Chapter 3
Indigenous Communities and Climate Change Policy: An Inclusive Approach

Vinita Krishna

Abstract Climate change is one of the greatest social and economic challenges today. It is a global problem which needs a global solution and for this each country has to play its part in reaching that global solution through local actions.

Adverse weather conditions are impacting the society on all fronts, be it food, habitat, livelihood, or income. There is an urgent need to take into consideration input from all segments of society. This paper deals with one such segment: the indigenous communities who have the vast potential to adapt in response to climate change. The paper deals with a general review of the efforts of indigenous communities across Asia with a specialized focus on the capacity of indigenous communities in India in combating climate change. The recognition that many environmental problems are local in nature is a rationale behind including the indigenous communities in addressing this global issue. These communities constitute an insignificant percentage of the global population and their contribution to the greenhouse gas emissions is minimal. A collaboration between these communities and the climate scientists could evolve solutions which go beyond the need to mitigate emissions and development of clean development mechanisms.

Presenting a holistic approach of the indigenous communities in coping with climate change, the paper provides an input to the policy makers on including the views of stakeholders from this sector to deal with the local needs and adopt a balanced approach between adaptation and mitigation strategies. It also gives an insight to the general public into more alternatives to climate change solutions.

Keywords Adaptation · Climate change · Inclusive policy approach · Indigenous communities · Mitigation · Traditional knowledge participatory decision-making

V. Krishna (✉)
F-150, Sarita Vihar, New Delhi 110076, India

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Introduction

This paper seeks to explore the threats and challenges of climate change faced by the indigenous communities of Asia in general, with a special focus on India.

Based mostly on a literature review due to the absence of adequate research or data on indigenous communities in most of the developing countries, referenced materials include project reports, negotiation texts, relevant journals, books, and the climate assessment reports. The aim of the paper is to discuss the current situation of this vulnerable group and bring to light possible areas for further research. The indigenous communities and their traditional knowledge systems in mitigation and adaptation have for a long time been neglected in climate change policy formulation and implementation and have only recently been taken up in climate change discourse. The paper also explores networking actions by indigenous communities to make their voice heard.

The term "indigenous" has prevailed as a general term in some countries; there may be a preference for other terms: "indigenous peoples" or "indigenous communities". There are some local terms (such as tribes, first peoples, aboriginals, ethnic groups, adivasi, janajati), or occupational and geographical terms (hunter-gatherers, nomads, peasants, hill people, rural populations, etc.) that, for all practical purposes, can be used interchangeably with "indigenous peoples".

The UN Permanent Forum on Indigenous Issues has identified inadequate data collection and disaggregation concerning indigenous peoples as a major methodological challenge in policymaking. Compared to the other population groups in most countries, there is no available disaggregated data on the situation of indigenous communities which can be used to qualify policies and monitor the impact of programmes. To gain an accurate understanding of indigenous peoples' situation, relevant data collection must be undertaken with the full participation of indigenous peoples.

Out of the six billion people in the world, indigenous peoples constitute at least 370 million. They practise relatively neutral or even carbon-negative lifestyles, having a substantial impact in lowering GHG emissions. Nevertheless, as pointed out in the report of the seventh session of the UN Forum on Indigenous People, some of the serious impacts of climate change, such as worsening drought conditions and desertification, leading to increased numbers of forest fires that affect land use, are causing serious loss of biodiversity. This seems to threaten the sustainable existence of indigenous communities. Furthermore, mitigation measures, such as renewable energy projects (hydropower dams, geothermal plants) and implementation of REDD, taken without the free, prior and informed consent of indigenous communities, deprives them from their participatory role and excludes them from the decision-making processes of their nation.

Social Impact of Climate Change on Indigenous Communities Across the Globe

The impact of climate change on indigenous communities is most apparent in the case of the Inuit peoples who are experiencing climate change threats from the rising level of greenhouse gases (GHGs). The findings of The Arctic Climate Impact Assessment, an extensive scientific study on climate change in 2005, reported the rise in warming by 4–7°C by the end of the century, with summer sea ice disappearing within 60 years. Local peoples' habitats and livelihoods being at stake, they have filed a legal petition against the US government on the grounds of a human rights violation. Such impacts are not restricted to the Arctic but are being observed in many places across the globe as climate change intensifies. From the British Columbian coast to the Kalahari desert in Africa to the English countryside and to the Himalayan mountains, local people are noticing changes in climatic conditions. The Andean region of South America has suffered an increase in respiratory illness, a decrease in alpaca farming (small farm livestock) and a shortened growing season. In Kenya, the Samburu people are losing their livestock to severe, extended droughts. The Dayaks in Borneo have documented climate variations including rising water levels and the loss of traditional medicinal plants. In spite of such widespread impact of climate change, indigenous communities are showing signs of coping with factors like changing trends in precipitation, droughts, and floods by practising their traditional methods. For example, in the Kalahari in Africa, recent changes in precipitation have encouraged a shift from rain-fed agriculture to manually watered homestead gardening and a shift from cattle to goats. On the other hand, British Columbian Gitga'at communities, having being unable to sun-dry their food because of unseasonable wet spells, have switched over to novel techniques, such as freezing their food until the weather gets sunny or drying it indoors. These communities are also adapting to the changing patterns of livelihood and habitat, as in the case of the Makushi of Guyana who move from their savannah homes to forest areas during droughts and plant cassava, their main staple crop, on moist floodplains normally too wet for the crop.

The adoption of the "stewardship role of indigenous peoples and new challenges" as the main theme of the sixth UN Forum on Indigenous Issues speaks of the growing vulnerability of climate change. In this forum, indigenous peoples expressed concern for both the problem of climate change and the proposed solutions. Raising the issue of their exclusion from the UN Framework Convention on Climate Change (UNFCCC) and the closed-door approach in climate change policy, indigenous peoples claimed that with their traditional knowledge, they could contribute significantly to identifying proper and sustainable solutions, as opposed to the present market-based solutions such as carbon trading and agro-fuels production which are questionable both ethically and environmentally. Indigenous peoples also expressed concern at the Clean Development Mechanism (CDM) projects, some of which have caused the deaths of indigenous peoples who refused to hand over their territories for the purpose specified in the projects. The decision

on Reduced Emissions from Deforestation and Degradation (REDD) was also questioned, as it makes no reference to indigenous peoples' rights.

