strict implementation of the Forest Improvement Technology (FIT) will intensify or expedite forest growth, and thus, carbon sequestration and water supply. Using the same formula (as the one in CDM project), they estimate that at least 1.7 million tons of $CO_2$ emissions will be possible in 20 years.

**Community preparations for the CDM project**

Prior to the signing of the agreement with Mitsubishi, the Board members of the KEF and other local key leaders and elders had a series of meeting and consultations regarding the CDM proposal. The main objective of the meetings was to come up with a unified response to the proposal. It was learned that KEF was interested in securing a buyer for carbon credits at an early stage of the project. This was the reason why the MUS revised its proposal from "MUS will be named as 20% owner of the total CERs generated from the project at the time of the project registration with the UNFCCC CDM Executive Board" to "committing to purchase all CERs earned by the project until December 31, 2012 at 8 dollars per tonne."

The agreement between KEF and MUS sparked interests from other parties in the community to participate in the project, as well. After a number of community consultations and infor-

mation drive on the matter, the Agroforestry department of the KEF claimed that Bacneng of Cluster 1, Atbo of Cluster 2, three sites from Balete (Aritao), and other villages and individuals wrote a formal letter to KEF requesting for a survey of their lands. These villages signified their willingness to decrease the area of their production farms for a carbon market project.

In the meantime, the KEF BOT appointed their executive director to be the CDM project manager. This means that all transactions and communications with MUS will be done through the manager. However, all the processes should pass through the members of the BOT and the community elders as deemed necessary. To comply with the CDM process of holding a public consultation of stakeholders, the KEF called for a community meeting in all its seven barangays. No negative reactions on how the project should proceed have been reported.

At the time of the research, the KEF acknowledged that the processes they had to undergo for their CDM project were rather complex. First, they had to identify plots within the 900 hectare project area with each plot having at most 10 hectares (they were aiming to finish the identification by February or March in 2009). Secondly, they had to contend with the individual farmers who were covered by the 900-hectare project area as well as the other people outside their domain who were included in the 900 hectares (interviews with the foresters and other members of the KEF revealed that at least 10 hectares of the project area was not within the domain of the Ikalahan).

In the process of mapping their project area, the KEF staff had initial conversations with some of the individual claimants of areas covered by the project. A series of consultations ensued and from there, three options were formulated. First, the farmer-claimant provides the seedlings for the reforestation and plants them. Another option is for the farmer to provide the seedling and the KEF will plant them. The last option is for the KEF to provide seedlings and plant the area. The amount of "reward" for the farmer will depend on the option that he chose, but either way, if the farmer wanted his land claim to be planted, it also meant that he was quitting his claim and giving his land for the the CDM project.

So far, only 30 hectares of the total project area has been planted and the families involved in the planting were paid according to the number of seedlings planted and the quality of their planting activity. The KEF said that it has to prepare at least six different contracts with individuals/family claimants in order to proceed with the mapping and reforestation. After the one-on-one agreement with the claimants, the KEF plans to call for a federation meeting to lay all the options on the ground.

Meanwhile, the nurseries that were established for the reforestation project of the reserve are being managed by the KEF. These are taken care of by the community-appointed forest guards, together with a total of around 220,000 assorted seedlings that came from the three forest nurseries maintained by the KEF, and from three other nurseries that were established within the Kalanguya-Ikalahan Ancestral Domain.

When asked what they will do about the money they will get from selling their carbon stocks, some informants said it would help them put up a hospital, pay a doctor and hire more teachers in the community. The KEF however acknowledges that it has yet to talk about the mechanism of benefit sharing as there are no clear methodologies on who will be accepting the payments, and how much will go to the KEF and individuals, if needed. The KEF, however, envisions that revenues from the project could help fund the community high school, medical care for the community health center and scholarship assistance for poor but deserving students. Any surplus could be used to help others start a similar program with the Ikalahan (Walker n.d.).

A lot of things are going on in pushing for the project, and because of the very technical nature of carbon traiding, not all are able to comprehend what it is all about. While the members of the Board are aware of what is going on, some members of the community still do not completely understand the project. As some put it, "We will be very happy to sell air; anyway, we lose nothing but air." Others, however, are very much aware that carbon trading is not just about selling air. They ex-

pressed their pride in taking care of their forest and their being able to help mitigate the impacts of climate change.

**What happens next?**

At present, the inventory of the forest resources for the voluntary carbon market is still on going. It is an immense work fro the Ikalahan but they are hopeful that at the end of the inventory, they will be able to compare the growth rates of their three types of forests (dipterocarp, pine and oak) and have data on the carbon sequestration capacities of at least 15 indigenous species. Meanwhile, the mapping and delineation of boundaries of the 900-hectare area for the CDM are currently being done.

The negotiations for carbon trading in the Kalahan forest reserve is still in its infancy. There are no carbon stocks that have been sold as of this writing although it has already been approved by the Philippine Designated National Authority on CDM. As such, the people in the community cannot give comments yet as to how the project would affect them.

## *The Ikalahans Lead the Way to Climate Change Adaptation*

The experience of the Ikalahan in owning, managing and protecting their forest proved to be sustainable, at least up to the present. The high regard of the community for their forest as source of life and livelihood is the main reason why the Ikalahan are protecting this important resource.

For some Ikalahan families in the reserve, the recent rice shortage in the Philippines and the whole of Asia was a real challenge. During the pre-war era, rice was only eaten when there was a camote shortage, which was very rare. Now, with the rice crisis, the elder Ikalahan women saw the value of planting and maintaining sweet yams in their backyards. Likewise,

the calculated harvesting of sweet yams has proven to be very helpful. They planted the yams in May, did the first harvests in September, another one in February, and still another one in May, in time for another season of planting again. Aside from sweet yams, the women as food keepers maintained other crops in their swidden farms such as bananas, cassava, ginger, potatoes and other tubers.

Ginger used to be planted in swidden farms for family consumption only. However, when the Ikalahan learned that they could sell them, they learned how to store ginger and sell them when the prices go up. Before, brooms, commonly known as tiger grass, were planted in swidden farms to prevent erosions. However, like ginger, it became a commercial commodity and may now be used as collateral for rice loans. Today, ginger and soft brooms have become major cash crops in swidden farms.

Weed trees like *dagwey* and *dikay* are being replanted for reforestation. These plants have proven to be very good in preventing erosion, and their fruits are likewise processed as jams and sold in the market. Through experimentation, the Agroforestry office also found that a weed plant locally known as the *panawel* is a very good fertilizer to potato plants. Apparently, the panawel wards off the weevil, a pest that destroys the potatoes. They observed that their yield increased to at least 40 per cent upon using the panawel.

Wage labor within or outside the community is resorted to by some residents (especially the youth to help augment family income). Labor within the community is often paid in kind or reciprocated with labor just the same. This reciprocal labor arrangement is called *amuyo*. This is done especially by people with no means of paying monetary wages for farm help. This is patterned after the concept of *bataris,* a process where a family butchers pigs in order to feed the people who helped in their farm work. These examples show the Ikalahan continue to have a strong sense of community spirit.

**Community unity brings resilience to impacts of climate change**

The people are united in their decision of not including the municipal and the provincial government in their negotiations with carbon traders. They insist that payments and/or other benefits should go directly to the people. However, there are no clear mechanisms yet on how to go about benefit sharing in the community.

In protecting their forests, the community believes that armed/coercive power is not needed in the enforcement of community policies on forest management. Rather, massive community education and information dissemination should be done. The people believe that education and forest protection should go hand in hand. If these are done properly, then other benefits (like clean water, good health and sanitation, and sustainable food) would follow.

Aside from the appointed forest guards, the community takes it upon themselves to guard the forest. This is being enforced because of the punishment (if appropriate) and reward system.[31] Forest management and protection brings unity and resilience to the community. As one writer puts it, resource use is another cultural emblem on which community solidarity and ethnicity may be predicated (Resurreccion 2003).

The people recognize the role of Rev. Delbert Rice who has been living in the community since the 1960s as instrumental in the development of the Ikalahan community and their transformation into a model for community-based forest management. Likewise, the KEF works well with the local barangay officials in formulating and implementing policies on resource management.

Lastly, the Ikalahan have a strong sense of ownership of their forest. They see the Community-Based Forest Management as a community need, rather than a government target. Their efforts in the 1970s in exerting pressures to the DENR Secretary to cede the authority of managing their forest is testimony to community unity and resilience. This experience has created a stronger feeling of accountability for their actions.

Another example of their ability to unite to protect the forest was their campaign against a government-proposed highway in early 1990s that would have constructed a road connecting Sta Fe, Nueva Vizcaya to San Nicolas, Pangasinan. In the proposal, the highway would pass right through the wildlife sanctuary of the Ikalahan. As mentioned earlier, this was strongly opposed by the people. To justify their opposition, the KEF invited the Haribon[32] and their partners from the UPBL to sit with them in their inventory of birds. They brought with them bird books, which became the reference of the elders in identifying the local names of the birds that they have in their sanctuaries. This activity with the elders and other community residents lasted for at least two days. The inventory continued by allowing ornithologists and other bird watcher groups in the sanctuary to identify more birds. They were able to identify at least 150 species of birds, 35 of which are endangered. Through this community effort, people were able to show the government what the road construction would destroy and its possible irreversible impact on the biodiversity in the reserve. Because of this, the highway project did not push through.

## Ways Forward

When the Ikalahan took control of managing and caring for their forest, joining the carbon market was farthest from their minds. But upon realizing the current needs of the community, people recognized the importance of economic sufficiency in order for them to continue protecting their ancestral domain. Now, they believe that it is but fair and just that they are rewarded for taking care not just of their forest but of the waters that they provide downstream and of the clean air that neighboring areas breathe.

Being an indigenous community, the Ikalahan have gone far in terms of taking care of their resources. They were able to survive decades of hardship and challenges through their strong

sense of unity and ability to adapt either to climate change or other external factors. Now, they are hopeful that venturing into the carbon market would benefit the whole community.

At present, the community is completing the data on the growth rates of their trees. One of their aims in doing the study is to influence the Kyoto Protocol. The KEF believes their data can provide evidence that old growth forests sequester the biggest amount of carbon, and hence, these should be included in the Protocol. The respondents said that if the true aim of the Protocol is to encourage reduction of emissions, then it should also reward communities who have long been taking care of their forests, forests that have been sequestering much of carbon emissions in the past decades. The people know that the lead time for the program is much greater than their other programs, but they believe that the expected benefits are also much greater (Rice n.d.).

In order to justify their demand for payment of water services, the Agroforestry office of the Ikalahan in 2008 set up a measuring system of water flow from the forest reserve to the down stream. The goal is to measure the exact amount of water that they release to the villages down the river. They are, likewise, planning to set up meetings and consultations with the communities down stream because they believe that water users must be educated for them to understand why the Ikalahan are securing remuneration for water services.

Meanwhile, the search for new markets for their fruit products and the discovery of new fruits available for food processing continue. Aside from guava, dagwey and other fruits that are being processed, the KEF is still experimenting on how to perfect the processing of other raw products.

The biggest challenge for the Ikalahan so far is the maintenance of their forest. With the constant need for cash, there might always be the temptation to do away with the Timber Stand Improvement program of the KEF. There are no alarming cases of extractive logging in the community as yet, but KEF feels that it is a continuing struggle to encourage the community to keep on upholding the TSI.

## Conclusion

The efforts of the Ikalahan to put pressure on the government to let them manage their own resources that led to MOA No. 1 served as an inspiration not only to indigenous peoples but to government institutions as well.

The land lease served as a catalyst for the Ikalahan to work hard on the reforestation of their then-deforested domain. In doing so, their community strategies became the model of the national CBFM program of the Philippine government.

The forest management systems of the community were done through traditional and innovative community systems that respect the roles of the elders, the KEF, the barangay as a political unit, and the community as a whole. And while the MOA stipulated the need for protecting the watersheds, the KEF saw to it that the other resources in the forest were also protected without prejudice to the needs of the people. To ensure this, livelihood projects were initiated.

However, while the Ikalahan who live upstream provide services such as water and carbon sink, they are yet to be rewarded for these efforts. The climate change market-based mechanism on carbon provided them opportunities to bring their services to the international market through the CDM and the voluntary market. In preparation for these, they tried both local and international networking and partnerships in order to set up and establish carbon sequestration/stock data. They wanted to maximize the opportunities afforded by their abundant natural resources. For example, they are now exploring the setting up of hydropower sources in the community.

Even as the projects on payment for environmental services are yet to be realized, mobilization for reforestation activities continue. The processes to be undertaken, especially for the CDM projects, are tedious and demanding, but the Ikalahan are hopeful that their decades of effort in managing their resources well will soon bear fruit for the people.

## Final Reflection

These cases show that local stewardship has helped protect and sustain the natural ecosystems in the forests of the Ikalahan and the coasts of the Calamian Tagbanua. Securing stewardship and legal ownership through the CADC and CADT was a long-drawn struggle and required sacrifices from the communities. Once their respective CADC/CADTs were obtained, the communities ensured that their traditional knowledge and practices in managing their resources were incorporated in the Ancestral Domain Management Plan (ADMP). This institutionalized their sustainable ways of managing their forests, coasts and other resources, effectively helping in climate change adaptation and mitigation efforts through the prohibition of activities that lead to deforestation and destruction of the ecosystems.

For the indigenous peoples who persisted in the campaign, securing stewardship was a step toward ending years of marginalization and neglect. In the process, the indigenous peoples have again shown their resilience in coping with and addressing the many and complex challenges surrounding their lands, waters and resources.

Finally, the results of the case studies which were done in two different ecosystems—one in a tropical forest ecosystem, and the other in a coastal ecosystem, demonstrate a critical point: despite the differences in the contexts from which traditional knowledge arise, its use and role in climate change adaptation and mitigation efforts are the same regardless of milieu. Across indigenous peoples' communities, the way to protect and sustain the collective well being and the health of the ecosystem is through the practice of their traditional knowledge and practices. This is an important lesson to remember and recognize as we continue to search for effective ways to help peoples and communities move from climate change vulnerability to resilience.

## Endnotes

[1] Climate Change and Indigenous Peoples. http://www.un.org/esa/socdev/unpfii/en/climate_change.html. Accessed February 13, 2009.

[2] Victoria Tauli-Corpuz. UN Permanent Forum on Indigenous Issues Statement On Biodiversity And Climate Change (Agenda Item 4.5). 23 May 2008, CBD 9th Conference of Parties, Bonn, Germany.

[3] The municipality of Coron Island has a total land area of of 949.526 sq. km. It covers the eastern half of the Busuanga Island and is composed of 23 barangays of which six are in the poblacion (town center) and five are island barangays/villages.

[4] The basic education system in the Philippines is composed of six years of elementary and four years of secondary education—a total of 10 years. Elementary education in the Philippines is free and compulsory.

[5] In the 1970s, the municipal government took control of the Calamian Tagbanua clan caves, thereby exposing these to intrusions by other people and outsiders. The government seized ownership of the clan caves, asserting that these were government properties and could not be owned privately. Many were dispossessed of their caves when the government offered these in public bidding. This brought extreme hardship to many Calamian Tagbanua, especially to those who depended on nest gathering for livelihood.

[6] Cashew tree could grow under wet and dry conditions. Because of its resistance to extremely hot condition, *kasoy* is known as a "drought-resistant" crop. Cashew nuts are usually harvested in January until March and are sold in the mainland. On the average, a cashew farm contains 20 cashew trees. Around 400 families have their own *kuma* for cashew trees.

[7] Kayangan Lake was acclaimed as the cleanest lake in the Philippines for several years (1997-99). It now holds the Presidential Hall of Fame award.

[8] Barracuda Island, or *Luluyuwan*, is known for barracuda sightings, the reason why it is famous among tourists who visit Coron.

[9] The story of these two warriors which is retold by elders and adults in the island gives inspiration to Calamian Tagbanua in having the strong determination to defend their territory. Two caves found in Banuang Daan were named after Makarere and Matambak.

[10] The Calamian Tagbanua people had to submit affidavits, maps, historical accounts, genealogical data, anthropological data, list of validated names and places in the native dialect, and other proofs to prove their presence in the area since time immemorial (Zingapan and De Vera, 1999; PCSD, 2003a). This process allowed a recording of Tagbanua's customary law that is traditionally transmitted orally. With the technical help of PAFID, the Tagbanua defined their CADC's inclusions and boundaries, and translated this into a map acceptable to the DENR.

[11] Delian Island is home to many Visayan migrants, both transient and permanent, who now have to pay fees to the Calamian Tagbanua in order to live there. This is in accordance to the CADC's specifications (Conservation International Philippines, 2003b).

[12] Integrated Approaches to Participatory Development (IAPAD), Tagbanua Peoples Ancestral Domain Claim, (accessed February 10, 2009); available from <http://www.iapad.org/applications/ancestral_domains/TagbanuaTagbanua.htm>.

[13] Most of the migrants are into commercial fishing. They use fishing methods meant to catch large fish harvests but are more likely unsustainable.

[14] The *tambalang* has developed diseases called *buntot ng bakes* and *ice-ice* which the people attribute to the mix effects of pollution and the warming of the sea. *Buntot ng bakes* is a term used by the Calamian Tagbanua to describe the deformed parts of the seaweed that look like the tail of a monkey (thin, hard and hairy). With *ice-ice*, the color of the seaweeds turns white, making it less palatable.

[15] An assessment of the condition of coral reefs in the Philippines especially in Palawan significantly showed that more than 40% are classified as poor in condition while 36.71% are considered as fair, 16% are in good condition, and barely 4% are considered to be in excellent condition. See Appendix B for detailed information.

[16] Natural disasters such as floods, typhoons and landslides account for about 25% of natural disasters reported annually worldwide. Figures from the National Disaster Coordinating Council revealed that between 1990-2006, the country incurred direct damages to agriculture, infrastructure and the private sector amounting to an average of PHP19.7 billion (in real 2005 prices). This is equivalent to about .05% of GDP per year.

[17] *Manlalabyut* is a term from the Calamian Tagbanua term *labyot* which means "to pull." According to the elders, they refrain from creating noise when they sail near the *panyaan*. They also bring with them tobacco, *buyo* (pepper leaf), *bunga* (betel nut), and rice as offering to the sea and appease the manlalabyut. It is believed among the Calamian Tagbanua that the manlalabyut would pull down people into the sea if angered by noise in the area.

[18] DENR AO No. 34 covers the guidelines on the management of ancestral domain claims. This is pursuant to the policies embodied in the Executive Order No. 192 (dated June 10, 1998), Republic Act No. 7586 (also known as NIPAS Act of 1992), DENR Administrative Order No. 02, Series of 1993, and other pertinent laws, rules and regulations.

[19] The role of the Council of Elders is to give advice and guidance. The council is a group of respected individuals who have demonstrated exceptional knowledge and decision making on various issues concerning

the community; they have life experiences that serve as key references to past and present events and these help the people make decisions critical to the community. They also provide a link to the Calamian Tagbanua's ancestors.

[20] This modified rule allows due process to any offender especially if he/she is an outsider.

