



THE ARKLETON TRUST

PROGRAMME ON COMMUNITY PREPAREDNESS FOR - AND RESILIENCE IN COPING WITH - IMPACTS OF CLIMATE CHANGE AND NATURAL DISASTERS 2006-8.

BRIEFING PAPER FOR THE SEMINAR AT DOUNESIDE, ABERDEENSHIRE, NOVEMBER 4-8, 2007

John Bryden¹

1. Summary of the Key Findings of the Fellowship Reports

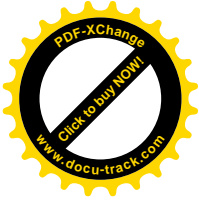
The following table seeks to summarise the main impacts and responses reported by the four Arkleton Trust Fellows supported by the Conyers Fund in their reports. More detail follows thereafter. I have added a few comments where appropriate. The reports show how varied and uneven are the responses from governments and communities in the five countries or regions studied. In many cases, the pace of climatic change appears to have increased, and the natural mechanisms of adaptation formerly present within the rural communities seem to be failing. However, there are also encouraging signs of local, NGO and in some cases government responses to grapple with impacts and increase capacities to respond at local levels.

	Impacts	Responses	Comments
N Finland & Russia	Shorter Ice Season, Melting permafrost, species changes, impacts on traditional livelihoods, transportation (ice roads). The speed of change appears faster than previous periods of climatic and environmental change. There are problems of maintaining or regenerating the culture, values and tools of resilience	As speed of change and loss of tools of resilience means that traditional culturally based education is seen as extremely important by the NGO Snowchange which works with the indigenous communities..	However, especially in Russia, there appears to be official resistance to such approaches
Bhutan	Increased rate of glacial ice melt. Problems of too much, too little, or too variable water including flash floods, drying up of springs, problems with	Main adaptation seems to be migration from mountain villages. Government has also given incentives to people to settle rather than to continue with slash-and-burn	Water problems (and maybe micro-climatic changes) are also associated with deforestation and water pollution, and its hard

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	transplanting paddy rice. threat from more Glacial lake outburst floods.	agriculture..	to separate the different influences. It remains unclear whether responses are aimed at adaptation to climate change, or if they are adaptation to other factors such as deforestation and lack of access to services
Rajasthan, India	Less rain, increased drought, increasing heat. Major impacts of drought include decline in groundwater levels, drinking and irrigation water scarcity, salinisation, reduced agricultural productivity and production, fodder scarcity and reduced food security.	Livestock farming especially cow, buffalo and bullock becoming increasingly problematic with reduced numbers and productivity. Installing more groundwater pumps but this further depletes the water table. Rural-Urban migration and abandonment of farms and land is a common result. However, cooperation among remaining communities remains strong.	Deforestation has also been a problem in this region, having climatic effects locally and also effects on groundwater.
Venezuelan Andes	Increased climatic variability, especially periods of intense rainfall and drought, with drought periods lasting longer and higher temperatures. Consequently, reduced water levels in streams and rivers during the dry season. Intense and prolonged drought impacts crops, especially, coffee trees. Irrigation becomes more important. Damage to roads and related problems of waste disposal.	Some coffee growers on high ground gain due to climatic change, those on low ground lose. Change to crops consuming less water and with shorter production cycle. Changing harvesting practices. More use of bananas as shade crop for coffee. Diversifying into livestock. Moving families from flood prone areas to higher ground. Introducing a rule that no houses should be built in flood prone areas. Community commitment to keeping areas of source water free of rubbish to avoid flooding. Construction of concrete canals and banks. Use of bamboos and 'vetvier' system to stabilize banks using edible grasses. Strengthening local response capacities including introduction of community councils throughout the country. Introducing an early alert system to warn of possible floods. Return to traditional organic farming techniques, and general increase in awareness and educational activities around environmental issues.	