However, the authors of the International Union on the Conservation of Natural Resources (IUCN) report highlight the fact that indigenous peoples' vast experience in adapting to climate variability will not be sufficient – they also need better access to other information and tools.

Based on the current situation, indigenous communities are asserting themselves through summits such as the Asia Summit on Climate Change and Indigenous Peoples, Bali, 2009, and the Indigenous Peoples' Global Summit on Climate Change, held in Anchorage, Alaska, 2009, to highlight their vulnerability and the impact of climate research.

The Social Impact of Climate Change on Indigenous Communities in Asia

As a physiologically diverse and ecologically rich continent, Asia is more vulnerable to the impact of climate change than other regions. This problem is compounded for the indigenous communities who are the actual caretakers of the natural abode and resources. The UN Forum on Indigenous Issues points out in the Asian review that with a rise in temperatures by 2–8°C and further climatic variation, in Asia, there will be a decrease in rainfall, crop failures and forest fires, all of which will threaten the existence of tropical forests, a rich haven of biodiversity and their conservator-indigenous communities.

The findings of the report of the Asia Summit on Climate Change and Indigenous Peoples held in Bali highlighted that indigenous communities in the Asia region inhabit the most fragile ecosystems ranging from tropical rainforests, high mountain areas, low-lying coastal areas and floodplains, as well as temperate forests and that they are at the forefront of climate change impacts and threats. One such anticipation of the scientists in this context is that people in low-lying areas of Bangladesh could be displaced by a one-metre rise in sea levels. Such a rise could also threaten the coastal zones of Japan and China. The impact will mean that saltwater could intrude on inland rivers, threatening some freshwater supplies. In the high altitude regions of the Himalayas, glacial melts affect hundreds of millions of rural dwellers who depend on the seasonal flow of water. There might be more water in the short term, but less in the long term as glaciers and snow cover shrink.

In the coastal zones of Asia, the main impact is seen as sea-level rise and more frequent and severe storms. In countries such as Bangladesh and India, which are particularly vulnerable to tropical cyclones and storm surges, approximately 76% of the total loss of human lives has occurred due to cyclones. In terms of sea-level rise, the consequences will be quite serious in countries such as Bangladesh and Vietnam, where 15 million and 17 million people, respectively, could be exposed, given a relative change in sea level of 1 m.

Tropical forest ecosystems around the globe, particularly the ones in Asia which support the livelihoods of people from several regions of the world, belong to the most vulnerable ecosystems to climate change variability and long-term changes in temperature and rainfall (CIFOR 2007). In many cases, climate change may result in longer dry seasons and will make these regions more prone to major forest fires. Evidence of this can already be seen in the Indonesian region Borneo. This will require major adjustments in the lives of indigenous forest-dwelling peoples.

Despite such vulnerabilities of indigenous communities, climate change in Asia faces numerous barriers in being treated as a mainstream policy issue. With priority given to technological development in most of the developing countries, this issue gets sidelined. Dealing with the issue in a tiered manner, i.e. at the local, regional and the national level, could generate a better response to the impacts of climate change.

Lombok Island in Indonesia is a case in point for managing climate change at the regional level. This island is under a serious threat of climate change, but being a part of Nusa Tenggara Barat Province, it has already prepared a Provincial Action Plan for Mitigation and Adaptation to Climate Change. Hence, Lombok Island shows serious commitment to its provincial government in preparing its society to face the impacts of climate change.

Moving away from water, drought and storms as the major impacts of climate change, the International Union on Conservation of Natural Resources (IUCN) notes that changes to land cover and biodiversity caused by climate change could force indigenous communities to "alter their traditional ecosystem management systems" and, in the extreme, eventually lead to a loss of their traditional habitats (Maachi 2008).

Asia is a rich reservoir of indigenous knowledge (referred to as traditional local knowledge), which is unique to local communities and is acquired through local peoples' experience and observations of their surrounding natural systems (Srinivasan 2004). One example of the impact of climate change on indigenous knowledge is the changes in the agricultural cycle as a result of intensified changes in the climate.

Many indigenous communities in Asia rely on the observation of particular indicators, which make the community able to determine cropping patterns, i.e. when it is appropriate to plant, cultivate and harvest (see Box 3.1).

Many more such indigenous coping strategies are known to enhance adaptive capacity but very few of them have been integrated into national or local adaptation planning in Asia, perhaps due to insufficient recognition of their value and bias against local knowledge. Indeed, many local ways to cope with climate extremes, which were once considered primitive and misguided, are now seen as appropriate and sophisticated. However, adaptation is often a complex process that requires detailed site-specific considerations; any adaptation measure must effectively utilize or be built on indigenous coping strategies. For effective integration of local coping strategies into adaptation plans, a thorough assessment of the strengths and weaknesses of each strategy is necessary, as some are no longer adequate to cope with the impacts of climate change.

Realizing the importance of local knowledge and the involvement of indigenous communities in successful adaptation, there is a growing interest in international

Box 3.1 The Kiling Connection
In the Sagada region of the Philippines, the calendar is not counted in terms of days, weeks or months; rather, it is indicative of the particular agricultural activity of that period. Each month is divided according to specific indicators. These indicators are either activities in the field or the blooming of certain plants. For example, their year begins with Kiling, which is the name of a small bird whose chirping indicates that the typhoon season has ended. Based on the chirping activity of the Kiling bird, this period coincides with October in the Roman calendar, and this is the time for sowing rice grain on the seedbeds. Farmers in the Philippines take it as a cue for sowing rice but, unfortunately, this custom of relying on particular indicators to determine farming patterns is in disarray due to changes in climatic conditions.

institutions to support community-led initiatives on adaptation or proactive micro-adaptation. For example, in 2003, the UNFCCC initiated a database of local coping strategies for adaptation to disseminate information to a wider audience.