[21] The noise and pollution created by tourists after visiting the caves disturb the habitat and nesting activity of the *balinsasayaw*. Noise coming from low flying aircrafts to have an aerial view of the island near the limestone caves is pushing the balinsasayaw to look for other nesting grounds. The accumulation of garbage pollutes the clean waters of Kayangan and this is also seen as threat to the balinsasayaw. The Calamian Tagbanua believe that the birds drink from the lake and that the bubbles created from the sea waves are gathered by the balinsasayaw to build edible nests.

[22] Ikalahan is a contested term. Other residents claim that their genealogies taught them that Kalanguya is their true and original name, and Ikalahan is just a recently-coined term. Because of this, some prefer to use Kalanguya but at the same do not mind being called Ikalahan. Nevertheless, majority of the residents and respondents claim that they belong to the Ikalahan group and are more comfortable with the name.

[23] The KEF was founded to help establish the legal entity of the Ikalahan's claim for their ancestral land. Although the Board of Trustees (BOT) of the KEF is the main governing body of the Kalahan Reserve, people from different barangays are involved in decision making in KEF through the practice of *tongtongan*. The BOT is composed of elected officials, local informal leaders and community elders, thus representing a very broad array of stakeholders in the community. They have set up a mechanism that is proactive and builds on mutual trust. The community is united in protecting their resources, and in the promotion of environmental protection.

[24] CITES, or the Convention for the International Trade of Endangered Species, is an international agreement between governments with the goal of ensuring that the international trade of plant and animal species does not threaten their survival. There are three levels of classification (called Indexes I-III). Regulations associated with these classifications dictate the quantities of plants and animals that can be traded (if at all). They also have rules governing the import and export of these species.

[25] IUCN, or International Union for the Conservation of Nature, helps develop conservation science, manages field projects all over the world, and brings together players from different domains and sectors to develop and implement policy, laws and best practice.

[26] The Kalanguya-Ikalahan Ancestral Domain Sustainable Development and Protection Plan.

[27] Transpiration is the evaporation of water into the atmosphere from the

leaves and stems of plants <http://ww2010.atmos.uiuc.edu/%28Gh%29/guides/mtr/hyd/trsp.rxml>.

[28] RUPES is a project funded by IFAD and coordinated by the World Agroforestry Centre's Southeast Asia Regional Programme based in Bogor, Indonesia. It brings together a consortium of partners to build and test working models and best practices for successful environmental transfer agreements (and adapted to the Asian context). The RUPES project was initiated in 2002 during a regional workshop in Indonesia.

[29] Community forester Tamano Bugtong revealed in an interview that negotiations with the National Irrigation Administration (NIA) and the National Power Corporation (NPC) have produced positive reactions, but will need to be followed up.

[30] Aboitiz Power Corporation (APC) is a holding company that, through its subsidiaries and affiliates, is a leader in the Philippine hydroelectric power generation industry. The company has interests in some of the largest privately-owned distribution utilities in the country.

[31] Community members who report violators to the Agroforestry office get a percentage on the penalty.

[32] The Haribon Foundation for the Conservation of Natural Resources is a membership organization dedicated to the conservation of Philippine biodiversity. It aims to build a constituency for environmental issues that will call for the prioritization of conservation actions on habitats and sites, based on solid scientific and socio-economic research.

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**Appendix A.** Drought events, areas affected and degree of severity in the Philippines during the last four decades

| EVENTS | SEVERE | MODERATE |
|---|---|---|
| 1968-1969 | Bicol | Rest of the Philippines except Regions 1 & 2 |
| 1972-1973 | Central Luzon | Visayas and Mindanao |
| 1976-1977 | | Mindanao |
| 1982-1983<br>a) Oct. 82-Mar . 83<br>b) Apr. 83-Sep. 83 | Central Luzon<br>Southern Tagalog<br>Northern Visayas<br>Western Mindanao<br>b) Region 2 and parts of Region 1 | Region s 1,2,3, an d 5 |
| 1986-1987<br>a) Oct. 86-Mar. 87<br>b) Apr. 87-Sep. 87 | | a) Western Luzon<br>Bicol Region<br>b) Most of Luzon<br>Central Visayas<br>Northeastern Mindanao |
| 1989-1990<br>a) Oct. 89-Mar. 90 | Cagayan Valley<br>Panay Island<br>Guimaras<br>Northern Palawan<br>Western Mindanao | |
| 1991-1993 | Comparable with that of 1982-1983 | |
| 1994-1995 | Regions 1,2 ,3, NCR,5 and Palawan | Visayas and Western Mindanao |
| 1997-1998 | The whole of Philippines | |

**Appendix B.** Coral reef status distribution by category, Palawan

| Site | Total No. of Survey Sites | Excellent | | Good | | Fair | | Poor | | Year |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | |
| Bataraza | 24 | 1 | 4.17 | 16 | 66.70 | 7 | 29.20 | 0 | 0.00 | 2003 |
| Narra | 18 | 0 | 0.00 | 10 | 55.60 | 8 | 44.40 | 0 | 0.00 | 2003 |
| El Nido | 11 | 0 | 0.00 | 0 | 0.00 | 5 | 45.50 | 6 | 54.55 | 2002 |
| Agutaya | 21 | 1 | 4.76 | 4 | 19.10 | 8 | 38.10 | 8 | 38.10 | 2002 |
| Magsaysay | 18 | 0 | 0.00 | 5 | 27.80 | 12 | 66.70 | 1 | 5.56 | 2001 |
| Dumaran | 17 | 1 | 5.88 | 6 | 35.30 | 10 | 58.80 | 0 | 0.00 | 2001 |
| Taytay | 13 | 0 | 0.00 | 1 | 7.69 | 1 | 7.69 | 11 | 84.62 | 2001 |
| Quezon | 17 | 2 | 11.76 | 7 | 41.20 | 8 | 47.10 | 0 | 0.00 | 2001 |
| Brooke's Point | 7 | 0 | 0.00 | 3 | 42.90 | 3 | 42.90 | 1 | 14.29 | 2001 |
| S. Espanola | 26 | 1 | 3.85 | 9 | 34.60 | 16 | 61.50 | 0 | 0.00 | 2001 |
| Araceli | 3 | 0 | 0.00 | 1 | 33.30 | 2 | 66.70 | 0 | 0.00 | 2000 |
| San Vicente | 22 | 1 | 4.55 | 3 | 13.60 | 12 | 54.60 | 6 | 27.27 | 2000 |
| Busuanga | 9 | 0 | 0.00 | 0 | 0.00 | 7 | 77.80 | 2 | 22.22 | 1999 |
| Culion | 9 | 0 | 0.00 | 0 | 0.00 | 7 | 77.80 | 2 | 22.22 | 1999 |
| Coron | 6 | 1 | 16.67 | 1 | 16.70 | 0 | 0.00 | 4 | 66.67 | 1999 |
| Roxas | 12 | 0 | 0.00 | 6 | 50.00 | 6 | 50.00 | 0 | 0.00 | 1999 |
| Aborlan | 4 | 0 | 0.00 | 1 | 25.00 | 3 | 75.00 | 0 | 0.00 | 1997 |
| **OVERALL** | **237** | **8** | **3.38** | **73** | **30.80** | **115** | **48.50** | **41** | **17.30** | |

# Increased Vulnerabilities due to Climate Change: The Case of Kep A Village in Northern Vietnam

by Cao Phan Viet
Centre for Sustainable Development
in Mountainous Areas (CSDM),
Vietnam

## Introduction

The country of Vietnam spreads from the 15th northern parallel[1] and the 7th eastern parallel,[2] sharing borders with China on the north, and Laos and Cambodia on the west. On its east and south lies the East Sea.

The vast majority of Vietnam's population, based on the 1999 Census, is ethnic Viet or Kinh (65.8 million or 86.2% of a total population of 76.3 million) who speak the Vietnamese language. In 2005 it had increased to an estimated 85 million. Most Kinh were followers of Mahayana Buddhism, Taoism and Confucianism prior to the Indochina wars, though official figures indicate more than 80 per cent of them today have no religious affiliation.

Ethnic Kinh tend to be concentrated in about half of the country's territory, especially in coastal and low-lying areas, and have been engaged in intensive irrigated rice cultivation and fishing, though that pattern is increasingly changing.

Most of the remaining 53 official ethnic groups (though not all of the country's minorities are part of the officially recognized list) inhabit the interior mountains and highlands, though some, such as the Khmer Krom, Hoa and Lao, are concentrated in the cities or lowlands. Most of the other many remaining minorities tend to live in the mountains of the north, down the Truong Son mountain range, and in the central highlands. These

include a huge diversity in terms of languages, origins, religions and even scripts used and, according to the 1999 Census, represented 13.8 per cent of the country's population or 10.5 million people.

The main minority groups are the Tay, constituting 1.9 per cent (1.47 million); Thai, 1.7 per cent (1.3 million); Muong, 1.5 per cent (1.1 million); Khmer Krom, 1.4 per cent (1 million); Hoa (Chinese), 1.1 per cent (862,371); Nung, 1.1 per cent (856,412); Hmong, 1 per cent (787,604); and others, 4.1 per cent (Census 1999).

## *Land and Terrain*

The total inland area of Vietnam is 329,241 square kilometers, with a coastline of 3,260 km, the widest being about 600 km and the narrowest about 50 km. The area of sea economic privileges is about one million sq km, three times wider than the inland area. The territorial waters are places where socio-economic activities are concentrated, with nearly 60 per cent of the total population and attracting about 50 per cent large and important urban areas and almost all industrial zones in the whole country.

The terrain of Vietnam is relatively diversified: mountains, rivers, highlands, deltas, coastline, peninsulas and island. Mountains and highlands account for three-fourths of the total area. Mountain ranges normally are in western north-eastern south direction, nearly perpendicular to the eastern north-south west direction of the monsoon. Many mountain ranges are parallel and divide the territory by rivers in the western north–eastern south direction. Almost all rivers flow into the East Sea.

The total area of deltas accounts for only one-fourth of Vietnam's total territory, including the Red River Delta, Central Delta, South East Delta and Mekong River Delta.

Vietnam is divided into seven economic zones and sub-climate areas, including: mountainous area in the North, Red

River Delta, Central North, Middle South, Highland, South East and Mekong River Delta.

Given the above mentioned features, Vietnam frequently suffers from the impacts of storm, flood, flash flood, inundation, drought, desertification, salt penetration, squall, whirlwind, landslide and earthquake. Floods and storms are the two main types of natural disasters with high frequency of occurrence, widespread influence and with severe damage and consequences. In recent years, along with the global climate changes, there have been higher increases in the number, intensity and influence of natural disasters. Natural disasters result in such extremely big consequences as: infrastructure destruction, disruption of economic and social activities, great loss of numerous socioeconomic development achievements and poverty increase. They also directly affect many groups of people in society, especially the more vulnerable like the elderly, disabled, women and children living in disaster prone areas.

In the merely past 11 years (1995-2006), storms, floods, drought and other types of disasters have taken a huge human and material toll, with 9,416 dead and missing people; 7,622 injured people; and 7,966,682 collapsed, destroyed, swept away or damaged houses. The total estimated loss is about 61,479 billion VND.

## *Ha Giang Province*

Ha Giang province, the study area, is a mountainous province located in northern Vietnam, with a total natural land area of 7,945,79 sq km (more than 80% of hill and mountain), bordering China in the north, Cao Bang and Tuyen Quang provinces in the south, and Lao Cai province in the west. Of the country's 64 provinces, Ha Giang is one of the poorest remote mountainous provinces. It has a very low development index, poverty rate is up to 37.5 per cent (as per the new norms), and 90 per cent of the province's expenditures are from the governmental budget.

Ha Giang has 10 districts and one township, with 195 communes and wards, of which 143 are ranked in the most difficult status based on the governmental Program 135. Its population is 701,872, with women comprising 347,700. In 2007, poor households composed 35.5 per cent (263,202) of the total household number, and they were found mostly in Vi Xuyen and Bac Me districts (48.45% and 43.76%, respectively, of total population).

Ha Giang is an agricultural province, with more than 89.2 per cent of its population being farmers. It is also an ethnically diverse community with 22 ethnic groups, and 79 per cent of them are ethnic minorities, with the Hmong comprising 31.15 per cent; Dao, 15.4 per cent; and Kinh, 12 per cent.

Located at an average height of 800-1000 meters above sea level, natural conditions and climate in Ha Giang are very harsh. More than two-thirds of its natural land area are earth and rocky mountains, and the rest are low mountains. The terrain is divided by many high mountains and deep abyss; thus access is difficult especially in the rainy season.

## *Bac Me District*

Bac Me district is ranked among the poorest or most economically disadvantaged districts under the governmental Program 135, with a number of ethnic minorities like the Dao, Tay, Nung, Bo Y, Kinh and Hoa. In 2007, the average income per capita in its communes was 2,500,000 VND/year (approximately US$150) compared to the average income per capita of other communes in the province of 4,050,000 VND/year (approximately $200). The number of poor families is very high. And flash floods and unexpected climate change can make their number quickly rise.

## *Kep A Village*

Kep A village, the study area, is one of 17 villages of Minh Son commune in the Bac Me district in the low mountainous area of Ha Giang province. The village is contiguous to Cao Bang province in the north, with protected forests, rocky mountain forests and rice and maize fields; contiguous to Tung Ba commune in the Vi Xuyen district in the east and to Yen Minh district of Ha Giang province in the west where there are primary forests and terraced fields. It is 12 km away from the center of Minh Son commune.

Kep A village has 67 households with 375 people (of which 6 households are Dao and 61 are Hmong). It is divided into 3 hamlets: 1, 2 and 3. Access to the village is a small road, 1.246m long, that connects the area to the main road, but it is currently in bad condition in two hamlets.

All the villagers have been living in Kep A for a long time. In spring and summer, the people cultivate rice on around 5 hectares and maize on a larger area of 37 ha. Forest land is mostly protected forests and primary and rocky mountain forests with

a total area of 95 ha. Of these 40 ha are allocated to households and the rest are used by the community as a whole.

The village is served by a concrete irrigation system of 1.200m in length originating from a dam in the north mountain; it irrigates 14 ha of rice in hamlets 1 and 3. Built though the joint effort of 134 Program (which provided cement) and local people, the canal was completely damaged by floods in 2007. In February 2008 it was rebuilt when 10 households contributed 18 tons of cement and others provided labor to carry stone and sand. In addition, the village has another canal, made of bamboo, from an artisan water source in the north hill that irrigates one hectare of rice and ponds in hamlets 2 and 3. These canals can only work effectively when there is enough rain; otherwise the hamlets face water shortage.

The people mostly rely on natural water sources, drawing from a source in the north hill through a steel pipe. The pipe, supported by government programs (134 and 135) started operating in October, 2008 in hamlets 2 and 3. Households in hamlet 1 have to use other water sources through a bamboo system.

As for other social services, a kindergarten and a 4-classroom primary school are located at the gate of the village where children of various ages are put in the same classes. The pupils have to cross a stream to get to the school, and when it is flooding, assigned people assist them on both sides of the stream.

The village has no health care service of its own, and the nearest facility is a health care center in the commune 12 km away. The common ailments that affect the local people in the rainy season are diarrhea, flu, sore eyes and virus fever.

## Impacts of Climate Change

### *In Ha Giang*

Low forest coverage in the two districts of Ha Giang causes soil erosion; thus when floods occur, the water sweeps down the hills and mountains, bringing all the rocks and soil down to the populated areas and filling up rivers. Bare land and hills in these areas occupy 82 per cent of the natural land area. There are two reasons for this situation: a) firstly, the two districts are more populated than others. Due to its easier access for settlement, the pressure for more and more cultivated land remains high, pushing local people to burn down the forests for cultivation including the watershed areas. b) illegal logging in the past, resulting in a great loss of forests.

The mass exploitation of natural resources and minerals, and construction of hydroelectric dams on the rivers has destroyed the natural topography, and this appears to have contributed to the higher frequency of flash floods. However, the provincial authorities (who give permits to companies) have not been aware of the linkages of such construction development and increased danger of flash floods.

Currently, many farmer households in these communes have continuously practiced slash and burn agriculture for rice cultivation. People are concerned about daily food supply, yet do not realize clearly the links between deforestation and flash floods. The interviews in the villages showed that the local community as well as authorities had very limited awareness and actions towards forestation and forest conservation, especially in the watershed areas.

## *In Kep A Village*

Hills and mountains account for 90 per cent of the total area in the village. Isolated by high mountains, sloping small streams and scattered dry streams, the village usually faces flooding and landslides in the rainy season. Earth roads are bumpy and difficult, especially in the rainy season.

Observations show that soil in high mountains is brown or gray, infertile, and easily dries and erodes. Water reservations are poor. A large area is bare hills with infertile soil, unstable geology and poor floristic composition. Rocky mountain forests, comprising bushes with low economic profits, account for a big proportion of the land area.

### *History of natural disasters in Kep A village*

The following presents the natural disasters, causes and effects that have struck Kep A village in the 10 year period from 1998 to 2008:

June 2008: catastrophic floods and landslides

- Near the stream
- Long heavy rain and people caught unaware
- 4 households swept away
- 2 cows swept away and 4.5 ha of maize buried in landslide

November 2008: severe/damaging cold (third most severe that had been experienced)

- Sowed maize seeds could not grow
- Rice seedlings died from severe cold and hoar-frost
- 48 cattle died
- 1 child and 1 old person died of pneumonia
- Edible cannas could not grow, all cassava plants rotted
- No grass for cattle as it could not grow due to the cold
- Children could not go to school

September 2007: flooding (second most severe that has ever been seen)

- Non-stop heavy rain for two consecutive days
- 1 house swept away
- 4 cows , 20 pigs, 100 chickens and 14 goats swept away
- 1 old person died when house collapsed
- Up to 8.2 ha of rice fields inundated
- Up to 6 ha of maize fields destroyed
- Children could not go to school due to swollen streams

July 2006: catastrophic flood and landslide

- Heavy rain for 7 consecutive days
- 4 ha of blooming maize buried in landslide

August 2006: typhoon

- 4 cows swept away
- 2 houses collapsed, 18 house roofs blown away
- One old person (about 65 years old) died when house collapsed
- 5 ha of rice to be harvested inundated
- 3 ha of grown rice plants destroyed
- 3 ha of cotton and flax inundated

June 2005: landslide and catastrophic flood

- Heavy rain for 7 consecutive days and landslide at night time
- 1 cow swept away
- 2 dams built by local people destroyed
- 2 ha of rice field in hamlet 1 buried by landslide

August 2004: typhoon

- 2 houses collapsed in hamlets 2 and 3
- Roof of one classroom and roofs of 6 houses blown away

May 2005: landslide

- Heavy rain and wind for 7 consecutive days, catastrophic flood and landslide at night time
- 3 ha of blooming maize and rice buried

July 2001: landslide (biggest ever seen)

- Heavy rain for 7 consecutive days, catastrophic flood and landslide at night time and people caught unaware
- 5 people died: one child, one old person and 3 youths
- 6 cows and 1 person in hamlet 1 swept away

September 1998: landslide in hills and catastrophic flood

- Heavy rain for many days
- 20 cattle, 30 chickens and pigs, and 20 goats swept away
- 4 ha of rice to be harvested completely buried
- Cassava and fruit trees buried

**Effects on socioeconomic conditions**

The abovementioned floods, landslides, severe cold and heavy rain had tremendous effects on the lives, health and culture of the villagers.