2. Introduction

This briefing paper is based on the scoping study undertaken for the Trust in 2005, the subsequent Programme Document, and the reports of four Fellows who received a competitive grant from the Trust's Bernard Conyers Fund to undertake work with communities in their own country. The scoping study was undertaken by Kirsty Hay, University of Aberdeen, and the four Conyers Fellows produced reports as follows:-

1. Hilda Zara Montilla (Venezuela), Community Resilience And Preparedness In Coping With Impacts Of Climate Change And Natural Disasters. July 2007.
2. Ugyen Penjor (Bhutan), Study Of Climate Change And Impacts In Hill Villages In Bhutan. August 2007.
3. Motilal Dash (Rajasthan, India), Rural Community Strategies For Managing Economic And Social Impacts Of Climate Change, August 2007.
4. Tero Mustonen (Finland and Russia) Community based observations of ecological and weather related changes, and responses in settled and nomadic communities of Republic of Karelia and Niznikolyma Region, Republic of Sakha (Yakutia), Russian Federation and the Province of North Karelia, Eastern Finland. (September 2007).

The Trust's two-year programme cycle commenced with the scoping study, followed by a programme plan, and then the announcement and subsequent award of Fellowships. It will conclude with the three-day participatory seminar in November 2007, and the findings of the seminar will influence the next programme cycle in order to ensure follow-up and continuity. The Fellows, as well as experts and practitioners from around the world, will be taking part in this seminar. They will also be joined by two scholars who subsequently received a grant from the David Moore Fund, and one who received support from the John Higgs fund, to work on topics related to the impacts of Climate change.

The background paper is intended to help participants in the seminar by providing an overview and summary of some of the issues raised in the reports of the Fellows. It is not intended in any way to substitute for the reports themselves which will be presented by the Fellows at the Seminar (reports are available from the Trust prior to the seminar upon request). It is also based on the draft reports, and I have left all quotations verbatim 'warts and all' except where editing was absolutely necessary to clarify the meaning.

3. Background

Climate change, and the related influence of 'greenhouse gases' on 'global warming', has become a key international issue, especially since the Kyoto



Protocol agreement in 1997, and its eventual adoption in 2004. It has also been the subject of many Government and other reports and initiatives. However, Kyoto, like many other 'mitigation' efforts, has been seen by many as a 'top down' initiative, and one which focuses on the reduction of 'greenhouse gas' emissions by the richer countries, and international policy mechanisms to achieve this reduction.

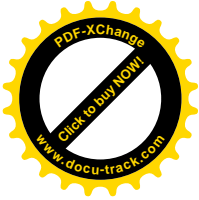
Whilst such objectives can only be good, they ignore the fact that global warming will continue even after the Kyoto targets are met and that it is at least partly a long term cycle of climate change. Rural (and urban) communities will be affected by consequential changes. Communities will be in the 'front line' in having to cope with such consequences, as many recent climate-related and other disasters made very clear. Many of the communities affected will be in the poorer countries of the world, and not a few will be the 'poorest of the poor' rural communities. Even in the richer countries, the capacities of rural communities to respond to the impacts may indeed be limited by historical and institutional factors.²

Measures adopted at national and international levels deal mainly with greenhouse gas emissions, as this is what 142 governments are bound to under the Kyoto protocol. In so far as there are measures directed at rural areas, these are largely directed at individual farmers. The literature review revealed rather few major policies, with associated funding, for the preparation of geographical communities, rural or urban, for the changes that are widely predicted by scientists.

Whilst it can be argued that climate change adaptation is recognized by Governments and large organizations, these are still concentrating their attention on agriculture and natural resource adaptation strategies rather than rural community strategies. For instance, the former President of the World Bank, Paul Wolfowitz, stated [World Bank, 2005] that climate change has emerged as a key concern for the World Bank and its clients in the 21st century. Sea level rise, warming temperatures, uncertain effects on forest and agricultural systems, and increased variability and volatility in weather patterns are expected to have a significant and disproportionate impact in the developing world, where the world's poor remain most susceptible to the potential damages and uncertainties inherent in a changing climate.

The Bank is increasingly incorporating these considerations into its development operations, advising clients on options, helping promote sectoral efficiency and clean energy alternatives, and assisting its clients in adapting to foreseeable impacts while seeking globally equitable responses to the challenge.