The Global Environmental Facility (GEF) is one such international effort. Through its small grants programme, it supports community-oriented adaptation projects in which local knowledge is duly considered. If other bilateral and multilateral donor agencies can also take initiatives to support, collect and integrate local knowledge in adaptation planning, the prospects for improved adaptive capacity will be enhanced. Long before the advent of complex numerical climate models, many indigenous communities have used changes in their environments to predict fluctuations in the weather and climate. Social and communal activities such as feasting, fishing and hunting patterns were planned in response to changes in weather and climate and revolved around the different seasons. While weather and climate patterns have been documented for many years using Western scientific techniques, little attention has been paid to documenting the traditional environmental observations made by indigenous peoples (Penehuro Lefale 2003).

Role of Indigenous Communities in Dealing with Climate Change

The Intergovernmental Panel on Climate Change has acknowledged that indigenous knowledge about climate change events in the past could be an "untapped resource" in developing additional adaptation strategies (Henessey and Fitzharris 2007). Most of the indigenous communities still practise their sustainable traditional livelihoods, such as swidden agriculture, hunting and gathering, pastoralism, extraction of non-timber forest products, small-scale mining and agroforestry. Such practices result in small ecological footprints. So why not use their knowledge in the areas under imminent threat of climate change due to deforestation, flood and desertification?

Climate change has affected their food security, their innovative practices of agricultural rituals and their traditional knowledge, but with the help of customary laws and practices on natural resource management, they have managed to conserve their forests and biodiversity. For example, in terms of mitigating and adapting to climate change, the Iklahan community of the Philippines have successfully fought for their rights over native lands through Certificate of Ancestral Domain Claims (CADC) and Certificate of Ancestral Domain Titles (CADT) (see Table 3.1). While with the Philippines Association For Intercultural Development (PAFID) they could protect their ancestral land and culture, with the Kalahan Educational Foundation (KEF) they could raise awareness about reforestation.

Traditional weather forecasting by the Tagbanuas, another community of the Philippines, had decreased due to the severity of climate change, and their subsistence activities were affected. Nevertheless, with their traditional knowledge, they have managed to find new adaptive strategies by practising swidden farming (adjustment in planting and clearing period), diversifying their fishing area, suspending seaweed farming for two years, being dependent on root crops (kurut/burut) and discovering a new water source.

Indigenous communities can also play an important role in strengthening social and economic ties between different groups of peoples in times of crisis. Groups affected by adverse climate conditions can acquire resources from other groups not experiencing the same problems (due to a reliance on different agricultural techniques, the use of different resources and ecosystems, or local variation in climatic conditions, for example). This sharing of resources is seen among the Penan Benalui foragers and Kenyah Badeng farmers in Borneo.

However, with impending climate change, some of these reciprocal systems may break down, as certain groups may become more permanently disadvantaged. The breakdown of such systems is evidenced in the archaeological record of Mimbres

Table 3.1 Community-based approach of the Ikalahan to adapt to and mitigate climate change

Year	Community struggle	Community action and results
1973	Land grabbing	Fought in courts and won the case; established KE & KA
	Land tenure and security	Pressured government for land lease and signed the MOA 1 and were granted CADC and CADT
	Mapping of the domain	Trained local people for survey and sought assistance from PAFID
1974 onwards	Forest fires and illegal logging	Established community rules and regulations Created firelines (*gaik*) and green breaks with maguey and *ipil-ipil*
	Land use and land management	Came up with land use plan (wildlife sanctuary, production forest and *dappat*)
	Reforestation	KEF staff, barangay officials and individual efforts Identification of endangered species
	Livelihood	Food processing; continuous planting of indigenous species

Source: Indigenous peoples' local mitigation and adaptation measures to climate change: case of the Ikalahans and Tagbanuas of the Philippines (presentation at Asia Summit on Climate Change)

Box 3.2 Collaborative Approach in Mitigating GHGs
Bushfires are a major source of GHG emissions. Mitigating these emissions is currently the main concern of climate change policy.

In the Northern Territory of Australia, bushfires account for around half of all greenhouse gas emissions. Involving the indigenous communities, the West Arnhem Fire Abatement Project (WALFA) has been started to reduce wildfires in the Arnhem Land Plateau by creating fire breaks and patchy mosaics of burnt country.

The strategies are reliant on both indigenous knowledge and western technology (Altman et al., 2007). Strategic burning is carried out in the early dry season when fires are lower in intensity and limit the damage to the upper canopy. This prevents the spread of more intense and highly polluting fires in the late dry season and reduces the total amount of land burnt and greenhouse gases emitted.

WALFA has an abatement target of 100,000 tonnes per year and in its first 2 years it has abated an estimated 256,000 tonnes of carbon. It also provides an opportunity for economic development for indigenous communities. It has provided employment for 30 indigenous Australians from the five Aboriginal communities involved in the partnership (Altman et al. 2007; ATSISJC 2007).

Valley in New Mexico. The Mimbres culture predominantly inhabited moist valley bottoms, which buffered them against droughts. In a period of above-average rainfall, satellite settlements were established in higher and drier areas, which probably receive support from the more humid main settlement areas in dry years. However, when conditions became permanently dry, there was not only the dissolution of upland settlements, but of the whole Mimbres culture. In this context, it becomes imperative to encourage the social networking of indigenous communities and save the rich reservoir of their traditional knowledge from extinction.

Yet another important role played by the indigenous communities has been their resistance to the extraction of oil, gas and minerals from their lands, which act as carbon sinks. They have contributed significantly to the mitigation of GHGs by resisting the deforestation and destruction of their forests and by managing forest fires (see Box 3.2). Unfortunately, indigenous communities' positive contributions to the abatement of greenhouse gas emissions are not generally recognized nor compensated by the UNFCCC and other multilateral and bilateral bodies.