### *Agro-forestry and animal husbandry*

Irrigation systems were destroyed, resulting in shortage of water for the village. Landslides buried fields and crops, and narrowed agricultural and pasture areas. Cattle died either from the extreme cold or flood, and other animals suffered a high incidence of epidemics that spread especially during the winter.

### Assets and construction

Vital public infrastructure like schools, bridges and canals were damaged, causing traffic jams and disruption in delivery of social services. Many houses of local people were similarly damaged or entirely destroyed.

### *Environment*

Water became polluted, while muck and garbage after the floods were not immediately cleaned up. Agricultural land was reduced and exhausted.

### *Food security*

Food production was reduced, increasing the number of months of lean food supply or food lack in the community. Villagers also had lower income from their trading activities as well as from their forest products, such as mushrooms and medicinal herbs, since access to the market and forest became difficult or these suffered damage.

### *Health*

A higher incidence of epidemics followed after the floods and rain, and this included strange diseases with unclear causes and gynecological diseases.

### *Culture and education*

All aspects of community life were disrupted. People could not work during the long rainy days and floods, and no village meetings could be held. Children were unable to go to school because of swollen streams and damaged classrooms, or they had to relocate to a new place to avoid floods and landslides.

## Local observations on climate changes

The Kep A villagers noted that the seasons are now unclear because of changes in the normal weather patterns. More rain is experienced than before and its duration is longer, lasting for as long as 3-4 hours. In the same vein, more droughts are seen in the dry season from December to April.

The changes are also manifested in more unpredictable and sudden floods, more landslides, increased temperature, and storms and whirlwinds that never happened before. Strange insects are also causing diseases in plants, and strange diseases are similarly striking humans

Some varieties of crops are no longer suitable, as they produce low yields and grow slowly. The water has become seriously polluted. Unplanned construction is undertaken, and people are not guided accordingly.

In the past animals, such as monkeys and bears, lived in the forests managed by the village but now they have all disappeared.

Watershed forests have recently been cut down, and hence could not retain water and soil. When heavy rains occur, different earth layers are swept away, causing land cracks.

In 2007, Hoang Back, an ore exploration company operating in hamlet 3, bought agricultural land from the local people, and as a result many households did not have any land to cultivate. Although the company's activities have not shown any evidence of being the cause for landslides, they caused negative impacts on the environment and life of the Kep A villagers.

In 2006-2008 various cracks appeared in the eastern side of the mountain where many people lived. According to this study's observations, there are six cracks (landslides) in total, each of 400-700 m. The village leader, Pham Van Sac, said he had never seen such cracks in his entire term since 1997. The local people did not know why these cracks occurred, although some people, according to Mr Sac, attributed these to the long drought that struck the village combined with heavy rain.

The local people expressed concern as well as surprise at these cracks that they said appeared shortly after about two hours of rain. They also exhibited worry and exhaustion from the natural disasters that have occurred and could happen any time. According to the study's assessment, the whole village is living in a dangerous area, but the commune and village think that only six households needed to move before the rainy season in 2009. However, either these households did not have any other land to relocate to or even if they did, they did not have money to move or to buy materials to build new homes. At the time of the study, they were still waiting for support from the local government to move to a safer place.

**Situation of villagers living in areas affected by climate change impacts**

Some families in Kep A village live on the banks of streams and at the foot of mountains where landslides can occur. Some areas have a thin and soft soil layer and some hills bear many cracks. While floods often happen, these and landslides occurred more frequently in the last two years.

The village's watershed forests have been cut down and other forest areas have been burned, with no big trees left. When it rains, the soil softens easily causing landslide, but during droughts the soil cracks. The village is located in a valley, thus it is not greatly buffeted by strong wind. The houses are so dispersed that it is easier for one to reach the main road or the center than to other households. Most households are poor or average. While clean water is available, people have no access to electricity.



One of the biggest problems of the villagers is flooding that can inundate the floors of their houses. They are especially concerned about flashfloods that happen so suddenly and occur at night that they are barely able to escape. When it rains hard, they stay awake the whole night to be able to quickly act when necessary.

Also of great concern are earth cracks that suddenly appear. After any strong rain, people are worried about landslides. Floods are sometimes predictable but not landslides. When landslides bury agricultural lands, they suffer a shortage of food.

Another problem for those living in high risk zones is that they do not have any land in safer areas to move to or the money to relocate.

To address some of these problems, the villagers want support for capital and fertilizers to start production in buried areas, especially for San Uu 63 rice seeds which are suitable to their soil conditions and have a shorter growing period. They also hope to find a new and safe place where they can resettle. But they need money to buy or exchange land with other households in safer areas as well as to purchase materials for building new dwellings and starting production.

## Climate change as interpreted by villagers

The research team used a number of participatory tools such as interviews, mapping, group discussions, storytelling and field observation to assess the situation of flash floods, duct flood, landslide and climate change at the grassroots as well as provincial and district level. Water scarcity has been a common problem for rocky and low mountain districts. Harsher weather including the sudden 2-month cold spell in 2007 and higher frequency of flash floods happened at random patterns in low mountain districts, sweeping away houses, fields, schools, cattle and even people. In the years 2003-2005, 3-5 flash floods occurred per year, These started only in late July or August, while more recent floods came earlier in May and June. In 2008 alone, seven flash floods occurred in Bac Me district.

Kep A villagers living in hazardous areas were very anxious about the danger that could happen any time. Through discussions with the local people, we realized that they had never seen a more terrifying flood than that of July 2006 and severe cold than that of 2007. They said floods are now faster, stronger, longer and more frequent than ever before.

**Table 1.** Seasonal calendar of Kep A village

| Variety | Maize | Rice | Soya bean | French bean | Vegetable | Flax |
|---|---|---|---|---|---|---|
| Area | 26 ha | 14 ha | 8 ha | 4 ha | | 3.8 ha |
| Month | March and April | May | June 6 | January | November and December | February |
| Harvest -ing month | August | August, beginning of September | August | March | January | June |

### Agricultural and livestock production

According to the seasonal calendar, the period to grow rice is from May to August. Local people are aware that growing rice at present is very risky. However, it is impossible to shift to a new rice variety with shorter maturity, as there is not enough water before May. They can only grow rice and maize in May.

The villagers mostly raise buffalo, and a few goats, chickens and pigs, and these are affected by certain diseases during certain times of the year. Cattle in the area usually catch congestion from February to March and from August to September, pigs often get diarrhea in March; and chickens, cholera and flu in June.

### Health care

People often have fever, cough and flu. Currently, there appear strange diseases such as fainting.

From January to February people usually get diarrhea as it is a transitional period between two seasons, and from July to August children and old people often get flu and cough.

From January to March, people have annual health checks in the commune health care station.

### Culture

According to the local people, TET (lunar calendar) in 2008 was not very happy, as it was too cold, hindering people from making visits to friends and relatives and from participating in cultural activities. Besides, many cattle and domestic fowl died from the cold, affecting their income and nutrition during TET holidays.

### Weather

The weather has recently changed unpredictably and diverged from its normal patterns, and the changes are more pronounced when compared to those of 10 years ago, as shown in the following table.

**Table 2.** Comparison in weather between 2008 and 10 years ago in Kep A village

| Normal weather pattern | Strange weather pattern |
|---|---|
| Drought from April to June | Drought may start from July until December |
| Heavy rain, catastrophic flood and landslide from July to September | Severe floods may happen in June |
| Stronger wind grade 8th, 9th, even 10th in October, November and December | Strong wind may happen from August till December |
| Severe cold, fog and hoarfrost happen in January, February and March | There may be severe cold from November of previous year till the following March |
| | Drought and hoarfrost from January till April, kill all pastures and wither vegetables |

## Indigenous knowledge/indicators to predict climate change

The village and commune do not have any warning systems or signals, such as for floods, in the danger zones. Therefore, when floods or landslides suddenly occur, people are often only able to take care of their own families. Bac Me has witnessed entire villages being swept away, but could only inform the province and district two days later. Although the provincial floods/storms control steering committee reportedly has had plans to build 10 rainfall gauges and early warning flood systems, the villagers are not clear where these systems will be installed and how to use and maintain them.

Local people cannot know when and where floods or landslides will happen. While weather forecasts usually provide general information about the risk of floods or landslides, specific areas are not mentioned, and forecasts have recently proven incorrect.

According to some old people in the village, they can predict heavy rain based on their own experience such as: it is cloudy, cold winds blow, termites appear, termites fly to lights, salt melts. Or when they see mynahs bathing, there might be storms.

In 2007, during a heavy rain in Bo Peng village adjacent to

Kep A village, a family was saved from a landslide due to the timely warning of the mother. They were having dinner while it was raining hard. Although they did not see any sign that a landslide would happen, the mother, based on her experience, ordered her two children to run out of the house. Only a moment after they got out, land on the hillside fell down. Luckily no one was killed.

Local people do not know how to give first aid in case of emergency as they are not trained and equipped with necessary equipment, such as: palanquin, oxygen pots, medicines and tents, among others.

Although the village has loudspeakers, these are used only to inform the people about the direction for flood/storm control of the commune or district or to inform them about weather forecasts that the village leader picks up from television or radio.

**Social economic and geographic factors increasing vulnerability**

Kep A village is covered by low earth hills and mountains and its geology is changing. Much of the watershed forests have been cut down, and only bushes are left behind. The weather has changed, with drought lasting from two to four months together with heavy rain creating big cracks. Currently the village has six big cracks that threaten the community with landslides.

Most of the households in the village live a difficult life, as they are poor, lack food for 3-4 months in a year, and do not have strongly built dwellings. None has completed high school. These problems hamper them from preparing and responding well to natural disasters.

While the local authorities recognize that Kep A village is one of three villages, which lie in the most dangerous zones, the province and district have so far no assistance plans for the village. Mr Nguyen Thanh Chien, vice chairman of Minh Son commune people's committee, said the situation was difficult as there were many areas in the province more hazardous than

Kep A that needed assistance. This aid did not concern only land policies but also support for livelihood activities for the affected people.

## Vulnerable groups

The following table shows the most dangerous natural disasters in Kep A village and the level of vulnerability of various groups.

**Table 3.** Level of vulnerability to natural disasters (level 5 is most vulnerable)

| Type of natural disaster | Level of vulnerability | | | | Total score | Final score |
|---|---|---|---|---|---|---|
| | Women | Men | Both men and women | Old and handicapped | Children | |
| Landslide | 5 | 4 | 4 | 5 | 5 | 1(23) |
| Catastrophic Flood | 5 | 3 | 4 | 5 | 5 | 2(22) |
| Floods | 4 | 2 | 3 | 4 | 4 | 3(16) |
| Severe cold | 3 | 2 | 2 | 4 | 3 | 4(14) |
| Drought | 1 | 1 | 1 | 3 | 2 | 5(8) |
| **Total score** | **18** | **12** | **14** | **21** | **19** | |

Landslide is ranked as the most dangerous natural disaster. Villagers living in hazard prone areas are always worried about its occurrence as it may happen without any warning. Next are catastrophic flood and common floods. People put lower scores for severe cold and drought as they think that they are able to respond to them and their lives are in less danger from these disasters.

The old and handicapped are the most vulnerable groups, followed by children and women. The latter group has limited knowledge and ability in preventing and responding to natural disasters, and they do not have many opportunities to participate in village activities. While men are also vulnerable, they are less so compared to other groups.

## State Policies, Programs and Actions on Climate Change

To address climate change and its impacts, the government has issued a range of policies, laws and ordinances.

Laws and Ordinances on Natural Disaster Management and Mitigation

- Decision of the Prime Minister No.137/2007 on 21/8/2007 approving a project on information organization serving natural disaster control at sea
- Decision No. 307/2005/QĐ-TTg of the Prime Minister issuing Rules for tropical low pressure flood and storm.
- Decision No. 63/2002/QĐ-TTg of the Prime Minister on flood and storm control and natural disaster mitigation.
- Decision No.23/PCLBTW/QĐ on 14 May 1996 on duty on Flood and storm Control of Central Committee, of Steering Committee, of Ministries, of Central Sectors and Steering Committee of localities
- Decision 355 of the Prime Minister on 28 May 1996 on functions, tasks and rights of Depart-

ment for Flood and Storm Control and Prevention and Department of Dyke Management of the Ministry of Agriculture and Rural Development

- Direction No.12/2005/CT-TTg of the Prime Minister on Flood and storm Control and search and rescue in 2005
- Direction No.13/2006/CT-TTg of the Prime Minister on Flood and storm Control and search and rescue in 2006
- Direction No.22/2006-CT-TTg on strengthening security/safety for sea fishing in sea areas, especially fishing offshore (30 June 2006)
- Direction No. 32/2004/CT-TTg on 17 September 2004 on some measures to control flash flood in mountainous provinces
- Decree regulating details of some articles of Ordinance on Flood and storm Control which was adjusted and supplemented on 24 August 2000 (16 January 2006)
- Decree No. 62/1999/NĐ-CP on promulgating rules on flood allocation and flood slowdown in Red River dyke system to ensure safety for Hanoi Capital (31 July 1999)
- Decree No.168/1990/HĐBT regulating organization and tasks of the Central Committee for Flood and storm Control and Steering Committee for Flood and storm Control of Sectors and Industries (19 May 1990)
- Decree No.168/HĐBT on 19 May 1990 on the establishment of the Central Committee for Flood and Storm Control
- Decree 50 NĐ/CP/ on 10 May1997 regulating rules and policy on establishment and operations of Local Flood and storm Control Fund
- Decree 07 on 9 March 2000 regulating social search and rescue policy

- Decree No.123/CT-TTg on managing aquatic product exploitation of Vietnamese organizations and individuals at sea (30 June 2006)
- Decree No. 66/2005/NĐ-CP on securing safety for people and fishing boats in aquaculture field (15 May 2005)
- Circular 18/2000/TT-BLĐ TBXH on 28 July 2000 instructing some articles of Decree No.07/2000/NĐ-CP on 09 March 2000 of the Government on social search and rescue policy
- Circular No.02/2006/TT-BTNNMT instructing implementation of Decision No.307/2005/QĐ TTg on 25 November 2005 of the Prime Minister's Rules for tropical low pressure flood and storm control

The government has also established a committee for flood and/storm control from central to local levels to respond to natural disasters, as shown in the following chart.

## *In Ha Giang Province*

*The central and provincial level* provides instructions and directions on floods and storms control.

*At the level of Bac Me district,* a steering committee on floods and storms control has been set up, including 13 commune people's committee chairmen. The vice chair heads the committee, and deputies include the heads of the district police office, district army and agricultural office. This committee has the responsibility to be on duty for 24 hours and implements all instructions and directions of the central and provincial committee.

*At commune level (Minh Son commune),* an implementation board with 38 people oversees floods and storms control and disaster risk reduction. The chairman is the vice chair of the people's committee, and other members include mass organizations, village leaders, school headmasters and health care centers. When the weather forecast predicts rain or a storm, the committee calls a meeting and assigns staff to implement directions from higher levels in the villages.

This committee meets annually to strengthen their organization, assess all villages in danger and make plans for control and for moving people.

*At village level (Kep A Village),* the implementation team for flood and storm control includes policemen, militia and youth union. This team should be on duty to support people when floods or storms occur and communicates with the commune.

Although Ha Giang province has given a lot of attention to flood/and storm control and disaster risk reduction, it faces hurdles in implementation due to the frequency and complexity of natural disasters.

When a natural disaster occurs, provincial and district authorities and flood/and storm control committees normally pay a visit to the affected area to look at the situation and provide financial support to victims. Provincial authorities also direct the army to help local people repair houses and schools, provide seeds/seedlings, and mend irrigation and water supply systems, among others. However, these efforts only help to reduce people's loss after natural disasters. A more important question raised by their occurrence is the lack of a good forecast system.

## *Natural Disaster Preparedness and Reduction*

The standing board of the Ha Giang provincial flood/and storm control committee has a plan for moving people, reviewing areas where natural disasters often occur, developing forests and watershed forest protection, improving communication, and building capacity for technical staff and communities. However, the implementation of the plan faces many difficulties in terms of finance, information and participatory basic researches.

Currently Ha Giang province does not have a strategy on climate change, which the flood/and storm control committee board is responsible for preparing. The province however has a plan to move people living in high flood risk areas in Kho Là village, also in Minh So'n commune. In 2007 after a catastrophic flood and landslide, 50 households in this village were relocated to an area in Na Seng village in the same commune in accordance with Decision No.2522/QĐ-UBND of Ha Giang People's Committee. Only after relocating to the new place were the victims given financial support to build houses and to start production. However, the land was limited, roads were not completed, and electricity and other services were not easily accessible.

In the past few years, the government has been implementing a resettlement policy for ethnic minority communities to settle in the commune, increasing the pressure on land resources.

## *National Strategy on Natural Disaster Prevention, Response and Mitigation to 2020*

The Vietnam National Strategy on Natural Disaster Prevention, Response and Mitigation to 2020 (or the Strategy) reflects the country's objectives, programs and strategies in natu-

ral disaster mitigation and management. Approved by the government in 2007, it prioritizes non-structural measures including community-based disaster risk management.

The community-based approach, by promoting community participation and ownership, encourages communities and government to take a proactive approach to the risk of natural disasters. Many activities for natural disaster prevention, response and consequence recovery have been and are being conducted by the government and national, international and nongovernment organizations to help communities better respond to natural disasters.

But there remains a significant need for a more integrated, holistic approach linked to broader development and policy planning at the national, regional, provincial and community levels. The Hyogo Framework for Action 2005-2015 stands as a successful model for addressing this issue. It states that disaster risk reduction and management should be included or given greater attention at national and local levels as well as in the development plans of international donors.

The Strategy sets up tasks and solutions in compliance with an area's natural and socioeconomic conditions. It directs the integration of natural disaster mitigation into socioeconomic development plans at different levels: national, provincial, district, commune and sectoral. It also provides for monitoring and evaluation.

It is the first time in Vietnam that a comprehensive strategy that covers almost all fields of natural disaster control, mitigation and prevention is available. The Strategy addresses shortcomings of past dispersed policies and programs. It is the legal base by which various sectors and industries can carry out integration of natural disaster mitigation into their socio-economic development plans.

The 5-year Socioeconomic Development Plan for 2006-2010 (or the Plan) set the framework for natural disaster mitigation both on the national and regional levels through strengthening capacity of the whole society to deal with natural disas-

ters. In addition, it established a monitoring and evaluation framework for the Plan's implementation.

In terms of objectives, the Plan not only set up objectives to achieve socioeconomic development for the period 2001–2010 but also sought to reach a higher level towards sustainable development to lead the country out of its low income status, create more employment with higher productivity and quality, and significantly improve the material and spiritual life of the people. The main criteria established for sustainable development were based on three axes: economy, society and environment.