² See Bryden and Hart (2004) 'A New Approach to Rural Development in Europe' The Edwin Mellen Press.



"We have an opportunity today, to think outside the box and find new ways, practical solutions, to promote the generation and diffusion of low carbon technologies and the integration of climate concerns in development strategies. Let's work together for a climate friendly future."

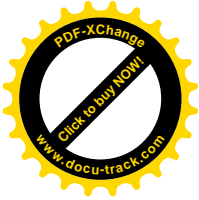
According to Hilary Benn, former Secretary for Development, United Kingdom, *"Climate change poses one of the greatest threats to the world today - and the impact is felt most by the poor. It risks undermining gains made in agriculture, health, and infrastructure. In other words, it risks eroding progress towards meeting the Millennium Development Goals (MDGs). We need concerted, collaborative action now to make sure that we start finding solutions and do not lock in the problem. And we must ensure that the poor, who are most vulnerable to climate change, are able to manage the risks."*

The eight Millennium Development Goals – which range from halving extreme poverty to halting the spread of HIV/AIDS and providing universal primary education, all by the target date of 2015 – form a blueprint agreed to by all the world's countries and leading development institutions. They claim to have galvanized unprecedented efforts to meet the needs of the worlds poorest. It could be argued that because the livelihoods and economies of poorer countries are still predominantly agriculturally based, this is the reasoning behind the current emphasis on agricultural adaptation strategies. Yet, this ignores the needs of richer countries where relative poverty still exists, and the difficulties that will face rural communities with diversified economies, as well as those rural communities in the poorer countries that are diversified.

Thus, although the Arkleton Trust scoping study revealed enlightened attitudes in Canada in particular, it is only in Samoa that 'adaptive capacity' has been defined from the start as *"the ability of a community to prepare for, and cope with or recover from, exposure to climate-related risks"*. In this case too, it is recognized that this 'ability' depends on a number of key factors which are independent of climate change *per se*.

Moreover, the impacts on rural communities of the 'top down' initiatives following Kyoto, and especially the systems of trading in 'carbon credits' of one kind or another, in some cases seem to be potentially harmful or even disastrous! Indeed, while the effects of climate change are probably ubiquitous, the impacts of the measures to reduce emissions seem to be particularly 'rural', and especially so in the poorest countries! At the very least, one can argue that this is largely 'unexplored territory' urgently needing attention.

There is no doubt that climate change also offers opportunities for at least some rural communities, as well as threats. For example, renewable energy resources are mainly located in rural areas. But unless the interests of rural communities



are considered, as for example they have in Denmark³, what appears as an opportunity may well turn out to be not only a threat but a truly exploitative type of development.

As Professor David Deutsch⁴ recently argued, we need to recognize the reality of climate change and the fact that it is leading to a greater incidence of natural disasters affecting rural communities in both rich and poor countries. Equally, there needs to be a shift from 'problem avoidance' to 'problem fixing'. It is the capacity to adapt and solve problems rapidly within communities that will increasingly matter for their livelihoods and hence survival.

The conclusion of the Arkleton Trust scoping study was therefore that much remains to be done to prepare rural communities globally both for climate change itself and for the impact of global measures to tackle climate change. The importance of rural communities learning from each other in these respects must be stressed.

It was on this basis that the Trust decided to develop a programme of activities and exchanges on 'community adaptation and preparedness for climate change and post-Kyoto mitigation measures' which emphasized both supported peer group learning and local capacity building. Thanks to the Conyers Fund which the Trust manages, we were able to invite applications for up to four small awards to enable people to work with rural communities in very different rural environments on issues of preparedness and resilience. In addition, the David Moor Fund, also managed by the Trust, was later able to offer two further scholarships, and the John Higgs Fund named after the founder of the Trust was able to offer a seventh. What follows is a synthesis of the issues identified in the four Conyers Fellowship reports.

Before starting, it is worth reminding readers of the hugely varied contexts in which this work has been undertaken. The deserts of Rajasthan are a far cry from the tundra, taiga and melting permafrost of northern Russia and Finland.