Potential Response of Indigenous Communities

Climatic variation in current times is more extreme than in the past and indigenous people are finding it difficult to adjust to it, although there is archaeological evidence of their successful adaptations in the past. Unnoticed, unheard for most

of the time in the national agenda of most of the developing countries, they continue to adapt with signs of resilience in different pockets of the world.

Adaptive Strategies in the Past

Indigenous communities have played the role of observers and adaptors since the evolution of the species. Much of this evidence is based on archaeological analyses in the absence of a complete and obvious timeline. From archaeology we know that food shortage is common and central to survival during disasters and climate change. The invention of agriculture was almost certainly a major adaptation to climate change.

However, much of what people have developed in response to disasters like climate change has also been lost. For example, in the case of domesticated crops, their wild relatives have been lost. At present, the existence of many such species is being threatened or they are on the verge of extinction. Such archaeological evidence could prove a positive step to building resilience in fighting climate change by reconstructing these processes as prehistoric farming techniques and environmental management.

Among plant use, it is being observed that what were prehistorically common seasonal foods have now become famine foods. Although usually justified by observed use in famine, this term is rarely explicitly defined. Based on the common practice to cite use of famine foods as an indicator of famine (Corbett 1988), experts on this issue deduce an underlying premise that these resources, which are generally harder to acquire or are lower in calories or quality, are resorted to only in times of crop failure (Huss-Ashmore and Johnston 1994) and such food is termed famine food. Most traditional vegetables – wild and managed – used during food shortages were first cited as a vibrant part of the staple diet, indicating a dynamic strategy of nutritional resilience. Because of their dietary prominence during times of food shortage, traditional vegetables, especially in Africa, are often referred to as famine food.

There is a danger now that knowledge of famine food and its management will be lost forever with the current trend in climate change. A research study of this trend could come up with interesting outcomes of the impact of climate change on food security.

Indigenous communities have used biodiversity over space and time as a buffer against climate change and natural calamities. In prehistoric times, biodiversity of the earth was devastated during periods of drastic climate change. Even during current global warming and its impact on biodiversity, indigenous people are instrumental in maintaining the balance on the basis of their carbon neutral living. The major climatic changes affecting biodiversity are temperature fluctuations at different times and precipitation unpredictability. The protection of biodiverse habitats such as forests and mangroves can provide multiple benefits for adaptation, mitigation and biodiversity conservation – by storing carbon, protecting coastlines, limiting erosion and regulating water flow, which reduce the risks of flooding.

Proxy analysis, a tool for data analysis, is not based on primary factors, such as people and/or climate change; rather it is indicative of other factors. Pollen analyses, for example, indicate climate change and human activities, i.e. what diversity of crops were used by people in a particular climatic period and under what environmental conditions. These are powerful lessons to contemplate as we can consider what indigenous people can teach us about climate change.

Adaptive Strategies in the Present

Indigenous people in times of climatic variation are known to have used phenological markers to predict the favourable and unfavourable times for biodiversity maintenance. These markers can be the appearance of certain birds, the mating of certain animals, or the flowering of certain plants (see Box 3.3). With climate change, many of these phenological events are occurring earlier or may not be as useful indicators of changing weather patterns as they used to be.

Changes may also take place in agricultural techniques, such as irrigation replacing rain-fed agriculture or changes in location during acute climatic crises. Indigenous people shift to settlements which are less susceptible to adverse climatic conditions. Changing lifestyle and food habits is also practised as an adaptive strategy by some, such as the Kenyah communities in Borneo, who plant new crops such as maize in the drying river beds during droughts cause by El Niño events, or switch to extracting starch from wild sago palms during El Niño droughts and floods.

There is numerous documentation of Asian countries which are most vulnerable to the impacts of climate change. They are employing traditional and innovative adaptation practices, which include improved agricultural techniques and building technologies, prevention of soil erosion, rainwater harvesting, crop and livelihood diversification, shoreline management, use of new materials, seasonal climate forecasting, community-based disaster risk reduction, and so on (see Table 3.2).

Indigenous communities are also sharing their resources as is evident from their presentation made at their summit in Alaska. A new farming method developed by the Quezungal people in Honduras, who plant their crops under trees so that the roots anchor the soil and reduce crop damage during natural disasters, was presented as a new adaptation effort.

Box 3.3 Indigenous Communities' Phenological Markers in Predicting Climate Change

Dayaks of Borneo observed bird species that they had never seen before and they became aware that the level of water in the rivers was higher/lower than usual for the season and that the traditional plants used as medicinal remedies could not be found any more. However, with extreme climatic variations, the behaviour and migration patterns of birds, which were traditionally used to guide these natural phenomena, no longer provide reliable guidance. Nor do

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these climatic disturbances provide accurate guidance to their hunting and cultivation activities.

The Punan communities in East Kalimantan, Indonesia base their observations on the phases of the moon to decide upon activities such as planting agricultural and tree crops, clearing cultivation areas, hunting, etc. But with the changes in climate, these lunar signals may no longer coincide with the favourable times for these activities and the Punan may be misled in taking their decisions (Boedhihartono 2004).

Table 3.2 Innovative responses of the indigenous communities from Asia

Countries	Vulnerability and impact	Adaptive strategies
Vietnam	This country is impacted by typhoons, unpredictable weather, and the threat of saltwater intrusion from sea-level rise	Planting dense mangroves along the coast to diffuse tropical-storm waves
Bangladesh	Coastal peoples of Bangladesh dependent on livelihoods from fisheries and mangroves are expected to be one of the most heavily impacted by sea-level rise caused by climate change	The communities are creating floating vegetable gardens to protect their livelihoods from flooding Catkins are grown in sandy soil in Manikganj to prevent erosion and raised platforms – manchans – are constructed inside the houses as coping strategies against flood
Philippines	The indigenous communities of Ifugao in the Luzon province of Philippines have been fighting hard to preserve their rice – their staple and stable source of food – from the impacts of climate change	Based on the indigenous knowledge and skills of the Ifugaos, such as employing wooden spades, digging sticks and bare hands, rice terraces have been planned. Water management made their terrace construction work easier. Rice produced from the terraces was augmented by sweet potatoes and other vegetables In Matalom province, Kahun, a soil developing technique is practised for checking soil erosion caused by heavy rainfall
Nepal	Landslides and floods make the topsoil vulnerable to the impacts of climate change	In its mountainous regions, ploughing sloping land in a sword-like fashion to prevent soil erosion
Indonesia	Indonesia has the highest loss of forest area due to regular processes of deforestation and overgrazing. This creates an additional need for new land to compensate for loss of soil fertility, fires and drought caused by climate change	Indigenous people of Borneo in Indonesia will need to readapt their way of life to all these changes in their environment, and possibly also to the impacts of carbon sequestration projects