## *Limitations*

A review of the current status of integration of natural disaster mitigation into 5-year socioeconomic development planning for 2006-2010 has initially pointed out some limitations.

In general, the Plan does not integrate natural disaster prevention, response and mitigation in a comprehensive manner. It mainly provides for socioeconomic development and environment protection, but disaster prevention, response and mitigation is dispersed on a small scale that does not follow the comprehensive approach set by the National Strategy. In some sensitive areas such as aquatic product development, coastal economy and environment, detailed indexes are not integrated. In the fields of infrastructure construction and transport and traffic, sustainable indexes of the work in areas most frequently subjected to natural disasters are not delivered, such as investment rate, design and construction materials. Or in the North Central Region and Southeast Coastal Region, it is necessary to have criteria on infrastructure, design and construction of housing models that are appropriate for flood and storm areas (according to the National Strategy to 2020).

Specific circulars are needed to guide sectors, levels and industries in the integration of natural disaster mitigation in their plans and programs. In addition, indexes and solutions for each

sector, industry, territorial area and field are limited to listing work heads and do not identify a road map, process, tasks and cooperation of implementation agencies, monitoring, including work and non-structure solutions for natural disaster prevention, response and mitigation.

Further investigation shows that many sectors and industries have not identified criteria and solutions for integration in their development plans. Natural disaster prevention, response and mitigation and risks are not cited at all.

While the Plan provides for some integration, it lacks an organizational setup that details the responsibilities of each of the implementing agencies.

## *Implementing REDD in Vietnam*

Vietnam signed the UN Framework Convention on Climate Change (UNFCCC) in November 1994, and approved the Kyoto Protocol (KP) in September 2002. The Ministry of Natural Resources and Environment is the lead agency in implementing the Climate Protocol. The government also approved the first National Notice to the UNFCCC Secretariat (2003), and on 4 July 2007 established the UNFCCC and KP Steering Committee based on a consultant board. Not only adaptation but also mitigation activities are part of the country's obligations in implementing the Climate Change Convention.

## *Policies and Key Actions*

Vietnam is one of the five countries most adversely affected by climate change, thus the Party and the government have focused great attention to its response. One of these is Reducing Emissions from Deforestation and Forest Degradation (REDD), a mitigation program proposed for inclusion[3] in UNFCCC and

strongly supported by some multilateral finance institutions such as World Bank (WB).

The government sent a Letter of Interest to UN-REDD and the WB Forest Carbon Partnership Facility (FCPF) for implementation of a REDD pilot program in Vietnam. REDD implementation is seen to directly contribute to the programs of the Ministry of Agriculture and Rural Development (MARD) to respond to climate change. REDD however requires a new level of forest governance, in particular reframing forest policy in a climate change context and capacity building.

## *National REDD Strategy*

REDD is a trans-boundary, multisectoral program, requiring wide and active participation of various stakeholders. Vietnam's REDD policies include national-based (programmatic) approach to avoid in-country leakage but also accepts project–based options for the first period (learning by doing). All potential resources are to be mobilized—government, donors, private sector and local communities—and the program is to be integrated into existing socioeconomic development programs and strategies. Market-based and non-market based mechanisms are to be combined, and while REDD is a country-led program, it needs support from the international donor community. The result of the pilot studies will be used to amend current related policies.

The objective of the national REDD strategy is to reduce emission from deforestation and forest degradation. It also aims to promote social-economic development and poverty alleviation in forest areas through sustainable management of existing natural forests and facilitate reforestation, both natural regeneration and forest plantation, and strengthen forest management and reforestation. Its goals are for reforestation of 14.3 million ha in 2010 (43%), 16.24 million ha by 2020 (47%); and afforestation at 1.0 million ha (2006-2010), 1.5 million ha in

2011-2020 ; and wood production at 20-24 million $m^3$/year.

The proposed components of the national REDD Strategy Reference formulation are: establishment of national REDD strategy development of transparent carbon-stock monitoring/verification system and data management; design of payment system; engagement with stakeholders at various levels (stakeholder dialogues); and reporting, review, evaluation and learning from system performance.

## *REDD Impacts on Indigenous Peoples*

While the Ethnic Minority Working Group (EMWG) cooperated with MARD and international and local NGOs to organize several workshops on climate change, which introduced the REDD program and its mechanisms, these had no participation from indigenous peoples. These only involved government officers and international and local NGO development workers.

Awareness on REDD is low especially among indigenous peoples, and transparency is lacking in the development of its national mechanisms. The REDD program should be guided by the United Nations Declaration on the Rights of Indigenous Peoples, and awareness raising on it and its concepts is needed especially for indigenous communities. Throughout the region, indigenous peoples are often unjustly blamed for causing large-scale forest fires which contribute to climate change, because of a perceived link between shifting cultivation and forest fire. Several Readiness Plan Idea Notes (e.g., from DRC REDD Network), incorrectly identify collection of fuel wood and shifting cultivation as main drivers of deforestation. This misrepresentation of traditional practices casts doubts on the credibility of governments and their willingness to consult with indigenous peoples. At the Asia Regional Consultation of WB Forest Carbon Partnership Facility, stricter control of traditional practices

was identified as one of the biggest risks of REDD for indigenous peoples.

## Adaptation and Mitigation Methods of Kep A Village

On the community level, local villagers have developed several ways to adapt to and mitigate climate change. But these do not address the impacts of climate change, having only limited effects, and the people lack the needed capacities to respond adequately to the growing frequency and intensity of natural disasters.

In the past, people in Kep A village planted high-yield China squash instead of local varieties as it grows faster and the fruit is bigger. However, its resistance to diseases is weaker and it rots more easily. Recently villagers went back to the local variety, since it can keep for 3-4 months after harvest although the fruit is smaller and grows slower. The villagers think that the local variety is more suitable at a time when a lot of natural disasters are occurring. When rains last long, damaging their vegetable crops or floods make it difficult for them to plant, people can rely on the China squash for food.

Local villagers usually reserve food items like salt, oil for lighting, rice, maize in case of natural disasters. People also store seeds in the ceiling. However, while storing food is effective for long rains, it does not work in case of catastrophic floods or landslide.

**Table 4.** Factors influencing response to natural disasters

| Material | Organizational | People's awareness |
|---|---|---|
| • Lack of an irrigation and drainage system<br>• Houses located in low land/area<br>• Lack of rescue equipment<br>• Lack of equipment for moving<br>• Lack of equipment for preparing and responding to floods and storms | • Not pro-active in preparing and controlling floods/storms<br>• Loose collaboration between different bodies in the village<br>• No voluntary rescue team | • Not pro-active in preparing and controlling floods/storms<br>• Limited understanding of natural hazards<br>• Subjective |

## *Local Capacity for Response Before, During and After Natural Disaster*

Kep A villagers are mostly ethnic minorities living far from the center of the commune and district. It is difficult for them to know when and where natural hazards will occur, as they do not understand the Vietnamese (Kinh) language. The village does not have a warning system or community boards to inform them about national disasters. Only a few people who understand Vietnamese can understand the weather forecasts on TV or radio.

**Table 5a.** Before a natural disaster

| Time | Action |
|---|---|
| Before a natural hazard | • inform/warn people through loudspeaker or putting up warning systems/signals<br>• review which households are in dangerous areas<br>• clean drainage system<br>• cut down trees to prop up house roofs<br>• households near streams to move to safer places<br>• take cattle to safer places<br>• put seeds/seedlings and assets up in ceilings |

Vietnam has a complicated geography and climate pattern, and catastrophic floods and landslides happen suddenly, making it difficult to give specific weather forecasts.

And in instances when local people know that they are in danger, they face many constraints to relocate to safer places, such as no land to move to or no money to buy materials to build a new house. Minh Son commune has an implementation board that includes representatives of different bodies in the village. However, the board acts passively, taking action only according to the directions and instructions of provincial and district authorities.

**Table 5b.** During a natural disaster

| Time | Action |
|---|---|
| During a natural disaster | • village head sends out alarm for people to move to safer place<br>• local people run away to escape flooding with a torch<br>• call for support of policeman, militia and youth union to help families in dangerous areas to move to safer place<br>• head of household takes family to safe place and then returns to get assets |

Catastrophic floods usually occur at night time, making it hard for people who are scared and confused, to act quickly. Women, children and elderly are the most vulnerable.

The village does not have a community house located in a safe place for those who are in high risk areas, while people do not have enough necessary equipment for evacuation such as tents. During floods they run up to the top of the mountain; for Kep A villagers it is a safer place.

The village has neither a warning or signal system nor loudspeakers. When a natural disaster happens, people act spontaneously and there is no voluntary group in the community trained to give first aid and emergency assistance. In addition, the village does not have medicine supply or first aid equipment to help local people in case of a disaster.

Although the village has established a so-called relay race team responsible for reporting to local authorities when a natural disaster is expected to occur, they are not very effective as the village is very far from the commune center. They run to reach the commune, but by the time they reach it, the disaster would have happened.

**Table 5c.** After a natural disaster

| Time | Action |
|---|---|
| After natural disaster | • villagers help each other to repair houses<br>• clear earth and stones from damaged houses<br>• dig holes to bury dead cattle<br>• clear up fields<br>• go to hospitals or health centers for treatment |

After a natural disaster, it takes people a lot of time to stabilize their production, especially for those with lands buried by landslides or inundated by floods. Thus, villagers often experience food shortage or lack after a natural disaster.

Water and environment also get contaminated, causing skin or gynecological diseases and diarrhea. Although commune healthcare workers are very active during times of catastrophic floods, they have to cope with various limitations (such as too few staff, long distance), especially in emergency cases and epidemics after floods. Damaged roads and traffic jams also hamper assistance and support for injured people.

## Recommendation

### *Establish Road Map for Integration*

Due to the abovementioned limitations and in accordance with the spirit of the National Strategy on natural disaster prevention, response and mitigation recently approved by the Prime Minister, a road map is needed to push its integration in the planning and strategizing of national socioeconomic development plans.

At the same time, it is necessary to bring this down to lower levels. Documents should be issued to instruct the integration of natural disaster mitigation for the different sectors and levels particularly provinces, industries and development programs, hunger elimination and poverty alleviation programs, investment strategies and activities of different partners operating in Vietnam.

**Endnotes**

[1] From 8 degree 30 to 23 degree 20.

[2] From 102 degree 10 to 109 degree 20.

[3] Which has since been approved.

# Coping with Drought: Climate Change and Maasai Pastoralists in Tanzania

by Elifuraha Isaya Laltaika
Commmunity Research and
Development Services, Tanzania

## Introduction

Tanzania is situated on the eastern part of the African continent, about one degree south of the equator. On the east, it borders the Indian Ocean, and on the north, Kenya and Uganda. To the west it shares borders with Congo, Rwanda and Burundi, on the southwest with Zambia and Malawi, and on the south with Mozambique.

Tanzania is also referred to as the United Republic of Tanzania (URT) because it is a union of two formally independent African states, namely the Republic of Tanganyika and the People's Republic of Zanzibar. The two concluded a treaty of Union on 22 April 1964 as the result of which, they became one sovereign republic from 26 April 1964.

Tanganyika gained its independence from the British who administered her after the end of WWII under the United Nations Trusteeship on 9 December 1961, and a year later she became a republic. Zanzibar on the other hand became independent on 12 December 1963. Prior to her independence, Zanzibar (which was ruled by an Arab Sultanate) enjoyed a protectorate status under the British. One month after she gained independence, the Arab Sultanate regime of Zanzibar was overthrown by a popular revolution on 12 January 1964, which led to the creation of the Revolution Government of Zanzibar.

At the time of the Union, Tanganyika was governed by the Tanganyika African National Union (TANU), the nationalist party which won the country its independence, while Zanzibar was ruled by the Afro Shiraz Party (ASP), which had led the popular revolution. The two states were by then governed under the one party system of government, i.e., the one party state democracy, which was then prevalent in Africa. In 1977 the TANU and ASP merged to form the *Chama Cha Mapinduzi*-CCM party, (otherwise known as the Revolutionary Party), which continued to exercise political control throughout the country under the one party regime.

The United Republic of Tanzania was under the one party system until 1992 when she effected the oft cited 13th constitutional amendments which enabled the organization of pluralist political parties. Therefore, in 1995 the first multiparty democratic elections were held in the country, and since then similar elections were held in 2000 and 2005.

The constitution contains a schedule which lists Union as well as nonunion matters. Union matters are those implemented by the Government of the United Republic (the Union Government), while nonunion matters are implemented by the Revolutionary Government of Zanzibar. According to the schedule, union matters include among others, higher education, research, foreign affairs and statistics. Environment in Tanzania and for that matter climate change is not a union matter. To this end, Zanzibar is constitutionally justified to have its own laws. It is against this background that the discussion on the laws on climate change below focuses only on the Tanzanian mainland.

## *Situation of Indigenous Peoples in Tanzania*

The United Nations has embarked on two International Decades of the World's Indigenous People to help make governments aware of the challenges faced by indigenous peoples

and the importance of protecting their rights, languages, identities and knowledge systems.

Being a member of the United Nations, Tanzania is obliged to uphold the underlying values of international human rights laws and norms set out in, *inter alia*, the Universal Declaration of Human Rights 1948, the International Covenant on Civil and Political Rights 1966 and the International Covenant on Economic, Social and Cultural Rights 1966. Moreover, Tanzania voted at the United Nations General Assembly in favour of adopting the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007. This declaration calls upon states to *inter alia,* formally recognise, protect and guarantee the right of indigenous peoples in and over their ancestral lands. But who are indigenous peoples in Tanzania and what is their respective human rights situation?

In conformity with the criteria set out by the African Commission on Human and Peoples Rights and the United Nations, the indigenous peoples of Tanzania include the Maasai, the Barbaig and the Hadzabe. The first two groups are predominantly pastoralists whereas the last comprise forest dwelling hunter-gatherers. The two modes of production, namely pastoralism and hunting-gathering, are not clearly reflected in the country's land laws. This makes indigenous peoples vulnerable to dispossession of their lands. Below are some examples to substantiate this point.

In the late 1970s, a government organization called the National Agriculture and Food Cooperation (NAFCO) was granted lease by the government to cultivate wheat in the Barbaig land in Hanang District, Manyara Region in Northern Tanzania. The Barbaig were hence evicted and their graveyards destroyed. Dissatisfied with the inhuman and degrading treatment, the Barbaig approached the court of law, including the court of appeal, which is the highest court as far as domestic remedies are concerned, unfortunately to no success.

As for the indigenous Maasai pastoralists, the situation of those in the Ngorongoro Conservation Area (NCA) can give us a larger picture. Established in 1959 by the Ngorongoro Con-

servation Area Act, the area was part of Serengeti National Park until the park was split into two areas with different conservation status. These are the Serengeti National Park whose conservation status does not allow human settlement, and the Ngorongoro Conservation Area where the Maasai pastoralists co-exist with wildlife.

The governing body of the Ngorongoro Conservation Area is the Ngorongoro Conservation Area Authority which was originally primarily charged to conserve and develop the natural resources of the area, promote tourism and safeguard and promote the interest of the Maasai who formally inhabited the Serengeti ecology.

It is important to note that following eviction from Serengeti, the Maasai indigenous peoples lost their grazing land and permanent water sources. An agreement they signed in order to move did not stipulate that they were entitled to compensation. The Ngorongoro Conservation Act purportedly vested control of the land in the conservation authority.

Despite the recognition of the multiple land use concept, the historical and contemporary situation in Ngorongoro shows that the interests of the Maasai indigenous pastoralists are given lesser attention by the Ngorongoro Conservation Area Authority compared to conservation and tourism interests. The implementation of the Ngorongoro Conservation Act militates against the welfare of the indigenous peoples in the Ngorongoro Conservation Area.

A glance at the Act reveals that the Ngorongoro Conservation Area Authority has vast powers amounting to those typical of a government. It can make subsidiary legislation to prohibit, restrict, or control residence or settlement in the area. This mandate has been used to create restrictions for the local indigenous Maasai population from grazing in the dry season refuges like the Northern Highland Forest.

This report focuses on the impacts of climate change on the indigenous Maasai pastoralists of Engikaret village in Longido

district, Northern Tanzania. It also includes their mitigation and adaptation measures.*

## Selected Laws, Policies, Plans and Strategies on Climate Change

The following are selected laws, policies, plans and strategies/plans that aim at mitigating the impacts of climate change and how the same affect indigenous Maasai pastoralists generally and those in Engikaret village in particular.

### *National Environmental Management Act*

Tanzania has no framework legislation that specifically addresses climate change. However, the Environmental Management Act (EMA) 2004 was passed by Parliament in November 2004 and authorized by the President in February 2005 as a framework overriding other pieces of legislation related to environment and natural resource management including climate change. The application of this law to mitigate the impacts of climate change has outlawed the use of resources, which are critical for the survival of indigenous Maasai pastoralists and their herds during the dry season.

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* The report is a result of two months of field research between December 2008 and January 2009. During this time, this writer conducted a series of seven unstructured interviews with the village government officials as well as 20 semi-structured interviews with villagers from all sub-villages of Engikaret. I spoke to a diverse array of villagers—men and women of all ages and socioeconomic standing. In addition to the interviews, I participated in two village meetings. I was also able to observe the impacts of climate change on the village as well as had a wide variety of informal discussions.

A good example is the implementation of the Strategy for Urgent Action to Mitigate against Land Degradation and Water Catchments known by its acronym SUALDWCT. This strategy was used in 2006 and 2007 to evict pastoralists from the Ihefu and Usangu plains in southwestern Tanzania on the grounds that they would allegedly exhaust the water resources in the area.

## *Wildlife Conservation Act 1974*

The Act provides for the protection, development, regulation and control of fauna and flora products and other related matters. In particular it is concerned with wildlife and habitat conservation. This role is now emphasized more by the government as a strategy for climate change mitigation. Its implementation however negatively impacts on indigenous Maasai pastoralists through the alienation of land, eviction and restriction of local communities from resources that are critical for their survival.

This method of conservation had been inherited from the colonial occupiers. During colonialism, the rights of people occupying the same territories with wildlife were regarded as secondary to those of wildlife. Accordingly, the training of Park management followed the same anti-human rights approach, disregarding development concerns of local people. These methods have over the years proven to be unsustainable, since poaching has progressed undaunted and biodiversity of wildlife is declining with the existence of some species being threatened.

The law provides for example that the President may declare any land of Tanganyika to be a game reserve, and the only procedure to be followed is to make a notice in the Government Gazette. This provision has been invoked to declare important pastoralists' pasture lands, such as Mkomazi and Mkungu

nero, as game reserves, and hence denying the local communities their right to livelihood.

The government is in the process of repealing and replacing the above law with a new one. To this end, a bill with a specific provision that prohibits grazing livestock in the game reserve is expected to be passed by the parliament soon. To add salt in the wound, violating this prohibition is punished with a fine of not less than the value of the livestock involved or imprisonment of not less than two years but not exceeding five years or both.