³ Danish wind power initiatives started with individual investors organised in local turbine guilds, establishing small-scale community owned wind power systems. Companies emerged based on individual experimentation and development, strongly rooted in these local networks and also motivated socially and politically by opposition to a proposed large-scale nuclear energy strategy. It represented a decentralised, small scale, and environmentally-based alternative. The cooperative movement and numerous local windmill cooperatives provided a market for windmill development and also secured sites for windmills typically in the vicinity of their place of living. Wind power then became the keystone of Danish energy policy and very ambitious CO2 reduction obligations. **Source: Atle Midttun and Anne Louise Koefoed Green Innovation in Nordic Energy Industry: Dynamic Patterns and Institutional Trajectories: Paper for the Conference: Innovation in Europe: Dynamics, Institutions and Values" Roskilde University, Denmark, 8th -9th May, 2003**

⁴ David Deutsch is a Professor of Physics at Oxford University, who recently won the \$100,000 prize funded by Jeffrey Epstein for his work on quantum computers. Here we are referring to his article on 'A DIY guide to saving Planet Earth' which appeared in The Daily Telegraph on Tuesday November 29, 2005.



The Mountain and Hill villages of Bhutan and the rural villages of Venezuela are very different from each other, and from the other two. The economic and social conditions, production possibilities, environment, institutions, and indeed development goals are widely varied. These differences provide us with a rich tapestry of cases to examine, but care is needed in making comparisons and in seeking to generalize!

It is also worth reflecting on the definitions of some of the terms used in this programme, and especially concepts of 'vulnerability' and 'resilience' as applied to communities. Community vulnerability can be due to several factors including poverty, ill health, age structures; dependence on government, landlords or single industries or employers; poor communications; social or religious divisions; disempowerment and lack of autonomous institutions at local level, to name but a few. The closely related issue of resilience is also related to many of these things, and also to the ability to mobilize, which is also be affected by local government powers, revenues and autonomy. Although not all these issues are considered by her, I have chosen to draw on Hilda's excellent literature review for this section.

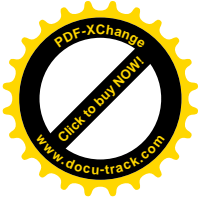
4. Vulnerability and Resilience (From Hilda Zara's Report)

Climate change and its impacts are now being observed and experienced, first hand, throughout the world and in many different ways (Tompkins and Adger, 2003). The disasters taking place today related to climate change are evidence of the adverse future impact that it may have and the urgent need for reducing vulnerabilities in some communities (IISD, 2003).

Poor communities within urban and rural areas are already vulnerable to the risks associated with climate change. A strong dependence on the ecosystem may jeopardize their well being and survival due to environmental conditions. As natural resources are less available and quality drops, owing to natural and human pressure, so do guarantees and the viability of life. In this regard, climate change threatens to increase imbalances in community development and increase existing vulnerabilities.

Social vulnerability, in this case, is about the tendency of human groups or individuals to suffer the damages resulting from exposure to the effects of certain environmental stresses. Stress affects the life style of groups or individuals, and implies an imposed adjustment to physical changes in the environment (Adger, 2000).

The concept of vulnerability is clearly related to other important factors of the relation between society and environment, specifically, under circumstances where individuals and social groups adapt and respond to environmental changes: social resilience.



For Resilience Alliance, resilience is:

“The ability to absorb disturbances, to be changed and then to re-organize maintaining its identity (retain the same basic structure and ways of functioning). It includes the ability to learn from the disturbance.”

Resilience in social systems includes the additional capacity of humans' anticipation and planning for the future. Resilience, as applied to integrated systems of people and the natural environment, is a measure of the following three defining characteristics:

1. The amount of change the system can undergo and still retain control on function and structure.
2. The degree to which the system is capable of self organizing.
3. The community's ability to build and increase its capacity to learn.

Additionally, the Community Resilience Project Team (2000) has developed a model in which a resilient community is one that takes intended action to enhance the personal and collective capacity of its citizens and institutions to respond to and influence the course of social and economic change.