The Impact of Climate Change on Indigenous Communities in India

The United Nations Development Programme (UNDP) has warned that "Changes in average temperatures, rainfall patterns and monsoon timings will affect India's entire environment, especially the nation's water resources, sea-levels and bio-diversity, impacting a wide range of sectors, particularly agriculture". It is the poorest of the poor who will be severely affected. According to economist Nicholas Stern, ". . .in India people understand the rising water stress, and how vulnerable they are to melting glaciers and snows from the Himalayas, but this thinking has to go beyond to assess the other impacts as well, i.e. loss of traditional knowledge and the forced relocation of the indigenous communities".

Tackling Water Stress with Traditional Practices in India

Climate change will impact India first and foremost through its water resources, as the Indian monsoon, the country's lifeline, will be significantly affected by climate change, says a report released by the NGO Greenpeace.

There have been experiments to adapt crops in Andhra Pradesh, India, to grow under minimum water availability, as in traditional practices. Despite the adequate availability of soil moisture in command areas at an earlier time, crops are usually not grown in irrigation tank areas before the tanks are half full of water. Experimentation with early deep seedling and weeding in June demonstrated that under specific conditions, a crop can be grown with considerably less water. This is important during dry years when tanks and reservoirs are deficient in water. Experiments carried out during drought conditions showed that although yields per hectare decreased, the total yield in the command areas would increase by as much as 50% (Bergkamp et al. 2002). Crops are being adapted to the changing hydrological cycles.

The Zabo and Cheo-ozihi system in Nagaland is another indigenous technique for managing runoff water. The *zabo* (the word means "impounding runoff") system is practised in Nagaland in northeastern India. Also known as the *ruza* system, it combines water conservation with forestry and agriculture.

Villages such as Kikruma, where zabos are found even today, are located on a high ridge. Although drinking water is a major problem, the area receives high rainfall. The rain falls on a patch of protected forest on the hilltop; as the water runs off along the slope, it passes through various terraces. The water is collected in pond-like structures in the middle terraces; below are cattle yards, and towards the foot of the hill are paddy fields, where the run-off is ultimately collected.

The river Mezii flows along the Angami village of Kwigema in Nagaland. The riverwater is brought down by a long channel. Bamboo pipes are used to divert

the water through secondary branches of the main channel. One of the channels is named *Cheo-oziihi*. *Oziihi* means water and *Cheo* was the person responsible for the laying of this 8–10 km long channel with its numerous branches. This channel irrigates a large number of terraces in Kwigwema, and some terraces in the neighbouring village. There are three *khels* and the village water budget is divided among them.

Carbon Offsetting Techniques

Community-based forestry projects initiated by the World Bank in Andhra Pradesh and Orissa in India propose to mobilize and encourage small and marginal farmers to raise plantations of tree species with high rates of carbon sequestration in their farmlands. Besides capacity-building measures, this project will:

- Provide short-term financing to farmers from an upfront payment by the global BioCarbon Fund. Such mobilization of funds from the international bodies, such as the SBI wing of the UNFCCC, would be a welcome move towards GHG reductions.
- Involve local communities in the protection of plantations and generate additional income from carbon credits to farmers. Such a step promotes the participatory approach of the local people and should be considered while implementing REDD in developing countries.
- Develop forest sector strategies with a livelihood and conservation focus. The conservation of forests maintains them as the natural sinks of carbon and retains the rights of the natural custodians – the indigenous communities.

The Madhya Pradesh Lok Vaniki Initiative is another example of involving stakeholders in forest conservation. The M. P. Lok Vaniki Act 2001 (M. P. Act No. 10 of 2001) provides an opportunity for willing landholders to manage their own forests. The law encourages owners of private forests and other tree-clad areas to manage their natural resources on scientific lines, in order to maximize both economic and environmental returns. Chartered foresters help prepare management plans and silvicultural operation in these forests by training the landholders.

Community-managed forests exist in the Himalayan region, as well, which become an important carbon pool, as previously deforested areas in these forests are showing signs of regeneration. The mean carbon sequestration rate for community forests in India and Nepal is close to 2.79 t C ha^{-1} per year, or 10.23 t CO_2 ha^{-1} per year, under normal management conditions and after local people have extracted forest products to meet their sustenance needs.

Besides this, a study of "climate change vis-à-vis tribals" has been planned by the Indian government to find out the traditional mechanisms and methodologies applied by the tribals to cope with climate change and consolidate existing knowledge of tribals to adapt to climate change. This study will seek to identify bio-indicators

which could help tribals recognize and anticipate climate change and prepare them to cope better with the rapidly changing climate.

The historical role of indigenous and local communities in protecting biodiversity and ecological landscapes and processes through sustainable livelihood and sustenance activities and traditional knowledge systems has also been acknowledged by the civil societies of India in their environmental manifesto.

The ongoing efforts have a long way to go, however, as India will need to better manage these resources and reduce the burden that environmental degradation is imposing on the population, particularly on the most vulnerable groups – the indigenous communities. Right from compiling the data and information on these groups, efforts have to be made to integrate their needs in the mainstream development. India has initiated several coordinated climate research programmes to assess and understand the implications of climate change despite the fact that there are no binding commitments to reduce greenhouse gases. But it is more important to study the situation of the vulnerable groups – indigenous communities – and work on their adaptive strategies. There is an imminent need to strengthen the legal provisions (similar to the customary laws and land tenure rights for the indigenous communities facing the impact of climate change in the Philippines), work towards the development of appropriate responses, and implement the global mitigation measures only after monitoring their impact on the vulnerable indigenous communities.