It is imperative to clarify what the first punishment above entails. In the pastoral community, young boys (and not warriors), some of whom are as young as 10 years, are the ones in charge of grazing livestock. It follows therefore that if such boys willfully or negligently graze a herd of 500 livestock in the game reserve, the whole clan will have to suffer loss of the whole herd as payment of fine. It is also important to bear in mind that the said game reserves (and even national parks), such as the newly established Mkungunero Game Reserve (MNGR), are not fenced out of livestock pasture lands.

The Wildlife Conservation Act of 1974 also creates Game Control Areas by way of a declaration to be made by the minister charged with conservation of wildlife. It has to be made in the Government Gazette in respect of any area of Tanganyika. Currently, some game controlled areas form part of village lands, and this is the case in Engikaret Village. It is also important to note that this Act excludes from the requirements for permits to live [and graze livestock] people born or whose places of ordinary residence are on the game controlled areas. In an extraordinary turn of events, the Wildlife Conservation Bill 2008 provides that "Any person shall not, save with the written permission of the director previously sought and obtained, graze any livestock in any game controlled area."

It follows therefore that to criminalize grazing of livestock in the above areas (save for a written permission of the Director previously sought for and obtained) equals denial of the right to livelihood. This is because it is practically very hard for a

pastoralist in Engikaret village to seek for and obtain a permit from the Director who resides in Dar-Es salaam.

Assuming there can be departmental arrangements to ensure the availability of such permits at the district level or even at the village level, the next pertinent questions are what if the Director refuses to grant a permit? Where will the pastoralists keep livestock while lodging an appeal with whatever other body? This contravenes the National Strategy for Growth and Reduction of Poverty which recognizes pastoralism as a viable livelihood of choice.

## *Revised Wildlife Policy 2007*

The Revised Wildlife Policy (March 2007) purports to transfer power over management of wildlife resources to the local communities such as indigenous Maasai pastoralists. It is on the basis of this policy standpoint that the government has devised more sustainable approaches that would involve communities to participate in wildlife management and conservation.

This marks a shift in the approach from one of policing the Parks to involving local communities as custodians of biodiversity. Before such arrangements were made, stiff penalties were imposed for killing animals which destroyed crops, killed livestock and either maimed or killed people. Those penalties created hostility to wildlife and wildlife regimes in different areas in the country. The wildlife authorities made decisions which favored and benefited colonial masters, with no benefits accruing to local communities. All manner of wildlife utilization either for food or ritual by indigenous people were all declared illegal by the state, and those caught utilizing wildlife in any way were punished. This state of affairs continued even after the attainment of political independence.

It is against the above background that the Revised Wildlife Policy makes an attempt to incorporate communities in the planning, management, conservation and utilization of wildlife re-

sources and in turn, allowing them to share in the benefits accruing from wildlife/tourism. In essence however excessive powers reside with the Minister and the Director of the Wildlife Division respectively. Indigenous peoples are not involved in decisions that affect their lives.

The policy also incorporates the Ramsar Convention, an international agreement on wetlands that entered into force for Tanzania on 13 August 2000. Indigenous Maasai pastoralists living in areas adjacent to Ramsar Sites such as Lake Natron feel that the concept of these sites, as interpreted and promoted by the Wildlife Division in Tanzania, is a threat to their resources, since its application on the ground overemphasizes conservation. It should be noted that almost all policies and laws that conserve wildlife and their habitats have been unfavorable to pastoralists. They affect them in their lands, territories and resources.

## *National Environmental Policy 1997*

The National Environmental Policy (NEP) was promulgated in December 1997 to provide a framework for mainstreaming environmental considerations into the decision-making processes in Tanzania. Although it does not pay explicit attention to climate change, it brings forward primary environmental issues that would be addressed by climate change adaptation measures.

The NEP highlights in particular the importance of integrating environmental management in several sectoral programs and policies. A particularly strong example of such integration is found in the agriculture sector, which is undoubtedly the most crucial for food security and for eradication of rural poverty in the country.

To this end, the NEP proposes for example for

> "the improvement of land husbandry through soil erosion control and soil fertility improvement; the minimization of encroachment in public lands including forests, woodlands, wetlands, and pastures; the strengthening of environmentally sound use, monitoring, registration and management of agrochemicals; as well as the improvement in water use efficiency in irrigation."

In addition, the forestry section of NEP most explicitly gives attention to cross-sectoral environmental issues by providing that:

> "the main objective is the development of sustainable regimes for soil conservation and forest protection, taking into account the close linkages between desertification, deforestation, freshwater availability, climate change, and biological diversity."

Another paragraph in NEP that relates to climate change provides that climate change studies should be undertaken in order to come up with mitigation options; and in view of Tanzania's vulnerability to climate variations, an assessment of impacts of climate change and climate variations. In this regard strategies will be evolved to ensure that options which are pursued do not unduly sacrifice national development endeavors.

## *National Environmental Action Plan of 1994*

This plan was the first step towards a realization for incorporating environmental concerns into national planning and development. It identified six priority environmental concerns: land degradation, lack of accessible good quality water for both urban and rural inhabitants as pollution, loss of wildlife habitats, deterioration of marine and freshwater systems and deforestation.

## *National Plans on Climate Change*

The first Tanzania National Action Plan on Climate Change was developed in 1997. This plan contains an inventory of emissions by source and removal by sinks of greenhouse gases. It has different objectives to be achieved within various timeframes as indicated hereunder.

## *Short Term Program*

Within the first two years from the start of the Plan, the main objective was to raise awareness of possible impacts of climate change on various social and economic activities. This could be achieved through holding training meetings and workshops to stakeholders. The overall aim of these meetings and workshops would be to explore possibilities of how the current activities of various sectors could complement climate change mitigation options. Another objective relates to a need for making an analysis of the effects of governmental macroeconomic policies in relation to climate change.

## *Medium Term Program*

This term is developed from an assumption that due to impact of the short term plan above, projects can now mainstream or internalize climate change aspects, especially those reducing GHG emissions and therefore should be supported. This support could either be sought from internal sources such as the government budget or from external sources such as the donor community.

Another objective of the medium term program is to ensure that climate change aspects should be included in the educational curriculum, preferably starting at secondary school level. It also proposes that the government should start introducing environmental economic instruments such as fiscal measures (pollution taxes, input taxes, product taxes, import tariffs, royalties, land user taxes, tax differentiation and others), property rights (ownership right, user right, and development rights), and performance bonds (land reclamation bond, waste delivery bond, environmental performance bond, among others) as incentives to increase environmental conservation.

## *Long Term Program*

The long term objective of the National Plan on Climate Change is to ensure that the long-term, large projects in the energy and transport sectors are undertaken. It also aims at ensuring that adaptation measures to cope with a rising sea level and its adverse effects on coastal infrastructures are implemented.

This plan is good for the Maasai indigenous peoples and the country at large because it aims at reducing greenhouse gas emission. It also outlines the need to use economic instruments as incentive to increase environmental awareness. It also aims at introducing climate change aspects into the educational curriculum, preferably starting at secondary school level. However, its long term program has the likelihood for negatively affecting the Maasai indigenous peoples if there will be no free, prior and informed consent when large projects are implemented on their lands. The long term program is also silent on adaptation measures for semi-arid areas where the Maasai pastoralists are found.

## *National Strategy for Economic Growth and Reduction of Poverty*

This strategy recognizes important impacts of climate related risks. For instance, stakeholder groups that were interviewed in its preparation voiced their worries: "A major concern of the poor is their vulnerability to unpredictable events. In Tanzania, famine often results from either floods or drought. Since the mid-1990s, Tanzania has in fact experienced a series of adverse weather conditions, which undermined food security. […]There is, therefore, a growing need for safety-nets." Reading this strategy between the lines, one recognizes that although it ackowledges the grave impact of weather and climate hazards on development, and particularly on the poor, it neglects climate change.

In response to this recognition, the strategy lists a number of activities that are aimed at reducing vulnerability. They include early warning systems (EWS), irrigation, better food supply systems, development of drought resistant crops, facilitation of the provision of adequate, safe and clean water to the rural areas from 48.5 per cent population coverage in 2000 to 85 per cent by 2010, promotion of the use of rainwater harvesting and sustained efforts in reforestation as well as in adaptation.

## *Multilateral Environmental Agreements*

Apart from the municipal laws, policies, plans and strategies, Tanzania has also signed or ratified a number of multilateral environmental agreements that intersect with responses required to manage climate change. Below is a discussion on some of the international treaties/conventions.

## *United Nations Framework Convention on Climate Change*

The United Nations Framework Convention on Climate Change (UNFCCC) entered into force on 21 March 1994. It has been ratified by 191 countries including Tanzania. In compliance with its provisions, Tanzania has recently submitted its Initial National Communication, and preparation for a National Adaptation Program of Action (NAPA) is ongoing.

A cursory look at the Convention shows that it is indigenous peoples-blind in that it does not mention them. However, Article 4(8) has been interpreted to create an obligation on the side of developed countries to support communities that are more vulnerable to climate change with the transfer of knowledge and technology in order to build their capacities to mitigate the adverse effects.

The Convention provides further that all Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall fully consider what actions are necessary under the Convention. These include actions related to funding, insurance and the transfer of technology to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures.

The Convention prioritizes countries with arid and semi-arid areas, forested areas and areas liable to forest decay. The Maasai indigenous people of Tanzania live in the kind of environment described above. However, the legal and policy environment obtaining in Tanzania does not guarantee that indigenous peoples can benefit from any funding mechanism. The case of Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries is exemplary in this regard.

In April 2008, the Norwegian government committed $100 million over five years to Tanzania for activities to address cli-

mate change and deforestation, including the development of deforestation pilot projects. This is a REDD activity. A danger that the envisaged activity poses to indigenous peoples is that they have always been the target of land dispossession and they are likely to lose more of the remaining land for REDD activities. There is also likelihood of not meaningfully involving indigenous Maasai communities, since consultation in Tanzania is not done thought traditional institutions but through local government authorities.

## *Kyoto Protocol*

The Kyoto Protocol was concluded in 1997 in Kyoto, Japan and entered into force in February 2005. A subsidiary agreement under the UNFCCC, the protocol came into being as a result of the need to have legally binding emission standards which were not provided for by the Framework Convention. The protocol does not mention indigenous communities. However, Article 10(c) has been construed to oblige the transfer of assistance in order to empower local communities to mitigate adverse effects of climate change.

The Article provides:

> "All Parties, taking into account their common but differentiated responsibilities (c) Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies."

### *Convention on Biological Diversity*

Tanzania has also signed and ratified the Convention on Biological Diversity (CBD), which is one of the outcomes of the United Nations Conference on the Environment and Development (UNCED) held in Rio de Janeiro, Brazil in June, 1992. It was adopted in May 1992 and in June it was signed by 153 states and the European Community. It is made up of 42 Articles, accompanied by two Annexes on identification and monitoring, and arbitration.

Tanzania's National Report to the UN Convention on Biodiversity does not mention climate change at all. However, in its first National Report to the UN Convention to Combat Desertification (UNCCD), Tanzania outlined aspects relating to climate change mitigation mainly through the diversification of Tanzania's energy resources.

The Second National Report shows some progress in the sense that it highlights the linkages between climate change and desertification. The report also notes that desertification programs have been quite successful in terms of both awareness raising among stakeholders as well as mainstreaming desertification concerns in national and sectoral plans and policies. The Maasai indigenous peoples have no civil society organizations with constant funding to attend Conference of Parties to the CBD and other Conventions; thus their concerns do not feature in the agenda.

## Case Study: Maasai Pastoralists of Engikaret Village

Indigenous peoples are undoubtedly the most affected group by global climate change. This is due to their direct dependence on the land and its natural resource base as well as the fact that climate change adaptation requires economic and tech-

nical ability. Technology transfer, capacity building and monetary benefits promised by the current climate change regime continue to be a day dream. A recent report issued by the Interagency Support Group on Indigenous Issues (IASG) provides inter alia most advanced scientific research has concluded that changes in climate will gravely harm the health of indigenous peoples' traditional lands and waters, and its immediate impacts threaten many of the plants and animals upon which they depend for survival.

In its National Report to the World Summit on Sustainable Development (2002), Tanzania made reference to the national vulnerability and adaptation assessment. It listed various sectors as being vulnerable to climate change, including agriculture, water resources, forestry, grasslands, livestock, coastal resources and wildlife and biodiversity. It however appears that more attention is focused on mitigation, and adaptation receives little notice. Furthermore, the report does not acknowledge that indigenous peoples in Tanzania, most of whom are pastoralists and hunter gatherers, are the most vulnerable. The discussion below, focusing on pastoralist indigenous peoples of Engikaret Village, is an attempt to bring that reality on the agenda.

## *Geographical Area*

Engikaret (Maasai word for a thorny area) village is found in Arusha region, Longido district in northern Tanzania. It has a diverse ecology, climate and topology. Its topography is greatly affected by the Great East African Rift Valley. The once beautiful grazing area on the slopes of Mount Longido, which 20 years ago was characterized by thousands of heads of cattle, plenty of milk and meat, expansive grazing areas, flowing rivers and an army of wild animals, has been rendered a semi-desert by the impacts of climate change. These impacts are casting a bleak future on the hundreds of livestock keepers, all of whom are Maasai indigenous peoples.

Engikaret village consists of extensive plains and a few scattered hills covered with bush and grasslands. The altitude of this village at 700 meters above sea level shows great contrast with other Maasai villages, such as Nainokanoka in Ngorongoro district, which is 2,400 meters above sea level. This elevation determines the rainfall pattern as well as water availability.

There are two main climatic seasons in this village: the dry and the wet seasons. The rainfall is bimodal, with short rains normally falling in November-December and the long rains in March through May. January, September and October are usually the driest and hottest months of the year, with livestock movements heightening during that time in search of either water or pasture. Being one of the driest villages in the Maasai land, Engikaret village receives a mere 400 mm of rain per annum. Water sources in this village include seasonal ponds, wells and boreholes. Some of these sources are very small while others are not reliable and are very saline.

## *General Profile of Affected Maasai Pastoralists*

### Population in relation to national population

Residents of Engikaret village who were the respondents of this research are Maasai pastoralists. The following discussion thus relates to the Maasai indigenous peoples generally, with specific focus on Engikaret village where applicable.

The Maasai are part of the Maa-speaking people of Eastern Nilotic in East Africa. They are estimated to be over 800,000 in Tanzania, which has approximately 40 million people. Historical accounts suggest that the Maasai originated from a mythological place called Endikir e Kerio and subsequently expanded southwards. Prior to colonial conquest, they occupied a vast area extending from Lake Turkana in Northern Kenya to central Tanzania in the south, an area of 600 miles (1,000 km) in length and a width of about 300 km (Jacobs 1965).

In Tanzania, the Maasai indigenous peoples are found in the Districts of Longido, Kiteto, Monduli, Ngorongoro and Simanjiro. These are considered the traditional Maasai districts, which occupy a total area of 64,789 square kilometers. Pastoral population in these districts ranges from 80 per cent in Ngorongoro to 32 per cent in Kiteto. However, following the encroachment into their land by neighbouring farming communities as well as forces relating to wildlife conservation, the Maasai were forced to look for pasture and water elsewhere. They are now found in small pockets in the districts of Hai, Same and Mwanga in Kilimanjaro Region, Handeni District in Tanga Region, and Kongwa and Kondoa Districts in Dodoma Region.

It is important to note also that due to the same reason, a section of the Maa-speaking Ilparakuyo migrated to the south, and now live in Iringa, Morogoro, Pwani and Mbeya Regions. Although they have settled in these regions, conflicts over resources have emerged, resulting in constant calls and demands that they go back to their areas of origin, i.e., Longido, Kiteto, Monduli, Ngorongoro and Simanjiro districts in Arusha region.

**Livelihood**

Engikaret Village has a population of approximately 400 people, 98 per cent being Maasai indigenous pastoralists. The people generally depend on livestock to survive, as the area is arid and thus not favorable for cultivation. Cattle primarily supply food in the form of milk, while goats are frequently slaughtered for meat. Cattle also supply meat, which is consumed occasionally, and especially for rituals; blood mixed with milk is consumed during difficult drought periods. Livestock also provide a basis of exchange for other products. They are sold in the market to facilitate the purchase of clothing, human and livestock drugs, and to pay for school fees and other household items. They are also still transacted for the elaboration of kinship, affinal and other relations and for numerous ritual and ceremonial occasions. Livestock also act as security against drought.

To supplement their food, and in particular their energy requirements, indigenous Maasai pastoralists of Engikaret village purchase cereals with the proceeds from sales of livestock and livestock products at a nearby town of Namanga. During droughts as a result of climate change (the latter example being May to December 2006), a number of things happen that negatively affect them.

Firstly, they lose a large number of their herds of livestock. According to Yohana Leng'irya, they lost more than 50 per cent of their livestock during the 2006 drought. Secondly, the stocks decline to a poor condition and thus fetch lower prices, with a bull selling for lower than Tsh50,000 (equivalent to $50). Ordinarily, a bull can fetch up to Tsh600,000 (equivalent to $600).

Thirdly, they inevitably sell more stock, and as a result market prices, even per unit live weight, decline sharply. Lastly, grain prices go up especially if drought has also affected the grain-supplying districts such as Karatu and Mbulu. During the 2006 drought, two children of Engikaret village were reported to have died of famine, although the government later on said they died of malnutrition (kwashiorkor).

**Education**

The village has only one primary school and a pre-secondary school that was built by the Catholic Church in the early 1990s. In the two schools, more than 80 per cent of the students are Maasai. It is notable that some children walk for approximately 20 km in order to reach the primary school. This school is funded by the government which pays for teachers' salaries, buys books and provides furniture.

However, parents are required to contribute for other expenses such as school uniforms and stationery. Since parents often inevitably move to find pasture and water, sometimes with school-going children, the children would stop attending school. Luckily for Engikaret village, there is a nearby boarding primary school in Longido (the district headquarters). However, only six per cent of the total number of children in the village has enrolled there.

According to a survey carried out by primary school teachers at the village, only 26 per cent of the children population is in school, and the average attendance is 62 per cent. When this percentage is applied to the enrolment, it is seen that only 32 per cent of the school-age population regularly attends school. There are many reasons for such poor attendance.

Firstly, the school is very far from the settlements of some pastoralists in this village. As indicated above, some children have to walk distances of about 15-20 km to go to school, which is contrary to the government policy, which states that the maximum distance pupils should walk is six km. Secondly, most of the time children go to school without eating, and food is not served at the school. This happens because there is either no food or children leave before milk is available. It was learnt during focused group discussions and interviews that no single child from Engikaret village has made it to university or college. Children in the village thus have few or no role models to show them the value of being educated. Similarly, there are no local Maasai teachers in the school.

The school is poorly equipped and staffed so the standard of education is very low. Parents are discouraged by the fact that some children in standard 4 or 5 still cannot read or write. They see no value in keeping them in school. Since most teachers do not originate from the village, they find living conditions in the area to be very poor. Social services are few or non-existent; shops are few, health facilities are poor and there is no source of clean water.