Conceptually, and based on experience, they establish four core components of a community's social and economic structure:

People: residents' beliefs, attitudes and behavior in matters of leadership, initiative, education, pride, co-operation, self reliance and participation.

Organizations: the scope, nature and level of collaboration within local organizations, institutions, and groups, as well as their financial capacity and decision-making autonomy.

Resources: The extent to which the community builds on local resources to achieve its goals, while drawing on external resources strategically.

Community Process: The nature and extent of community economic development planning, participation and action (CCE, 2000)

In a resilient system, change has the potential to create opportunity for development, novelty and innovation. Resilience is essential in order to increase the ability of a socio-ecological system to cope with new situations and keep future options, that is, its capacity to adapt (Folke, Carpenter et al. 2002).



Within social systems, this capacity is linked to the existence of institutions and networks that learn from and safeguard knowledge derived from experience; institutions that can reinforce flexibility in problem solving and balance power among interest groups (Scheffer et al. 2000, Berkes et al 2002).

Vulnerability is the flip side of resilience: when a system loses resilience it becomes vulnerable to change it could have previously absorbed (Kasperson and Kasperson 2001a). In a vulnerable system, even small changes may be devastating.

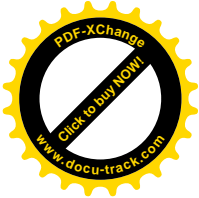
The concept of resilience implies a change in policies from those who expect to control change in systems based on their stability, to manage the adapting capacity of socio-ecological systems and forge change. This tendency increases the possibility of sustainable development in changing environments in which the future is predictable and surprising (Levin et al. 1998, Holling 2001).

From this perspective, new research initiatives are, today, looking into the issue of vulnerabilities owing to climate change and the community's ability to adapt in light of increasing critical events such as rising global temperatures.

Several approaches consider vulnerability related to climate change. Consequently, vulnerability can be understood as final stage, that is to say, as the resulting condition when exposure related factors and the systems' capacities are at play. This approach corresponds to an impact assessment usually with a top to bottom methodology. The issue is first tackled with an impact prediction and, subsequently, assumptions or estimations are made on the human systems' capacity to adapt to such climate changes.

By contrast, a different approach perceives vulnerability as a starting point, which favors the "bottom-up" evaluation of impact. In this manner, the goal is to identify what the system is exposed to and its existing capacities to handle change. Even though predicting is an important aspect, research is focused on considering relevant community variables.

To this end, work begins with an interest system and, for example, exploring the climatic aspects that matter to the community, how does the community handle stressful events, how do individuals face up to their day to day activities. This can provide a vulnerability estimate in the community specially by assigning relevance to the perceptions and experiences of the groups evaluated (C-CIARN, 2004).



5. Finland and Russia: The Evidence of Climate Change and Impacts from the case studies [all quotes from Tero Mustonen's report]

The impacts of climate change in the Arctic region include a shorter ice season and weaker ice, with implications for the ice-fishing industry, vehicle transport (ice roads), permafrost melting and related road and transport problems and disappearance of lakes (fishing consequences). Arctic communities have been highly adaptable in the past, but problems today seem to be due to the speed of change and the problems of maintaining or regenerating the culture, values and tools of resilience. For this reason, traditional culturally based education is seen as extremely important by the NGO Snowchange which works with the indigenous communities. However, there appears to be official resistance to such approaches, especially in Russia.

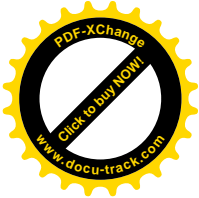
Finland, North Karelia Province

“As well due to the specific climate conditions which are an interplay between the North Atlantic Low and West Siberian High Pressures, Finland and Fennoscandia have only recently received extreme and unstable winter conditions. Season 2006-2007 represents the most significant change in winter conditions. It was the warmest winter on record. No lake ice or snow cover existed in Karelia before the end of January. This had significant impacts on subsistence economies and the general public as well.”