Why There Is a Need To Have an Inclusive Approach in Climate Change Policy

The inclusion of indigenous peoples' voices in issues affecting them is important and relevant, as their right to participate in decision-making is confirmed in Agenda 21 of the Declaration on the Rights of Indigenous Peoples. Article 18 of the Declaration on the Rights of Indigenous Peoples states that "Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions". It is therefore time for them to get fully involved in all the ongoing debating issues on climate change.

The Economic Social Council report points out that indigenous peoples were not consulted in the creation of the United Nations Framework Convention on Climate Change or the negotiations on the Kyoto Protocol. In spite of this, the indigenous peoples of the Arctic carried out their own consultations with their hunters and with Western scientists, which shows their growing awareness about the impact of climate change on their lives.

One of the biggest challenges of climate change is how best to combine traditional and scientific knowledge for incorporation into decision-making processes. That most of their knowledge is not documented and peer-reviewed has been recognized in the Indigenous Peoples' Global Summit on Climate Change,

held in Anchorage, Alaska in 2009. With their willingness to start to document and express their findings in a way that is easier for scientists to use, these traditional offerings of indigenous communities can be taken up as serious research. It is being realized that "If mainstream scientists want to incorporate local knowledge and local impacts as they said they did, they have to move away from a strictly guided and formulated approach to what information is valid and what isn't . . . they have to meet some of these [indigenous] stakeholders halfway".

To further justify an inclusive approach in policy making, it can be argued that indigenous peoples interpret climate change in a far more subtle way than believed at present. Innovations will be crucial to adaptation and biodiversity conservation in the wake of climate change. Many communities are already practising innovative techniques using agricultural biodiversity and traditional practices, such as seed exchange and field experimentation, to adapt to climate change. Traditional knowledge is an inseparable part of indigenous culture, and their livelihoods and their local environment. With unprecedented climate changes, livelihood strategies come under increased stress as knowledge based on known indicators reveals the limitations of local coping strategies in the face of broader global processes.

In fact, local interpretations of climate change help people to make better sense of observed climate changes, but do not necessarily empower them to act. Local peoples' experiences and interpretations, as well as scientific research, indicate that climate change seldom acts in isolation, but interacts with other environmental and social factors. Interactions tremendously affect peoples' perceptions and adaptations to climate change.

Although scientific explanations for climatic changes have mainly concentrated on anthropogenic greenhouse gas emissions, the traditional farming practice of indigenous communities in fact brings about mitigation benefits. Their carbon-neutral techniques produce far fewer greenhouse gas emissions than modern intensive approaches that rely on mechanization, and inputs such as fertilizers and pesticides derived from fossil fuels.

Seldom do the media report on climate changes that impact the timing and outcome of agricultural activities, such as hunting, fishing and resource gathering. Scientific causal explanations of climate changes may be seen as removed and abstract for the local people. As a consequence, people may feel powerless and/or not responsible for combating climate change, despite their own vivid experiences of climate change impacts. This was seen to be the case with farmers in western Austria, who had many detailed observations of climate change, ranging from increased wind-felled trees, increased drought, and decreased snow cover, but whose information on climate change causes were largely based on the media and who did not see themselves as connected to the causes or their solutions. In contrast, where media play a limited role, interpretations are more closely dependent on people's own observations and local interpretations.

It needs to be determined whether development policies, while making full use of modern science, are also truly sustainable. This is in consonance with the Asia's Indigenous Peoples Summit on Climate Change in Bali, Indonesia, where one of the major recommendations was that "Scientific reports should include human and

social factors". In the context of indigenous communities, a presentation report on Malaysia highlighted the link between traditional knowledge and climate resilience, stating the fact that "Vulnerability is increased by loss of traditional knowledge and the space in which traditional knowledge lives". Citing the example of Padi knowledge, which deals with a particular strain of rice and its cultivation in Malaysia, recommendations were made for restoring and documenting the traditional knowledge of indigenous communities so as to form an intersection between this knowledge and the modern-day knowledge base.

The report of the International Council for Science (ICSU) working group details some of the many ways in which traditional knowledge and modern science can, and frequently do, work closely together. It points out that traditional knowledge has often played a role in the development of modern science, citing, for example, Linneaus's use of folk taxonomies in his development of biological classification systems. It also describes how, more recently, scientists have begun to work closely with indigenous communities to promote a synergistic effect in sustainable agriculture and ecological practice. Such work is likely to increase in importance during this century, because of the recognition that many environmental problems are local in nature and the fact that there is a growing need for the cooperation of traditional peoples in addressing global issues. This is supported by the findings of an IUCN report that in the Arctic, scientists and indigenous people work together and this opens doors to knowledge not accessible through western scientific methods.

Adaptation and Mitigation

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report published in early 2007 confirmed that global climate change is already happening. Since then, there has been a debate on adaptation versus mitigation in combating climate change.

The UNFCCC refers to adaptation in Article 2 and Article 4 (4.1(b,e,f), 4.8 and 4.9) and explicitly mentions the traditional coping strategies as one of the appropriate adaptive strategies.

> "There are many options and opportunities for countries to adapt, with adjustments and changes required at every level: community, national and international. Appropriate adaptation strategies involve a synergy of the correct assessment of current vulnerabilities to climate change impacts; use of appropriate technologies; and information on traditional coping practices, diversified livelihoods and current government and local interventions. Adaptation to climate change is a necessary strategy to complement climate change mitigation effects. Adaptation often produces benefits as well as forming a basis for coping with future climate change. However, experience demonstrates that there are constraints to achieving the full measure of potential adaptation".

Long-term adaptation to climate change requires anticipatory actions, which would require considerable investment of capital, labour, and time, which are the major challenges in the Asian region.