When teachers are assigned to this village school, many refuse to report or they request transfers out of the area immediately after reporting. It was learnt that a plan has been drawn up to try and motivate teachers through loans to buy bicycles. Supported by Danish Aid, a Teachers' Centre, established in 1994 in the nearby district of Monduli, gives seminars to teachers for ongoing education and upgrading as well as seminars to school committees.

**Healthcare**

Like other social services such as education, the health situation in Engikaret village is similarly poor. The situation is exacerbated by the worsening dietary conditions of pastoralists created by the reduced resource base and lack of services in the livestock sector. A combination of factors has resulted in reduced food content and reduced nutritional value of available food.

Many of these pastoralists depend on starch-based foods (particularly maize) as opposed to their traditional protein-rich milk and meat diet. The cumulative effect is a less healthy population with increased susceptibility to diseases, hence requiring more from what seems like worsening and inaccessible health care services. The commonest diseases include malaria, upper respiratory tract infections and diarrhea infections among children. The last two are a direct result of poor living conditions and lack or inaccessibility of social services. Despite the above state of affairs, Engikaret village has no single health facility (dispensary, health center or hospital). In their stead, mobile services are initiated and conducted by nongovernment organizations, such as World Vision International and Community Research and Development Services (CORDS). This provision however is not permanent but rather aims at responding to specific acute conditions. Villagers walk for about eight (8) hours to get to a nearby hospital in Longido town.

## *Impacts of Climate Change on Maasai Pastoralists of Engikaret Village*

Through field observation as well as interviews conducted among a wide array of respondents, it was evident that the impacts of climate change are now very real in this village. They are mainly observable in the recurrence of severe drought as a result of declining rainfall. A NASA report showed that rainfall has declined in eastern Africa by 15 per cent since the 1980s

and is likely to go down 15 per cent every 20 to 25 years. Below are some of the observed and felt impacts:

### Major losses in livestock

Drought as a result of climate change has affected pastoralists at Engikaret essentially by reducing the amount of forage available, thereby leading to death of livestock. It has also directly killed livestock through lack of drinking water. By weakening animals, drought has increased their vulnerability to a range of animal diseases, both during the dry phase and during a succeeding recovery phase when internal parasites may flourish in newly rainy conditions.

Drought has worsened during the 1990s particularly in the whole of 1993 and 1996, and a similar condition happened in 2006. During the 1990s, livestock herders lost 25-40 per cent of their livestock, but in 2006 this almost doubled to 50-60 per cent. This shows that the situation is worsening. In the past, the Maasai could predict with high degree of certainty when the rain can fall. This is no longer the case. Their explanation of the drastic change of climate is cultivation. They accuse neighbouring agricultural communities for cultivating their land, including cutting down trees. Other respondents say that god is angry that many Maasai have abandoned him. In the past, when rains were delayed, the Maasai could go to pray at Oldonyo Lengai or the Mountain of God and other sacred places, and rains would fall immediately. But many have converted to Christianity, and many sacred places have also been encroached on and alienated such as in the Mkomazi Game Reserve. This is the case in the whole of the pastoralists' areas.

### Reduction in purchasing power

As indicated earlier, pastoralists generally depend for their staple food, and in particular their energy requirements, on cereals purchased with the proceeds from sales of livestock and livestock products. The prolonged drought at Engikaret village as a result of climate change has significantly reduced the pur-

chasing power of individual households, hence making them susceptible to famine. This is because, during drought, the amount of money earned from selling livestock is lesser, sometimes for up to 80 per cent. Another impact is that in periods of drought, pastoralists at Engikaret find it difficult to continue to pay for animal health services and therefore become more susceptible to a risk of disease outbreaks. Below are other impacts on selected issues.

## *Other Impacts on Environment, Lands and Resources*

Traditionally all livestock herders of a given community of the Maasai people are assured access to range resources, and they all play roles in the management of that habitat for sustainable optimum production of forage. This environmental preservation and sustainability was traditionally accomplished by seasonal movements of livestock—to the lowlands during the rainy season and to the highlands during the dry season.

These transhuman strategies are dictated in any season by formal and informal regulations relating to frequency of utilization of a given range. These arrangements provide for herd dispersion, pasture rotation, protection and regeneration, and in this way undue stress on fragile range resources was avoided. Areas near settlements are reserved and enclosed for the use of small, weak and old livestock, ensuring other livestock is dispersed, again to avoid overuse of the settlement areas.

The pattern of resource use by pastoralists is predicated on the avoidance or reduction of risks, hence the provision of flexible mechanisms that permit relatively free animal movement, dispersal, separation, and splitting of herds. These patterns are deliberately planned as responses to specific needs, contrary to the view that they are haphazard arrangements. Maasai movement of livestock, therefore, serves both ecological and socio-

economic purposes in achieving adaptive and survival strategies which allow them to use fragile range resources in a sustainable manner.

Diversification of herds also offers nutritional benefits by ensuring that the combination of different livestock species with slightly overlapping dietary habits, water and management requirements, results in a more efficient use of the range and helps in the allocation of range resources in the best and most flexible way possible. Cattle, sheep and goats, all have different but not necessarily competing requirements. Browsers and grazers may be pastured together without competition or undue stress being exerted on the resource base.

At the same time, some leaves and grasses are known to be good for increasing milk yields, while others are known to be good for fattening livestock. Due to climate change, the environment in Engikaret village does not offer such flexibility and certainty. It was clear during the interviews and field observation that drought persists for unusually longer time to the extent of destabilizing the ecological patterns of movement.

Prior to the incidence of drought/climate change, the ecological situation in Maasai land could be characterized as a balanced resource base. This means that both browsers and grazers were assured of grass and water near homesteads. Similarly, animal diseases were not as many as there are now. To a Maasai pastoralist, this is a good ecology—one that is free from undue stress, conflicts and uncontrollable diseases. The impact of climate change has unfortunately brought about all these problems.

**Food security**

It was evident during the research that the intensity of climate change has resulted in increased vulnerability of households to food shortages in Engikaret village. Pastoral dietary habits of consuming milk and meat have drastically changed and replaced with cereals, mainly maize, which have more starch and low protein content. Unfortunately, more caloric intake of maize

meal leads to low body resistance to diseases and therefore increased malnutrition and susceptibility to illness.

It therefore follows that the quality of the diet and amount of food consumed varies according to the year and season. In good years, such as 2004 (when there were no negative impacts of climate change such as drought), from January to August the basic diet is milk and stiff porridge for adults who eat twice a day, and mainly milk and porridge for children who eat three times a day. The worse period where food becomes scarcer is in the months of September to December. The researcher observed some women going to the maize grinding machine to pick up maize.

During drought prices of livestock drastically fall, while prices of grain rise steeply. In December 2008, for example, the price of a livestock unit at Engikaret village was Tsh120,000 or $120 (weighing an average of 100 kg) while a 100 kg bag of grain was fetching Tsh42,000 or $42. Paradoxically, this is the time when pastoral households have no choice but to purchase maize grain in order to survive. At this time of the year, 80-95 per cent of the diet becomes grain based.

Since pastoralists of Engikaret village do not grow their own food, they purchase maize grains from neighboring agricultural communities in Namanga and Longido towns. Their only source of income is their livestock, thus they have no choice but to sell live animals in order to get money. Unfortunately also, indigenous pastoralists of Engikaret do not qualify for the many loan schemes because their animals can not be used as collateral.

It can therefore be said that the main cause of food insecurity and malnutrition in Engikaret village is increased impoverishment following frequent droughts and unreliable rainfall as a result of climate change. These, combined with the alienation of the best dry season grazing areas, have led to declining household herds, which are the main sources of food and income.

**Women and children**

Another impact of climate change is evident in the changing gender roles, which tilt more against women and children. Traditionally, the Maasai have been employing labor-intensive animal husbandry where animals are herded over large tracts of land. Labor is organized along the lines of gender and age.

The primary responsibility of men is looking after livestock. This entails herding, watering, treating sick animals and management of pasture, water points, building and maintaining fences for settlements and protecting livestock from any possible predators. It is also the men who supervise sales and exchange of animals. The task of herding is undertaken mostly by boys and young men, with the older men playing a more supervisory role, providing direction on animal husbandry, range management and making decisions about the overall use of communal resources.

Women, on the other hand, mainly manage the home, along with the tasks associated with them. Their duties include building and maintaining houses, milking, cooking and feeding the household and visitors, fetching firewood as well as water, building houses and raising children. Some of these roles are performed with the help of young girls and boys. In their role as milkers, women have an extra task of rearing and domesticating animals.

Most of the tasks done by women (e.g., milking and feeding the household), are specific and are often performed individually, and very often they do not allow for substitution. Milking, for example, is done twice a day with great care being taken to ensure that the calf as well as family members are all adequately fed. Conversion of livestock into food, medicine, clothing and utensils are tasks performed by women and are all very demanding (Kipuri 1989 and 1996). Labor is often in demand especially during dry seasons particularly in low potential areas. It was traditionally solved through cooperation where many families reside together in large settlements.

Due to the impacts of climate change, men's activities have increased women's work loads, while the difficulties involved in marketing livestock have increased men's work as well. The implications are that men are finding themselves away from home for longer periods of time and their previous roles have ended up being performed by women. This is in addition to the numerous domestic chores they already perform and additional new tasks.

It is also important to note that while the women remain managers of household food, they do not have regular access to cash for which to purchase alternative foods. Cash proceeds obtained from the sale of livestock are controlled by men. Thus for cash needs, most women have to depend upon their husbands or male relatives. Another task for women that has come about as a result of climate change is buying maize flour or taking the home-grown maize to a distant grinding mill (it should be noted that this is not a traditional role due to the fact that pastoralists used to depend solely on the protein rich livestock products for food).

Since children attend school, the work load for women is increased tremendously. Thus sending children to school is not only an additional cost (school fees, uniform, books and other expenses which some women have to meet), it also means expecting women to accept enormous amounts of work in the home.

**Livelihoods**

Regarding livelihoods (employment/unemployment rate), impacts of climate change are more evident in this village with regards to young men, also known as warriors. The young men (in the Maasai community at large) have traditionally been responsible for taking care of herds and often live in small camps, moving frequently in the constant search for water and good grazing lands.

However, due to reduced rainfall rates because of climate change, instead of roving for water, they have had to begin a

new search for jobs. As a result of drought, millions of heads of cattle have been lost, forcing them to seek other solutions elsewhere. In Engikaret village alone, more than 50 per cent of young men have migrated to the cities in search of "green pastures."

This "exodus" started in the early 1990s. The jobs that these young men get in cities and towns involve guarding the rich and combing women's hair. Three decades ago, it would have been impossible to convince a young Moran from the Maasai community to leave behind his traditional task of looking after the cattle and migrate to urban areas to do such a job. However, this has now been described by the local media as exodus.

Young men who are employed in towns as guards and hairdressers earn an average of 65,000 per month each (approximately $60). It was encouraging to learn that many of them manage to save money and buy one cow after being away from home for one year.

**Local ecological and cultural values**

Impacts of climate change have not spared cultural as well as ecological values that have been uniting the Maasai for centuries now. An interview with elderly respondents revealed that indigenous institutions are no longer as binding and effective as they used to be 30-40 years ago due to the coming into being of new forms of wealth such as land, money and wage employment as well as new forms of organizations with different interests.

A cultural value that has changed as a result of climate change and in particular due to food insecurity relates to the traditional concept of "sharing." Two examples can shed more light: the first is *Enturuj* (food sharing for young men). It used to be strictly prohibited for a young man to eat or drink anything without sharing with another young man. This was meant to ensure that young men from poor families do not starve.

The second is *Inkishu lipai* (milk cows). This refers to cows which were traditionally lent to poor friends or relatives for milking. Poor households would keep the stock and milk them, often for many years. In doing so their problem of food shortage is alleviated. The two practices above were possible in a society in which milk, meat and livestock had little or no monetary value. This "luxury" has vanished due to the impacts of climate change. According to a local politician in the village, livestock and their products are now valued in monetary terms and therefore the concept of sharing has been replaced by the desire to accumulate surplus. Surplus, once accumulated, is sold rather than given to poor households.

Another impact of climate change is evident in the changes in property relations. For example, the decrease in pastoral lands has subsequently led to the reduction in pastoral products for food, hence the dependence on the market for subsistence. Items that are marketed by indigenous pastoralists include land, live animals, milk as well as hides and skin. This has introduced changes in property relations in that some members are ready to sell the traditionally communally owned land in order to afford life's amenities. The concept of property rights is shifting from collective to more private forms of ownership.

This state of affairs is necessitated by the country's Village Land Act no. 4 of 1999. This law recognizes the possibility for a villager to apply for an individual title on village lands. An immediate consequence of this recognition is that a villager who secures an individual title on an area of a village comprising pastoral land can then at will dispose of his/her land for monetary value to a non-pastoralist. Up until now, there are no cases of Maasai pastoralists who have successfully gotten individual land titles on communal lands.

## *Views on Why such Changes are Happening*

Many of the respondents agreed that their village must have been drier compared to those of their neighbors. However, they also agreed that it was only in the early 1990s that the weather turned more hostile, rendering the seasons unpredictable. The trend of livestock loss (during drought) shows that the situation is worsening through the years, but it is important to note that drought is not common in all years.

Indigenous peoples of Engikaret associate the changes with failure to go and perform rituals at the Oldonyo Lengai, the only active volcanic mountain in Tanzania that the Maasai call home of God. Lankoi believes, like many other respondents, that it is a punishment from God. "What happened to our land is more than a curse," he said.

In a rather unexpected answer, one respondent associated climate change with the intention of the government to make their land less favorable for settlements. He is fearful that the government intends to evict them in order to give room for wildlife conservation. "You never know with educated people, maybe there is something they have made to make our land hard to live in; I don't know whether this is possible, I just imagine."

When this writer asked him whether that can make him vacate the place, he said "Yes" and added, "We have been forced to abandon our culture to survive, now some neighbors are keeping poultry to sell. If I know somewhere else where there is water, pasture and the Maasai, I will immediately relocate with my family."

Factors aggravating the effects of climate change in Maasai lands include loss of potential land especially for use as game reserves and national parks. For indigenous peoples of Engikaret in particular, the establishment of Tarangire National Park has affected their traditional refuge. It appears that state-driven actions, policies and laws are not favorable to indigenous peoples.

## *Traditional Indicators of Climate Change*

The indigenous peoples of Engikaret who were interviewed demonstrated traditional knowledge regarding presence of climate change. This is through the use of traditional indicators, and one of these is the amount and frequency of rainfall. For example, when asked how he measures climate change, Naini said: "During the 1990s we used to get heavy and reliable rainfall but suddenly the situation changed. Moreover, we had three different rainy seasons but today it is only one season which is highly unpredictable."

Naini added that she can also measure climate change by the fact that they now face acute shortage of clean water for their cattle. When a similar question was posed to Saipi, he replied thoughtfully: "I had 600 heads of cattle in 1989, but today there are only 30—most of them died. What else should be the measure?"

Another indicator that was mentioned by many respondents is dew. They narrated that dew used to be seen in the area every morning during the 1990s. One elderly woman said:

> "Ngyaraiyai Iyolou ake ajo etoole engop amu, ore nene kataitin tenidumunye ninepu engoilelyo embore engop. Nemeishunye dikata mpaka metooshi ndare. Ina koilelyo apa enyor ngishu tenikirik linga *(My son, it is easy to know that climate has turned hostile because when one woke up during those good old days, he/she saw dew covering the whole land and it would not evaporate until around 9.00 a.m. That dew was very favorable to cows.)"*

Moreover, the Maasai community as a whole and the Engikaret pastoralists in particular monitor changes in range conditions constantly to determine the effect of management actions and practices. They have developed various sampling and surveying techniques to quantify forage type, quality, quantity and the condition of other range animals. Livestock and wildlife behaviour may be used to determine the value of the range. Milk yields are a common indicator of forage availability or shortage, as well as quality. The condition of the animal's fur, mating

frequency and colour and texture of the dung all provide useful indicators for assessing the quality of the range. This holistic set of indicators provides indices of environmental stress, relating both to occurrences at a specific point in time, and as change over time.

## *Adaptation and Mitigation Measures*

Pastoralists of Engikaret village adapt and modify their livelihood strategies as a response to many stresses such us animal diseases. Drought as a result of climate change is the most frequent stress for them. They have thus developed some livelihood strategies to be able to deal with the effects of droughts for over longer periods of time. Below are some of these adaptation mechanisms.

### Sale of cattle

The impact of climate change has been the reduction of livestock due to drought, and remaining herds of cattle cannot support households in terms of food. Pastoralists at Engikaret village are thus forced to sell their cattle in order to buy food, mainly maize. This has led to the emergence of cattle markets, and pastoralists in Engikaret sell their livestock mainly at Longido market. Prior to the manifestation of the impacts of climate change, pastoralists could not sell their livestock since owning many animals also meant commanding more respect and prestige in society.

### Cultivation of food crops

Engikaret village is one of the driest villages in the Maasai land. However, due to the impacts of climate changes, some pastoralists have been forced to grow food crops in order to supplement their food demands. This is done by the most des-

titute households who have no more livestock to sell. The researcher observed the land and thought that it is unfit for cultivation, only for livestock rearing.

These thoughts were confirmed by a respondent who said they can harvest as low as five sacks of maize in one hectare. When asked why he should go on with cultivation, Sanagau Olembirias replied, "Cattle used to be as important to me as life itself. However, the whole herd has been wiped out by the hostile drought. You can also see that I am too old to go to Arusha to be a night security guard or hairdresser. So, if I don't till the land, my family will die of hunger."

### Long distance relocation with cattle

An adaptation mechanism for indigenous people has been to relocate long distances with their herds of livestock in search of water and pasture that have been scarce in their original areas due to the impact of climate change. And this has been the case for the pastoralists in Engikaret village. The village chairman revealed that the village population has decreased drastically because members have relocated to other areas, such as the Ngorongoro highlands, Monduli and Simanjiro. These are areas where maize cultivation is possible due to better climatic conditions. In addition, there are other indigenous peoples in these areas with whom they can team up or social capital they can take advantage of, in terms of the large numbers, for support during extreme droughts.

### Migration to cities for wage employment and change of women's roles

The most felt adaptation mechanism for indigenous Maasai pastoralists has been the migration of youth to towns and cities for paid employment. As cited earlier, what they do in towns and cities is to guard rich people as well as to comb women's hair. This is a new practice that has come about in the 1990s as Maasai pastoralists lost many cattle to the extent that the remaining few could not support households. The migration has

been described by one respondent as amounting to a curse: "What happened to our land is more than a curse…I don't know how to describe it but it has forced us to abandon our culture to survive."

Women, on the other hand, remain at home as the main providers of sustenance. Women's responses to these processes have been to seek ways of supplying their households with food. In Engikaret village, the women have taken up different economic activities, ranging from manufacturing artifacts for the tourist market to brewing and selling beer, buying and selling small items such as tobacco and snuff, traditional herbs and other medicines as well as cultivation. Some women have formed groups and have obtained grinding mills from the Community Research and Development Services to provide services for income generation.