“In general the people reported that the weather has become more warm and unstable. Esa Rahunen commented that there used to be longer cold spells, but now in the space of 24 hours the weather can shift from below freezing (25 below) to above freezing. Changes are more violent now. Seasonal weather is not stable. Summer 2006 was the warmest in 150 years according to Rahunen. Markku Tervonen reports that winds have increased significantly according to the elders... Pentti Pöllänen, one of the old fishermen in the community, confirms this... Ice conditions have been fluctuating in the past as well, but the winter 2006-2007 was the warmest on record. No lake ice arrived before end of January 2007. This cut the fishing season in half, causing economic impacts to the fishermen... the ice breakup is earlier than usual now. The fishing season ended early ... in early April. This also prevented the Snowchange school childrens' day from taking place.”

Russia, White Sea Karelia, N-W Russia

“ During the visit subsistence fishermen, hunters and community leaders such as Santeri Lesonen were met and the climate and traditional knowledge discussed. Main scientific interviews focused on the community of Paanajärvi, where the members of the hunting family Dementyiev were interviewed (Risto and Teppo). Both men are retired and have been engaged in subsistence



activities in the taiga boreal forest all their lives (mainly fishing and hunting). They shared base line data on current observations of unusually warm winter spells, during which the weather can shift from minus 20 degrees Celsius to plus degrees in the coldest months of the winter. Additional winds and warming especially in November-December had been reported for the 2005-2006 season.

“The White Sea Karelian community people have witnessed rapid and new climate conditions that are important to the communities due to the impacts they cause – many of the places are located far away from centres of administration and are dependent on ice roads and subsistence activities which are crucial for the survival in post-Soviet Russia.”

Russia North, Republic of Sakha-Yakutia

“The Nizhnikolymsky region lies in the Russia Arctic in the far northeast of the Sakha Republic. Splintered by the great Kolyma River and its tributaries, it covers 87,100 square kilometers, but its population is only around 5,600 people. It is, in fact, one of the most remote regions on earth. The only roads in the area are made of ice, and most supplies are transported by river and air. Outside the main settlements, the region is tundra and woodland, and home to an abundance of wildlife. It’s also home to many different indigenous peoples, including Dolgans, Evenk, Even, Yukagir, Chukchi and Nenets. The main economies are traditional reindeer herding, hunting and fishing.”

Impacts of climate change here include the melting of the continuous permafrost, and snow and other weather changes, with adverse consequences for transportation and subsistence/ livelihood activities.

“Numerous Indigenous community representatives reported this disturbing observation. Aljora, a local site of fishing activity, has had several lakes disappear, as the permafrost has melted and the water has drained out. This phenomenon has begun in the past ten years according to the community representatives...”

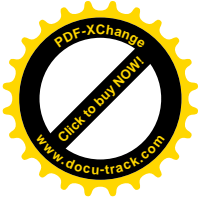
- “River Tšukotšja has many new bushes growing rapidly. Weather is warmer and permafrost has melted. The River Kolyma is eroding fast, the banks of the river are collapsing, and the river is wider than before.”

- “Changes have taken place on the permafrost. Many lakes have disappeared in the past ten years both in the taiga and tundra zones. We can see this happening in front of our eyes. It is warmer than before. This has impacts on fishing and reindeer herding. One lake disappeared so that the fish in the lake died completely. New holes on the ground have appeared – collapsed zones. We do not move any more so much on the marsh lands.”

“ Snowfall, the times of freeze up and melting have shifted according to the participants in the communities.”

- “This year (2005) there is more snow fall than I have ever seen in my life.”...

- “We watch the weather and notice changes. Lakes are flooding the banks.



Small rivers become larger. On grazing grounds, I come across unknown plants. There are many dwarf willows growing on the tundra. We use them for bonfires. When I was a kid we had to search hard for the willows. Today, I don't need to look hard at all. New fish species can be observed in the Kolyma River. Marine species are showing up. We used to migrate north slowly to reach the sea. Now we reach it very fast because of the mosquitoes that bother the reindeer. We observe new streams and very little ice on the sea. We are observing lots of single polar bears wandering along the shore. Four cyclones in the fall and lots of snow. Very difficult to ensure enough food for the reindeer.”