The IPCC's First Assessment Report warned that the greatest effect of climate change on society could be human migration, i.e. involuntary forms of displacement and relocation (OSCE 2005). This seems to point to population mobility as a less desirable form of adapting to climate change – a last-resort coping strategy when other adaptation possibilities are unavailable or have failed. In such situations, working towards the in situ adaptation would be a risk-proof and low-cost measure for the indigenous communities in the developing world.

Adaptation is the process whereby ecological, social or economic systems adjust in response to actual or expected climatic stimuli and their effects or impacts while mitigation is the process whereby GHGs emissions are reduced and the sinks of GHGs are enhanced. Strategies for mitigation and adaptation must take into account not only the ecological dimensions of climate change, but also the dimensions of human rights, equity, and environmental justice.

In this debate of adaptation versus mitigation, a "one size fits all" approach would not be a workable solution. Rather, making both the processes situation and nation-specific would better take care of the impact of climate change. For example in India, over a quarter of India's poorest people, many of whom are indigenous people, depend on forests for part of their livelihoods. However, almost half the country's forests have been degraded, and their average productivity is a third of their potential. A new World Bank report, "Unlocking Opportunities for Forest-Dependent People in India" by Grant Milne, suggests that if national and state-level reforms are introduced and forest productivity improved, the condition of indigenous communities can improve. Globally, many governments are increasing the rights of forest communities to use and manage forest resources. However, without adequate monitoring of the impact of REDD, its implementation might pose a constraint to the in situ adaptation of indigenous communities due to issues of tenure rights, access to resources and benefit sharing.

Indigenous practices, such as rotational farming, pastoralism, hunting and gathering, often use environmentally friendly, renewable and/or recyclable resources which contribute significantly to the mitigation of GHGs. There is ample evidence for the same. The Igorot of the Philippines, the Karen of China, Myanmar and Thailand, and the Achiks of India continue to practise traditional, rotational agriculture. This practice increases the overall health of forest and jungle ecosystems, which are critical to the mitigation of global warming. However, R. K. Pachauri, head of the IPCC has warned that very soon climate change impacts will exceed the adaptive capacities of local communities and that we need to have a strategy by which the adaptation has to be local, while mitigation has to be global.

The Stern Review, a report on the economics of adaptation has analysed possible measures to combat climate change and concluded that extensive adaptation strategies are of the highest priority and that the costs of preventing climate change are significantly lower than the projected costs of damage from climate change. However, the cost issue of adaptation has been challenged on various accounts. It is argued that for successful implementation of adaptive strategies, generation of funds is a major concern. To quote an example, it is estimated that the cost of relocating just one of the many Alaskan native villages threatened by flooding and

erosion worsened by climate change is as much as $400 million. Adaptation based on the traditional knowledge of communities at risk would be a better alternative in order to reduce their vulnerability to climate change. More specifically, the in situ adaptation, which entails strengthening the existing conditions for the indigenous communities in their habitat, would make them resilient to climate change impact.

A paper published early in 2009 by the International Institute for Environment and Development (IIED) warns that to be effective, policies must have greater input from local communities who are particularly vulnerable to climate change and have valuable local knowledge. Pro-poor, biodiversity-friendly ways to adapt to and mitigate climate change are clearly the way forward. "But for them to work, local communities must be involved in decisions about how biodiversity is used. Good governance and fair access to land and resources must be at the heart of these efforts but biodiversity is also key to adaptation to climate change, particularly as it enhances the resilience of farming systems and other ecosystems". For centuries, traditional farmers have used the diversity within both domesticated and wild species to adapt to changing conditions.

Carbon trading and carbon sequestration plantations are likely to create demand for land in the humid tropics of Asian countries. Employing multi-stakeholder processes in the implementation of policies such as REDD brings up challenges for the indigenous people, as well as allowing for the exploration of their potential in adaptation and mitigation measures.

Indigenous communities who are less integrated into the market economy and whose land rights are less clear or less easily defended in courts will rarely benefit from the payments flowing out from the forest management projects. In addition, avoided deforestation payments will probably flow to central or regional governments and not to forest-dwelling peoples. These payments may be linked to restrictions on forest use that deny development options to indigenous peoples. In this situation, it is anticipated that mitigation measures might run contrary to the adaptative measures or vice versa.

Recently, the UNDP estimated that the additional costs of adaptation in developing countries would be as high as $86 billion per year by 2015 (UNDP 2008). Likewise, the World Bank estimated that $10–40 billion per year would be necessary to adequately address adaptation needs, while the funds under the current climate regime are less than $200 million. Given the wide gap between requirements and supply, existing publicly available funds have to be utilized to finance adaptation projects. In addition to public funds, the role of the private sector (e.g. insurance) will be increasingly important. But there is divided opinion even on the funding mechanisms for addressing adaptation in developing countries. In addition, the mitigation and adaptation efforts to address the disproportionate impact on tribes are going to require considerable funding to put into effect. The cost of relocating just one of the many Alaska native villages threatened by flooding and erosion exacerbated by climate change is estimated to be as much as $400 million. Therefore, the effects of climate change on tribes will also have major legal and practical ramifications, of which policy makers must be aware.

Policy Issues and Gaps

Ever since the Intergovernmental Panel on Climate Change said that action must begin immediately to avoid irreversible damage, climate change has risen to the top of the global policy agenda. To stabilize the situation, the Panel has asked for drastic reductions in GHG emissions within the next 10–15 years. Article 3.1 of the United Nations Framework Convention on Climate Change, adopted in Rio in 1992, states "The Parties should protect the climate system for the benefit of present and future generations of humankind on the basis of equity and in accordance with their common but differentiated responsibilities and respective capacities. Accordingly, the Parties of developed countries should take the lead in combating climate change and the adverse effects thereof". However, there is a lack of accountability in the practising climate system and reducing emissions on the basis of equity as envisaged in Article 3.1 of the UNFCCC.

The reluctance of the developed countries to comply with the "polluter pays" principle from Kyoto to Bali to Poznan has so far created a status quo in climate change policy. This is a major concern for developing countries and especially their most vulnerable group – indigenous communities who have the smallest ecological footprints, and still carry the heavier burden of adjusting to climate change.