**Controlled breeding**

During periods of drought and fodder shortage, the Maasai practice methods of controlled breeding for various livestock. These include the use of penile sheets to allow breeding of sheep and goats only during the rainy season. This practice is called *embolokinoto*. While ensuring ecological balance as well as livestock health, such techniques allow pastoralists to ensure that the required labor input for the optimum management of livestock is also taken into consideration. The Maasai pastoralists of Engikaret village are also employing this method.

On mitigation measures, pastoralists in Engikaret have relied on social reciprocity. This is through constant redistribution of meager individual family resources in response to drought and other risks. In this way, poor members of the community get support from those who are better off.

Another measure is teaming up. During drought, relatives and friends team up to move livestock so they can assist one another in the provision of labor and finances and take advantage of social capital to find pastures for the livestock. If the poor cannot provide financial support, they provide labor in looking for livestock.

## Conclusion and Recommendations

In Tanzania, indigenous peoples, that is the Maasai and Barbaig pastoralists as well as the Akie and Hadzabe hunter gatherers, are the most vulnerable groups to climate change. However, this does not seem to be fully understood by the public or decision makers. Without this understanding and concerted effort to do something about it, indigenous peoples will continue to be even more impoverished by environmental pressures caused by climate change. In formulating various policies, plans and strategies as well as in enacting laws, it is important to assess how each community will be affected. Mitigation measures may be more meaningful to Tanzania if the following points are adhered to:

**Enact a comprehensive legislation on climate change**. Tanzania does not have a framework legislation that comprehensively regulates the impacts of climate change in the country. Sensitive as it is, regulation of climate change should not be left to sector legislation. In relation to the enactment of comprehensive framework legislation, relevant legislation, policies and other regulatory frameworks should be amended to reflect the problems currently encountered.

**Studying an individual community** to determine which measure should be implemented. In this regard, it would be grossly inappropriate to enact a law that prohibits pastoralists from accessing water sources for their livestock. This is similar to creating a prohibition against a hunter gatherer who gathers fruits in the wild for sustenance.

Much as it is important to use the law in conserving the environment as a mitigation measure, such laws should not be used to interfere with the right to subsistence for other communities. The right to subsistence or livelihood is provided for under Article 1 of the International Covenant on Civil and Political Rights as a nonderogable right that may not be violated for any reason.

**Implementation of human capacity building** through training and establishment of climate-related information centers, such as libraries. In order to ensure that indigenous pastoralists do not get wiped out by the threats of climate change, it is important to ensure that they also benefit from the various strategies that aim at ensuring they get the required capacity through various trainings. The current discussions on Reducing Emission from Deforestation and Forest Degradation in developing countries is a window of opportunity for building capacities of indigenous peoples.

**Conduct research to address knowledge gaps** for as it has been evident that climate change and its impacts in Tanzania have not been a subject for discussions among common people. Many of the respondents interviewed in Enkikaret, for example, thought that it is a result of a curse. They are still performing rituals thinking that such impacts can be done away with. Such a research can lead, for example, to identification of livestock species that are more adaptable to climate change. Research in this area can also concretize and identify other good practices for mitigating the effects of climate change.

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# Ways of the Mbororo: Responding to Environmental Changes in Cameroon

by Ibrahim Njobdi Amadou
Lelewal, Cameroon

## Introduction

The Republic of Cameroon covers a surface area of some 475,000 square kilometers made up of the northern plains, the central and western highlands, and the southern and coastal tropical forest. The imposing Mount Cameroon, the highest peak in West Africa and the 6th in entire Africa, is located in the southwest region of the country.

Cameroon has a climatic variation that spreads in the different regions, as it is divided into three big climatic zones. The 2nd and 6th degree of the north latitude and equatorial zone is characterized by abundant precipitation, with 2,000 mm of average rainfall per year, and an average temperature of 25 degrees centigrade. On the 7th and 10th degree of the north latitude is the Sudanese zone (zone Soudanienne) where the dry season lasts from five to six months. It has an average temperature of 22 degrees centigrade and 1,000 mm of rainfall within the year. After latitude 10 degrees north, the Sudan-Sahelian vegetation is found characterized by a dry season which lasts for seven months with precipitation a little bit abundant.

The vegetation is as varied as the climate. A demonstration project on the mechanisms of proper development following the Kyoto Protocol on climate change in Cameroon gives a brief description on the energy and industrial sectors of the country. It notes that Cameroon has diversified energy resources which

are unequally distributed in the national territory. Wood energy is abundant in the south (forest zone) but is lacking in the northern part (the savanna zone). Hydrocarbon resources and natural gas are average. The western highlands are among the most fertile regions and are densely populated with the practice of intensive agriculture. Commerce is also high in this region, which is characterized by cohesive communities.

The appellation of Cameroon as an Africa miniature is widely known, demonstrating its cultural diversity, geography and natural riches. Unfortunately these riches are deteriorating progressively as a result of climatic modification which is profoundly felt throughout the national territory. In effect, climate change is a reality in Cameroon.

Cameroon is a bilingual country like Canada where English and French are official languages. Before independence in 1960, the territory was jointly administered by France and Britain as a UN trusteeship territory seized from the colonial master, Germany after her defeat by the allies during World War II. Britain and France shared the territory, with the latter taking four-fifths and the former, only one-fifth. The British section is made up of two regions, the southwest and northwest regions, while the rest or eight regions are French speaking areas.

## *Ethnic Groups*

Cameroon has an estimated 250 ethnic groups, which form five large regional-cultural groups as follows:

- Western highland people with an estimated population of 38 per cent made up of the Bamileke, Bamoun and part of the northwest region;
- Coastal tropical forest people with an estimated population of 12 per cent that brings together people from the Littoral and southwest regions;
- Southern tropical forest people with an estimated popu-

lation of 18 per cent. They include the Ewondo, Bulu, Fang, Maka and Pygmies;

- Predominantly Sahelian people of the northern semi-arid regions and central highlands including the Mbororo pastoralists and the Fulani, 14 per cent;
- The non Islamic peoples of the northern desert and central highlands comprising about 18 per cent.

## *Economy*

Cameroon has a gross domestic product of 20.646 per cent following the 2007 estimate annual real GDP growth rate of 3.3 per cent. Industry is 15.9 per cent of GDP; services, 39.8 per cent, and agriculture, 44.3 per cent with products like timber, coffee, cocoa, rubber, palm oil, pineapples, cotton, among others. Natural resources include oil, timber, hydroelectric power, natural gas, cobalt, nickel, iron ore, uranium.

Its main markets are the European Union, the Central African states grouped under CEMAC, France, China, United States and Nigeria, among others.

## *Effects of Climate Change in Cameroon*

Even if Cameroon is not contributing to the emission of greenhouse effects, climate change is perceptible as United Nations expert on the environment Mouchi Njipouta explained, "The effects of the degradation of the environment in Japan and the United States can easily have repercussions in Cameroon." That is to say the situation of climate is not limited to the national frontiers or surroundings of countries.

In several Cameroonian towns in previous years, climatic variation was the cause of floods such as those that occurred in Douala and Yaoundé cities. In October 2006 the two cities witnessed serious floods that destroyed more than 30 homes especially around the Atlantic coast in Douala. It is not known whether indigenous people were affected by the floods.

But at the same time reports indicate that Cameroon saw a considerable reduction of rainfall in the last 10 years. In the west of Cameroon, several rivers have been noted to be drying up, and access to water in several areas of the region is becoming an evident problem. In the north of the country, dryness is greatly affecting pastures, which has caused the price of meat to increase. Since the end of August 2007, rainfall has been raging the Sahelian north region of Cameroon, which has often been rare. Several farm lands have been destroyed, several cows carried away by rivers.

In the east of the country which is covered by the great equatorial forest, the dry season is very harsh and very long. "I have lost more than 50 cows, all of them died of thirst and hunger, absence of water and herbs," says Alhadj Bouba Djibirrock, a cattle raiser. This situation is identical in Central Africa, a neighboring country where rainfall was expected in May but the first rain only fell in August (General Directorate of civil Aviation and Meteorology of Central Africa).

The south meanwhile saw a reduction of agricultural productivity, as the climate apparently became very hot. The paradoxes equally observed are those of a heavy downpour in the heart of the dry season or vice versa, which has contributed to decreased agricultural produce.

Voices of concern have been raised on such observed effects and impacts on other areas. The national bilingual daily Cameroon Tribune on 2 November 2007 affirmed that the harsh temperature variation, which exposes people to illnesses like meningitis, is among others the consequence of climate change. The prime minister, in an audience granted to a Commonwealth special envoy, agreed that the most alarming phenomenon today is the scientific report on the level of increase of average

temperatures of the ocean and the atmosphere, including global warming on the planet in general and Cameroon in particular. In the same light, Republic of Cameroon President Paul Biya, while addressing a high level climate change meet in New York on 24 September 2007, noted the negative effects of climate change on human health, biodiversity and water resources, "Cameroon is largely exposed to the modification of its coastal ecosystems threatened by sedimentation, floods and the increase in salt water." While no data are available to show how serious the situation is on the ground, the president added that the climate situation preoccupies the government everyday as the average annual temperature is constantly increasing in Cameroon at a time when average annual rainfall is witnessing a drastic drop.

And, as the president noted, all these factors greatly jeopardize the country's food security and food self-sufficiency. It is largely due to this that the government is joining the international community in the search for possible solutions to address this phenomenon; it has taken several plans of action to fight climate change in the country

## Government Policies on Climate Change

### *Law No 96/12*

The Cameroonian government's response to climate change has taken two different dimensions: theoretical and practical. The fight against climate change in Cameroon is vast as elaborated in the government's program on the protection of the environment that includes all decisions, laws, arêtes regarding this. The practical level consists of the concrete actions applied on the ground to combat climate change in the national territory.

In Cameroon before any law becomes operational or goes into force, it is tabled before the National Assembly which debates on it and once adopted, it is finally promulgated into law by the President. Following this process, Law No 96/12 with 99 articles was passed on 5 August 1996, spelling out the guidelines on and general jurisdiction of the management of the environment in the country.

The environment constitutes a communal patrimony of the nation that is integrated in the universal patrimony. Cameroon has ratified the United Nations Framework Convention on Climate Change (UNFCCC) and fully engages in the efforts of the international community to reduce greenhouse gas emissions to a level that can prevent the destruction of the climate system. The country has also ratified and adheres to several accords which guide international cooperation in the domain of climate change. By ratifying the UNFCCC on October 19, 1994, she became party to the Kyoto Protocol of July 23, 2002.

The government implements the laws on climate change after consultation with territorial decentralized collectives, local communities and associations that defend the environment. It has elaborated strategies and plans on a national program to ensure the conservation and durable utilization of environmental resources. This includes environmental audit, systematic evaluation and documentation that highlight changes noted in the different climatic regions of the country. During the UN General Assembly's 62nd session in September 2007, Cameroon announced the future creation of an observatory to take care of climatic problems that will include climate change adaptation in the development policies of the country.

After ratifying the UNFCCC, Cameroon presented an Initial National Communication (CNI) which presented the state of affairs of greenhouse gas effects and the actual and future vulnerability of certain fragile ecological zones in the country like the marshy zones, raffia, gallery and secret forest. The CNI was elaborated following a sectoral pilot study done in 1995 and 1997, creating an intergovernmental panel of experts on climate (GIEC) to evaluate the impact of climate change and

necessary measures of adaptation. This aimed to ensure a harmonious equilibrium in the management of the environment in such a way that if an environmental resource is damaged or depleted in one area, a resource of equal or greater value should be regenerated elsewhere for a balance to be achieved. This however can only be possible if landlessness, poverty and lack of access to institutional resources are resolved for those in need without discrimination.

All public projects and investments are also supposed to consider their capability and general impact on the environment; in particular risky installations should be assessed for their direct and indirect consequences to guarantee ecological equilibrium. When major projects are carried out in Cameroon especially those relating to the environment, environmental experts are sent to the field to make an evaluation of their direct and indirect impact on the environment and on the inhabitants of that locality in particular. For example, during the construction of the Cameroon-Chad pipeline project from Kribi in the south region, environmental experts from the Ministry of Environment and Protection of Nature and the Ministry of Forestry and Wildlife, including representatives from environmental non-governmental organizations, went to the construction site to make an inventory. Compensation was given to some inhabitants who were directly affected by the project.

Cameroon's environmental policy plan takes into consideration air, water and soil quality and ways of protecting human health, establishing a level of pollution that considers conservation of biological diversity and the general state of the environment. Its elaboration in relation to climate change and the environment recognizes the impact on users, especially indigenous people and local communities who are often the most affected. The plan is constantly revised every five years to address new challenges and to ensure effectiveness and practical realization on the ground.

It is important to note here that the natural resource base of a country and the quality of its air, water and land represent a common heritage for all generations. Damage to soil, water sup-

ply and forests resulting from unsustainable methods of production can reduce long term national productivity. This is why the administration has to fully integrate environmental issues in all development programs. The creation of the ministries of environment and nature protection, and of forestry and wildlife shows government's determination to fight the adverse effects of climate change and environmental degradation.

## *Role of Ministry of Environment and Nature Protection*

The Ministry of Environment and Protection of Nature was created by Decree No 2005/117 (April 14, 2005), which organizes the ministry, and was later modified by Decree No 2005/ /496 of December 31, 2005. The ministry has the task to protect the environment. For example in the construction of major environmental projects like hydroelectric power stations or dams, ministry experts have to go to the site to make an assessment of their potential environmental impacts. The ministry also examines all foreign and imported products to make sure these are free from substances that may have adverse effects on the climate and the environment. For example, a few years ago in Cameroon's economic capital of Douala, some imported refrigerators were destroyed by ministry experts because these contained harmful substances that could affect the climate and the environment as a whole.

The ministry also protects some national patrimonies like botanical gardens, national parks and game reserves. It has the responsibility of creating a cordial relationship between the users of the environment and the authorities concerned. It also recommends the exportation of timber exploited from forest concessions where environmental norms are respected. When projects under implementation run contrary to environmental prescription, the ministry steps in to call for modifications or outright cancellation of such operations.

## *Role of Ministry of Forestry and Wildlife*

Like the Ministry of Environment, the Ministry of Forestry and Wildlife has the responsibility to fight climate change and protect the environment. This ministry has five technical services, 10 decentralized regional and divisional delegations spread across the country with about 2,000 personnel directly employed by the state. Its main mission focuses around rational management of the country's forests and resources. As of 2009, some 160 community forests had been created from which the population concerned derives some benefits. The state, for instance, gives part of the taxes paid by logging companies as forest royalties to local councils and the local population. Logging companies are bound by the 1994 forestry law, which obliges them to provide basic infrastructures for the local population in their respective areas of operation like pipe-born water, electricity, roads and schools among others.

About 70 per cent of Cameroon's forests are under management plan with strict enforcement of measures put in place. Some 2.3 million trees were planted as part of the reforestation program in 2008 while some three million more trees were expected to be planted in 2009. Tree planting is often jointly done by the ministries of the environment and protection of nature and of forestry and wildlife, among other partners.

The protection of nature, preservation of animal space and vegetation, maintenance of biological equilibrium and the ecosystem, conservation of biodiversity, degradation and extinction are of national interest and concern to public authority and the right of citizens.

## *Fight against Desertification*

It is quite glaring today that desertification is fast approaching in Cameroon especially in the northern regions where natural vegetation is rapidly disappearing. Food production and yield per hectare are noted to be reducing with alarming rates of drought. Cameroon, like other regions of the world, is struggling against desertification. According to the United Nations program on the environment and the World Meteorological Organization, soil erosion and desertification could intensify in the next 30 years. It has been noted that the amount of rainfall is decreasing in arid zones in East, South, North and Central Africa with the encroachment of dryness and desertification.

To mitigate the fast approach of the desert and the degradation of natural resources in the northern parts of Cameroon, MTN-Cameroon, a mobile telephone company, signed in July 2005 a partnership agreement with World Wide Fund for Nature (WWF). This created an environmental conscience based on the planting of some 100,000 trees. The project called "A tree for life" falls in line with the government's objectives to work with other partners to combat climate change and protect the environment.

According to the program's objectives, the tree planting exercise will limit the effects of climate change, conserve biodiversity and fight desertification. The aims are:

- Planting of 100,000 trees in the northern regions to be surveyed at a rate of 65 per cent;
- production of nurseries of some 1,500 plants for the reforestation-afforestation of some secret sites in the villages and the Benue National Park;
- Creation of about 50 local committees to maintain the plants;
- Training of monitors on the approach of environmental education in the village milieu;
- Sensitization of environmental education in primary and secondary schools of the locality.

The tree planting exercise is also seen as a means of battling poverty. Since 2005, some 23 per cent of trees planted are fruit trees, which have contributed to the subsistence of the community concerned. The second phase of the project started in 2008 with the planting of mostly fruit trees expected to increase the reforestation area.

## *Involvement of Local Communities and Stakeholders*

The above is a veritable partnership as part of government's measures to fight climate change and to preserve the environment. It shows how citizens and enterprises can fully be integrated in this new vision of a social environment for a better world.

The scientific exploitation of biological resources should also be done in a transparent manner and in collaboration with national research institutions, taking into consideration international conventions ratified by Cameroon. The Ministry of Scientific Research and Innovation through its regional delegations work in collaboration with those assigned to carry out activities that directly concern the environment. It emphasizes the participation of the population in environmental management like free access to information that assures natural security, mechanisms that allow opinions and consultation from the population, their representation on environmental issues, sensitization, training, research and education.

Environmental management and participation encloses all activities carried out on the environment including research and training. During the 2006 farming season in the north-west region, the Ministry of Agriculture and Rural Development took steps to boost food production with the adoption of new methods for increased production.

Farmers are giving up the long tradition of burning the grass in their farms as part of several measures to boost food production. Agriculture technicians have been discouraging farmers against the burning commonly known as *Ankara* because it is detrimental to soil fertility in the long run. Farmers throughout the region inherited the Ankara farming method from their great grandparents, which is a source of temporal soil fertility but destroys the soil for several years after. Ankara is usually influenced by the late preparation of farm lands which does not allow enough time for the grass to decompose into manure and farmers resort to the only alternative at their disposal. With the deployment of animators in the field to monitor them, most farmers in the region are trying new techniques learned with the assistance of either agriculture technicians or farming group members. The animators assess input supply and farmers' needs. The results are proving positive as most farmers are shifting from this traditional method of farming that greatly contributes to environmental degradation and to climate change to more modern techniques that are environment friendly.

Those who violate laws that pertain to the environment are liable for sanctions and penalties, which range from payment of cash to prison terms from six months to one year. There have been many cases where the licenses of forest exploiters are stopped or suspended by the authorities. Those who also hunt protected animal species are brought to justice. Environmental protection in Cameroon is no longer the issue of a particular ministry. Security officials and other government ministries are bound to implement the rules put in place by the government.