“In Andrejuskino, local community leaders voiced their concern about the flooding that has impacted their community. Andrejuskino depends on ice roads for medical services, supplies and other crucial humanitarian services; it is 12 to 18 hours away from Cherskiy by car. The thinner river and lake ice, as well as the unpredictable and swift changes in winter conditions, are impacting community life, they say.”

Community preparedness in Finland and Russia

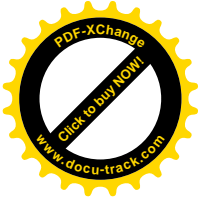
Mustonen concludes that *“communities are aware of the changes that are taking place using their own knowledge systems. They have as well reflective materials from time immemorial – due to the deep, even spiritual connections to the surrounding ecosystems the northern communities understand that by preserving the core elements of their knowledge, which always mean life on the land, on the ice and on the tundra, they can survive the man-made catastrophe of climate change which has been imposed on them”*

Some Community Responses in Finland & Russia

Mustonen and his organization Snowchange are focusing on the re-empowerment of the indigenous communities in Russia through the nomadic schools, which teach indigenous knowledge and culture. In this way they hope to raise the capacities to adapt to change in ways that are consistent with the age-old adaptation practices of the nomads. In addition, they hope to break the cycle of colonization which has suppressed the indigenous language, culture and values and thus disempowered the nomadic (and other) communities.

In Finnish Karelia, the establishment of the Snowchange cooperative as a non-profit educational, scientific and environmental organization dealing with climate change and working with similar groups across the circumpolar region represents a significant advance.

In Russian Karelia, the revitalization project of the Viena Karelian villages, resettling former inhabitants or their descendants on the often abandoned villages and reintroducing traditional farming and other techniques is mentioned.



Nevertheless, in the case of northern Russia, Mustonen point to contrary forces, such as the proposal the charge rent on traditional nomadic hunting, fishing and forest regions

6. Evidence on Climate Change, Impacts and Responses from Bhutan [Ugyen Penjor: all quotes are from his report]

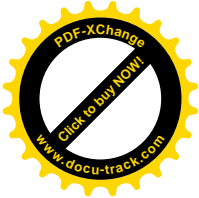
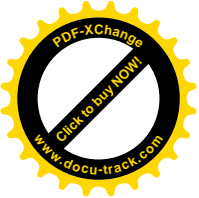
Ugyen's study looked at the general situation in Bhutan as well as undertaking case studies in four very different rural communities, two in western Bhutan, one in the south and one in the centre.

Reliable climatic (temperature, rainfall) are only available in Bhutan for the last decade, a short period over which to assess changes.

"To see whether there is climate change, meteorological data recordings for more than a decade at these places or near these places were analyzed. Three components of the weather -temperature, precipitation and humidity were analyzed for the study. After the analysis it was found out that there is no change from 1996 to 2000, it has remained almost stable. But from 2000 to 2005 there is a slight increase in the temperature every year. In terms of rain fall 2002 received the maximum rainfall and has decreased since then."

Nevertheless, about 10% of Bhutan is covered by Glaciers, and there is evidence that the rate of retreat of the Raphsthreng glacier has increased from 35m per annum from 1984-98 to 60m per annum from 1998-2003 [ICMOD report, cited by Penjor]. According to Penjor, *"People see some change in weather pattern every year, through the heat they experience, the change in the species, flash floods they get with rain. But, due to their superstitious nature, they associate and attribute the changes to negative actions on the part of the residents. They conduct rituals to appease the local deities as the solution. In one village for example, years ago a huge landslide occurred in the area wiping out a couple's farmland. The villages blamed the occurrence on the deity of a lake above the village. So to make him happy again they perform rituals."*

Although awareness of climate change is considered to be "minimal", respondents agreed that temperatures had *"risen over the years and that it has become warmer. Some even agree that the rainfall pattern has also changed. From more than fifty respondents in these four villages, climate change and awareness is minimal."* However *"Respondents consider deforestation to be the main cause of the fall in water resources"*. It is well known that deforestation has macro- and micro-climatic impacts, and so it is surely understandable if people are unsure about the causes. According to the study, it is caused by, variously, increased demands of livestock on grazing resources, domestic needs for fuel and cooking, and construction needs for housing.