The adaptation versus mitigation debate has been another issue ever since the confirmation of global climate change by the Intergovernmental Report in 2007. There are still heated debates on the costs of adaptation, which will be very unevenly distributed around the world, with poor nations predicted to bear the brunt of climate change-related damages and costs. Indigenous communities and their plight are seldom mentioned in these discussions and climate change has yet to move up in the priority list of most of the developing countries. In Asia, it is considered purely an environmental rather than a developmental issue. Besides this, the importance of technology in Asia often outweighs the other factors, such as social and economic ones, and this approach often overlooks the needs of indigenous communities who are not to gain directly much with the CDM and low energy drive for mitigating the impact of GHGs emissions.

While these are issues at the policy formulation level, there are other major gaps at the policy implementation level as well. Policy at the national level often fails to attend to the particular local situation and the national goals do not reflect the reality of the local needs. This comes in the way of effective implementation of policy. Lack of information and adequate data on indigenous communities may pose a great challenge in monitoring the impact of REDD in forest areas. At the same time, implementing the Clean Development Mechanisms for reducing GHGs raises issues such as who will pay for technology development and technology transfer.

As outlined by the UNFCCC governments are supposed to:

- Gather and share information on greenhouse gas emissions, national policies and best practices

- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- Cooperate in preparing for adaptation to the impacts of climate change

However, there is a wide gap between what is on paper and what is practised in reality. The north and south divide over the emission reduction percentage blocks the way forward to adapting strategies especially required for developing countries, which are poor in resources. This goes against the spirit of cooperation and financial support as mentioned in the UNFCCC.

Recommendations and the Way Forward to Copenhagen

Based on all the case studies of indigenous communities in this paper, the following recommendations are suggested as a way forward to Copenhagen in December 2009. Overall, recommendations are general in nature with pick-and-choose mechanisms for the different developing nations. A good policy needs to be in tune with the reality at the local level. National policies are sometimes challenged by the conflict of interests in whole and in part, where "whole" represents the national success and "part" represents a particular sector or local entity. This clash of interests can be taken care of by upscaling good practice and downscaling good policy intentions for effective sustainable policy implementation. For example, the carbon-neutral techniques of the indigenous communities can be upscaled as a GHG-mitigating measure, while at the same time formulating pro communities REDD policy can be taken up as a top-down approach.

There is a need to shift the focus to the most vulnerable group – indigenous peoples – who are actually the primary actors within global climate change monitoring, adaptation, and innovation. Indigenous peoples must have a voice in policy formation and action in the same way they do in other relevant UN processes, such as the UN Permanent Forum on Indigenous Issues, the Convention on Biological Diversity, the World Intellectual Property Organization, the Human Rights Council and, to some extent, the United Nations Framework Convention on Climate Change, among others.

Technology-traditional knowledge platforms need to be created to facilitate the knowledge process in both ways. For instance, remote sensing data from NASA, for better understanding of land vegetation, can be combined with the traditional knowledge of indigenous communities through the use of a geographical information system (GIS).

All these discussions can be broadly covered under the following three headings:

1. Empowerment of indigenous communities
   - Promote land tenure and access rights to natural resources of indigenous communities

- Facilitate access to scientific information and technology for in situ adaptation
- Conservation of biodiversity in order to increase resilience and adaptive capacity of indigenous communities
- Sharing of expertise and resources between different groups of indigenous communities and capacity building and empowerment of indigenous peoples to deal with climate change
- Active involvement of indigenous communities in decision-making

2. Designing an inclusive policy approach

- To meet the challenge of "uncertainty" linked with climate change, inputs from all sectors under the impact of climate change
- Participatory agenda and responses to climate change at regional, national and local levels in terms of mitigation and adaptation
- Recognize indigenous and traditional peoples' own coping strategies to adapt and incorporate their perceptions into the climate change policy
- Encourage countries to adopt National Adaptation Programmes of Action (NAPAs) and ensure the integration of indigenous and traditional knowledge
- Include NGOs and civil societies in climate change projects

3. Monitoring the strategies

- Explore carbon offset strategies that indigenous peoples practise and for which they should be rewarded through payments and other means
- Maintain or enhance livelihood diversification for indigenous communities
- Address specific risk management strategies in areas where traditional and indigenous peoples live and where projected hazards will have the most serious impacts
- Create awareness of traditional adaptation and mitigation strategies such as sustainable carbon neutral and carbon negative livelihoods and expand knowledge of these practices
- Develop a virtual climate change centre and knowledge bank on traditional knowledge

Areas for Further Research

- Identify indigenous peoples living in the most vulnerable areas to climate change.
- Design situation-specific projects and community-oriented projects.
- Monitor the implications of mitigation efforts under international mechanisms, such as the REDD and CDM on ecosystems on which indigenous and traditional peoples' livelihoods depend.
- Collect and analyse information on past and current practical adaptation actions.

- Joint network of climate change researchers, ethnoecologists, and indigenous peoples.
- How to incorporate their knowledge in the development process of adaptation and mitigation strategies to climate change?
- Analyse the economic and social costs and benefits of adaptation measures.
- Explore options for funding for adaptation funds.
- Monitor the traditional and non-traditional adaptation measures and assess their impact.

Conclusion

From the documentation of a wide range of case studies it is evident that over the past, the indigenous communities around the world have adapted their livelihoods to a wide variety of climatic variations. They have immense potential to alleviate the adverse impacts. There is an urgent need to integrate their knowledge into mainstream policy. However, the climate experts feel that these adaptive strategies will be insufficient to cope with the future hazard level. In fact, the situation in Asia specifically is complicated by numerous interrelated social economic and political factors. Hence, it is essential to explore appropriate situations and nation-specific ways to enhance the resilience of indigenous communities and to reduce factors such as cost which come in the way of adapting strategies. In the Copenhagen negotiations in December 2009, summit participants are planning to formulate a declaration calling for world governments to include indigenous peoples as well.

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