## *Good Governance Program*

The government of Cameroon, through its good governance program launched in the mid-90s, came out with a number of policies that include the participation of citizens and civil society in the management of public affairs. An area of concern

here is the Poverty Reduction Strategy Paper. The paper is aimed at fighting poverty, which has been identified as one of the root causes of environmental degradation and climate change. Its objective falls in line with the Millennium Development Goals.

The strategy paper was designed and formulated in a participatory manner, involving at all stages the entire social corps (public authorities, business operators, civil society, village communities and development partners). Such participatory consultations made it possible to get a better insight into the factors of poverty as perceived by the grassroots population and to get their recommendations on the consensual strategies for poverty reduction. As then executive director of the United Nations Nafis Sadik noted some years ago, "Much of the environmental degradation witnessed today is due primarily to two groups of people—the top billion richest and the bottom billion poorest. It is also said the most pressing environmental challenges in developing countries in the next few decades will be caused by poverty."

## *Decentralization Program Involving Local Population*

Decentralization, which is aimed at building local capacities to involve the population in the management of their own affairs, seeks to improve the provision of basic services at the local level. The regions' internal organization, function and human and material resources give them an upper hand in its rational management. All government ministries are involved in the decentralization program where every ministry opens regional and local offices to deliver grassroots projects and services. For example, the Ministry of Livestock now has offices with veterinary doctors in almost all cattle-rearing villages including the study area. On 30 May 2008 a local representative of the Ministry of Territorial Administration visited Ngorin village to supervise the election of the 10-member village com-

mittee to manage grazing land in collaboration with the local representatives of the Ministry of Livestock and Animal Husbandry. Mr Sali Usmanu, the village chief, was elected to head the committee.

The Ministry of Forestry and Wildlife has also undertaken a program on community forest management, whereby local communities are trained to take care of their forest and use the resources sustainably .An example is the community forest program in Mbiame, a neighboring village to the study community, where experts from the forestry ministry work with an elected village management committee including women to take care of their own forest.

Under the decentralization program the Ministry of Public Health has opened a hospital in Ngorin village, and one Mbororo boy has been trained to take care of pastoralist health and to serve as interpreter for the doctor, since some patients do not understand English. The hospital is managed by a committee elected by the villagers in collaboration with the health ministry's local officials.

## *Protection of Vulnerable Groups and Communities*

The national program on good governance has put in place an institutional framework to facilitate the social integration and protection of vulnerable groups like the disabled and the minority groups such as the Mbororos and Pygmies, protecting their rights in their different communities. The Ministry of Social Affairs has started a program to help vulnerable communities that includes giving special scholarships to children and training indigenous youths who dropped out or have never been to school in technical skills like driving, carpentry and others.

In 2005, 10 Mbororo youths benefited from this program while one Mbororo girl was employed full time in the Ministry

of Social Affairs to help in policy making for the Mbororo. The government of Cameroon does not like the term "indigenous," preferring to use "vulnerable" communities to refer to indigenous communities like pastoralists and hunter-gatherers, popularly known as Pygmies. It argues that every Cameroonian is indigenous to Cameroon.

## *Defense and Promotion of Human Rights*

The national program on governance considers the defense and promotion of human rights as one important aspect that can help foster the participation of citizens and civil society in the management of public affairs. This program seeks to:

- Promote a better knowledge of the international instruments relating to the defense and promotion of human rights;
- Identify the instruments ratified by Cameroon and integrated in Cameroonian law;
- Promote the culture of peace;
- Ensure the protection of vulnerable groups and minorities among others.

It was through this initiative that the National Commission on Human Rights and Freedoms was created by a presidential decree of November 8, 1990 to defend and promote human rights and freedoms. It equally protects the citizens on their rights in the durable management of resources.

## Case Study:[1] Ngorin Village

Ngorin village was founded by two grazers who were brothers, Nankore and Randare. Around 1950 they migrated from northern Cameroon with their families and cattle in search of pasture, deciding to settle in the village because there was enough land, good pasture and less cattle diseases. The grazers of Ngorin are the descendants of these two brothers.

Ngorin is found in Mbven subdivision in Bui division of the north-west region, one of the 10 regions that make up Cameroon. The north-west region is also one of the two English speaking regions of the country. Of the 10 regions, four are made up of savanna vegetation where cattle rearing is an important activity. These regions are the Adamawa, the north, north-west and west regions, which are all inhabited by the Mbororo Fulani cattle grazers because of the favorable climate for cattle raising.

The north-west region in which Ngorin village is found is inhabited by the Mbororo Fulani who are mainly cattle raisers and the Nso people who are farmers.

The Mbororo Fulani number about one million in Cameroon, which has a total of about 15 million people. The rest of the population are farmers.

The Mbororo Fulani pastoralists of Ngorin village number about 350 people belonging to 25 families. Each family lives about five to 10 kilometers from another to allow enough space for cattle to roam and graze freely. The Mbororos hardly live a communal life, that is they hardly live together in a village but in isolated or scattered settlements. The Mbororo Fulani who are found in the West and Central Africa regions are said to have originated from Mali, a country in West Africa. Oral tradition holds that the Fulani ethnic group to whom the Mbororo belong are descendants of a white Arab man and a black Malian princess. The story says that the Arab man came to Mali to preach Islam and got married to a Malian princess, and their children were the first descendants of the Fulani.

The Mbororo are just a clan of the large Fulani ethnic group in West and Central Africa. Apart from cattle, they also rear sheep and horses but in a lesser number.

## *Economic Situation of Mbororo Pastoralists*

Like any other pastoralist community in Africa and other continents, the Mbororo pastoralists of Ngorin village depend solely on cattle wealth as a source of living. Their entire economy and livelihood depend on this animal and to a lesser extent sheep and horses, and some also raise chickens. The people live on meat and milk from cattle as their principal diet. They sell cattle to buy other foodstuff like rice, maize and other foods. Money from cattle is also used to pay children's school fees, buy clothing and all other needs. Cows are slaughtered for sacrifice and traditional ceremonies like marriage or to celebrate a newborn baby in the family.

For climate change, for example, a cow is slaughtered to appease the gods and ancestors to bring rain in times of severe drought. This is because to the Mbororo drought is interpreted as a punishment from the gods for wrongdoing by the community. In April 2005, each family in Ngorin village slaughtered a sheep or cow and elders fasted to placate the gods to give rain. Rain was supposed to be back in March but the dry season extended to the end of April that year. Many cattle died of famine and thirst and some families were left without livestock.

## *Health and Education*

Ngorin village has a government primary school to serve children of pastoralists and of farmers of the Nso tribe. The former are a minority in the school because most Mbororo pastoralists

prefer their children to look after the cattle than spend their time in school especially during transhumance when many Mbororo children are withdrawn from school to take the cattle to the valleys. During this movement of people and animals, pastoralist communities migrate to valleys and plains near riverbanks during dry season in search of pasture and return to their homes after the return of rains. This writer witnessed one such case in January 2009 when Mr Sabana of Ngorin village withdrew his 10-year-old son Yusufa from school in standard five to take his cattle to a place called Bambalang valley for transhumance.

It was observed that during the period of severe drought in 2005 and 2006, many Mbororo children had to stop their schooling temporarily to take cows for transhumance. This also happens every dry season in November when children abandon school in Ngorin to take cows for transhumance and only go back to school in April or May depending on when the rains come.

The decline in animal wealth due to prolonged drought has indirectly affected the health situation of Mbororo pastoralists of Ngorin village. The November to April 2006 drought left many families without cattle as the animals died of hunger. Family heads had no means to provide health care for their children, wives and themselves. The people experienced hunger and malnutrition because there was no milk and meat nor money to buy rice and other foodstuffs. No mortality data were available in the health centre, since as the nurse explained, the center was relatively new and was closed for some time due to a lack of workers.

## *Impact of Climate Change on Ngorin Pastoralists*

### *Gradual disappearance of grass for cattle*

Due to continuous and prolonged drought every year, the village's land surface, which is savannah, is changing drastically. The natural grass on the hills and plateaus for cattle grazing are being invaded gradually by strange species. These changes started around the late 80s in small negligible quantities and are increasing every year. The main species include *Agugu, mbaajoo, bokassa* and *Fulawa*, names given to the strange plants by the villagers. Cattle do not eat them.

*Agugu* and *mbaajoo* are fern plants that grow in savannah areas. These two are not strange to the villagers because they have been growing in the locality, but not in an invasive manner like now.

Fulawa is a shrub, and its name is a distorted form of the word "flower" in English. The villagers gave the plant this name because it produces shining flowers.

Mbaajoo is a short thin herb. Its name is coined from another popular local herb *baaji* because of their resemblance. Baaji is used to make rope to tie cattle.

These grasses have replaced pasture for grazing in some parts of the village, bringing famine and consequently poor milk production and death of cattle, rendering grazers poor. To solve the problem of milk deficiency, the women now have to milk twice a day, in the morning and evening, especially when the suckling calf is more than five months; if younger it will be affected by famine as it has not yet started eating grass, living solely on milk.

The people have a mysterious explanation for the grasses; they attribute these to misuse or abuse of land by human beings. To eliminate the grasses, they clear them continuously for three to four years until they disappear completely, giving way to grass as before. But this method is too cumbersome especially when dealing with many hectares of grazing land. In the long run machines may be needed to do the work faster.

### Drying up of water points

Most water points have completely disappeared. According to one elder of Ngorin village, in the 60s there used to be eight water points or *maaje* in the village where the people get water for cooking, washing and other domestic uses but only four exist today. Prolonged drought and insufficient rain have led to the deepening of the water table, thus the disappearance of water points. The worst droughts, according to the elders, were in 1983 and 2004 when they had to fast and kill animals for sacrifice to invite rain.

### Advent of strange cattle pests and human diseases

Due to constant movement of cattle for transhumance in search of pasture, cattle have contracted new and strange cattle diseases or illnesses.

In the past there was movement but not too far because the dry season was shorter. Movement did not depend on the distance but more on the length of the dry season. If the dry season is long the pastoralists continue to move for hundreds of kilometers. Whenever the grass in an area is consumed, they leave to look for a new place. Sometimes they cross the border to Nigeria, a neigboring country to Cameroon, without visa or passport but illegally through the bush.

The most common cattle pest, which the villagers named *Sille Jijam* meaning "blood urine," especially attacks cows; they pass urine mixed with blood when they get infected. There is no proof that eating a sick cow with this disease can contaminate humans; it is subject to further research. This illness has affected marketability because it is against veterinary law to sell meat from a sick cow; butchers do no buy sick cows even if they are priced very low because the animals would have lost weight due to the illness. The villagers have attributed this disease to cattle consumption of certain strange herbs and contaminated water. They say they use their local herbs to treat it. They have reported the disease to a local livestock ministry official who promised to look for a solution but none has been issued yet.

The prolonged drought has led to the drying of streams, leaving standing water which is contaminated by mosquitoes. This water, which has a yellow color the villagers call *Kaadam*, gives diseases to both humans and animals.

**Land degradation**

Due to drought and bush fires, some hills and plateaus around Ngorin village that were covered with grass are now bare without any grass or shrub. About 200 hectares of grazing land are useless at present, but farmers can use some areas. The hills are not just bare without any vegetation but also have hard red soil without anything growing on it. The villagers call this *Kare* and have attributed it to excessive sunshine and bushfires. They have decided to keep away cattle from the barren areas so these can rejuvenate.

**Impact on women and children**

As in most indigenous communities, in times of disasters, women and children are the most affected victims. This is evident in Ngorin village where the negative effects of climate change have put more pressure on these groups. As they are in charge of housekeeping, the women have had to trek long distances since the late 80s to fetch water and fuel wood. These resources have become scarce due to continuous drought and bushfires that burn down trees. Bushfires have also destroyed houses of villagers.

**Increase in child labor, school dropouts**

During transhumance, children in Ngorin village as young as nine are taken out of school to take the cattle to the lowlands and near riverbanks where an oasis of green grass can be found to feed the animals. They move to a plain called Mbo about 40 km from the village. In December 2009 Sali Yaya, a grazer in Ngorin village, withdrew his 12-year-old son Hassan from school to take cattle to the lowland of Mbo.

In Mbo the children live in hard conditions. There is little food and they depend solely on cattle milk for their daily meals. "I sent my young son with our cattle to Mbo plain this year because shepherds have been stealing my cows whenever I sent them to take the cattle on transhumance for payment," says Ardo Sali, the chief of the Mbororo pastoralists of Ngorin village. The villagers however do not perceive this as child labor at all but a normal initiation and training on the culture and future responsibilities in the society for the child.

**Mass reduction of cattle, increase in poverty, malnutrition, crime and cattle theft**

Due to hunger and cattle pests and theft especially during transhumance, the number of cattle in Ngorin village has decreased from about 3,000 in the late 90s to just 1,800 in 2008. A grazer, Mallam Abdu Bi Bakari, said, "I had 200 cows five years ago but due to drought, most of them died and I now have only about 60." The mass reduction of cattle started in the late 80s.

This has led to poverty and malnutrition in the village. Some youths who lost their cattle have indulged in cattle stealing and highway robbery. In January 2008 some three youths noted for cattle theft were killed through mob justice when they attacked a vehicle in Mbo plain with the intent to rob.

**Disappearance of traditional medicinal herbs and trees**

Trees and herbs that the Mbororo pastoralists of Ngorin use for medicine both for humans and animals are now very scarce. Some have even become extinct due to continuous dryness and bushfires. They no longer grow. According to the villagers, medicinal plants like *iblis* used for treating fever and *kaltininli* to fatten calves are hardly found. To treat their animals, the villagers now depend on modern commercial veterinary drugs.

### Disappearance of wild fruits

Indigenous people all over the world are noted for their dependence on nature in all aspects of life. Feeding on wild fruits is part of this dependency. Pastoralists of Ngorin village especially youths consume a variety of wild fruits, and some of those now scant include *kondoje*, *sitta*, *dukuuje* and many others.

"When we were young, we used to have a lot of fruits around our houses, but now most of the trees are dead and our children will never know the taste of some of these natural succulent fruits," said Nenne, an elderly woman.

Domestic food crops too are scarce because of drought.

## Mbororos' Mitigation and Adaptation Measures

The Mbororo Fulani pastoralists of Ngorin have developed a number of traditional mechanisms to adapt to climate change and to mitigate its adverse effects.

### Change of economic activity

Pastoralists who have lost all their cattle have become small scale farmers. They migrated to a river bank in a place called Lip 30 kilometers away and are cultivating food crops like maize, beans and banana mainly for household consumption and also for sale. Other crops they grow are cassava, rice, coco, yams, vegetables and others.

### Migration to cities

Many pastoralists especially youths have migrated to the nearby cities of Bamenda and Bafoussam where they are employed as night guards, while others are involved in petty trading. After getting some money in the cities they go back to the villages and buy cattle.

### Transhumance

Mbororo pastoralists have resolved to move constantly depending on the length of the dry season in search of pasture and water for their cattle which are now scarce due to climate change effects especially drought. Transhumance is a continuous movement to look for pasture during the dry season or drought and stops when rain returns. During the dry season, pastoralists are in constant movement to the valleys and near riverbanks where there is green grass like elephant tusk. Locally called *Tolore,* this plant is good food for cattle.

### Change of cattle breed

Many pastoralists are now gradually changing their cattle breed called *Gudali*, which has less resistance to harsh conditions like hunger and thirst. They now prefer a more resistant breed called *Akuji*, which are thin, white and can move for long distances in case of constant migration during transhumance. Some only buy the bull and crossbreed. The disadvantage with the Akuji is it is naturally small in size and weighs less, which means less meat and less money it can fetch when sold. Butchers and cattle traders buy according to the weight of the animal.

### Stocking of dry grass

One of the ways the pastoralists are adapting to climate change is by harvesting a lot of grass when the dry season steps in and stocking it near their residences to feed their cattle during drought. "We dilute salt in water and wet the grass before giving it to cattle, if not they will refuse to eat the grass even if they are hungry because it is dry grass," explained Musa Njobdi who practices this method of feeding his cow in periods of drought.

## A platform of understanding with farmers on alternative use of land

Climate change effects have brought a lot of pressure on land use between farmers and grazers that sometimes results in bloody conflicts. In Mbo plain, the Mbororo pastoralists have come to an agreement with rice farmers in the area to use the land alternately. That is, after harvesting their rice the farmers will allow the pastoralists to graze their cattle in the farms and by so doing the droppings from the cattle will serve as manure during planting. This is a win-win agreement which has brought peace between the two communities that were almost always in conflict over land.

## Adaptation

The villagers have also developed a program of clearing strange invasive herbs and plants to recover lost grazing land. The program consists of continuous weeding and clearing of the plants for three to four years until they disappear and give way to grass as before. This program was introduced to the community by an American veterinary doctor, Dr Lewis. One of the grazers Dauda Gado says he recovered about 20 hectares of land near his compound, completely useless five years ago, for calves, sheep and horses.

The pastoralists of Ngorin are tackling the new cattle pests like *Sille jijam* with traditional medicine. Sanda Hosere, a grazer, makes a concoction from the bark of a tree called *Barkehi* to treat some of the diseases. This knowledge, he says, was handed down to him by his late grandfather Nangkore.

The villagers also clear all water absorbing plants like eucalyptus trees especially around water sources. According to some women, they now have to dig deep wells to get water, some of which can be seen around the village with two or three families sharing a well.

## Recommendations

Considering the impacts of climate change on indigenous peoples as manifested in the situation of the Mbororo pastoralists, the following recommendations are made:

1. Indigenous peoples' traditional knowledge on climate change mitigation and adaptation should be recognized and encouraged by governments, donor agencies and the international community as a whole;
2. Mitigation and adaptation measures, policies and programs by national governments or other institutions that have negative effects on indigenous peoples should be discouraged. This includes displacement from their ancestral land without prior, free and informed consultations;
3. Indigenous peoples should be included in all climate change negotiations and programs, be they at the national, regional and international level;
4. African governments should integrate climate change issues, especially concerning indigenous peoples, in all their development policies, particularly in poverty reduction programs;
5. National governments and the international community should engage in a wide communication and sensitization program for indigenous peoples to raise their awareness on climate change issues;
6. Funding institutions should support indigenous peoples of Africa on programs on climate change mitigation and adaptation;
7. Indigenous peoples of Africa should develop a strategic plan to address climate change issues to be able to engage and influence the decisions of the United Nations Framework Convention on Climate Change and related institutions;

8. Capacity building seminars should be organized to train indigenous representatives to understand the highly scientific and technical language of the UNFCCC to be able to effectively engage and influence negotiations of the Conference of Parties.

## Endnote

[1] The study was carried out in December 2008 and January 2009, with the interview as the main methodology used. Elders were interviewed individually, and group discussions were held with family heads, women and youths of various social status. Observation was also part of the information gathering for the research.

"Indigenous peoples are vital to, and active in, the many ecosystems that inhabit their lands and territories and may therefore help enhance the resilience of these ecosystems... (T)hey interpret and react to the impacts of climate change in creative ways, drawing on traditional knowledge and other technologies to find solutions which may help society at large to cope with impending changes."

- UN Permanent Forum on Indigenous Issues



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