Impacts in Bhutan

The key issue for Bhutan is water, which accounts directly for 30% of income (through hydro-power) and indirectly for much of the agriculture (which accounts for 32% of income), and of course always to the general welfare of people⁵. Although piped water is now available to some 69,000 households in Bhutan, over “17,553 households depend on springs and river for daily water use ... 112 on rainwater .. (and) more than 240 on tubewells..” It seems that the demand for piped water arose from water pollution rather than shortages, at least initially.

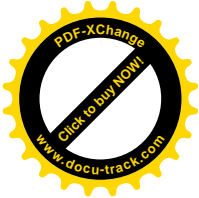
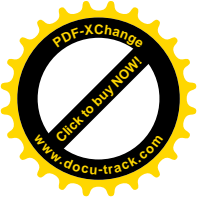
Water-related problems in the mountain areas are cited as one of the causes of migration to the cities and plains. However, we note that in the Lanfthil community at 1300m above sea level, “people have to walk more than 10 km to avail basic services like schooling and health and other government extension services”. Outward migration leads to population and social decline, and some land abandonment. The problems of too much, too little, and too variable water include flash floods, drying up of springs, problems with transplanting paddy rice. A recent study by ICMOD has also identified a threat from more Glacial lake outburst floods.

“Climate change is a new topic for most of the rural people in Bhutan. They are more or less ignorant of what climate change is. They feel that there has been some change in the climate but given their superstitious nature, they are more likely to blame a wrathful local deity who has not been sufficiently placated by the villagers. They will call on the central monastic body to conduct elaborate rituals to pray for timely and abundant rain.

“They may admit seeing other species of plants and animals in their surroundings but may not see them as the consequence of climate change. In some cases, farmers reported seeing new weeds or hearing the sound of strange birds. They have reported the disappearance of certain bird and animal species.

“2007 has been described by most farmers in the country as the driest season. Farmers in low lying valleys paddy is cultivated as the staple crop could not carry out the paddy transplantation on time due to the late and scanty monsoon. It was followed by a long dry spell. In many places, farmers had to leave their paddy fields fallow and watch helplessly as the paddy they had managed to transplant began to wither under the scorching sun. Assured sources of water like streams began to dry. This year too, the Monsoon rains arrived late but when it did arrive, there was plenty of water for everybody. In fact in the southern, the deluge even caused floods submerging crops and causing extensive damage. A farmer in Paro said the rain has become less reliable and scanty over the years. He recalled seeing the black necked cranes in his paddy fields as a small boy. The

⁵ Bhutan is the only country in the world to have a development objective which seeks to maximise ‘Gross national happiness’.



endangered cranes have now changed their winter roosting place in Bhutan. They now roost in another western district about 60 kilometers as the crow flies from Paro.

“Elderly people in their 60s to 70s recollected playing in knee deep snowfall in Paro in March as children. Paro and other neighboring districts haven’t seen snow for several years now. Looking at the data collected by two stations in Paro, there was no snowfall in 1996...”

Responses

The main adaptation appears to migrate (all year, or seasonally) to the plains or city. The government has also given incentives (land grants) to people to settle rather than to continue with slash-and-burn agriculture which is considered to be bad for the environment. But it remains unclear whether responses are aimed at adaptation to climate change, or if they are adaptation to other factors such as deforestation and lack of access to services.

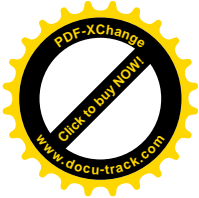
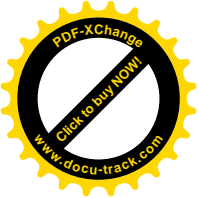
7. Rural Community Strategies for Managing the Economic and Social Impacts of Climate Change in Rajasthan, India [Quotes from the report by Motilal Dash]

Rajasthan is the largest of India’s 28 States and seven Union Territories. It contains about 85% of the 2.34 million km of Indian ‘Thar’, or great hot desert, the remainder being in Pakistan. The desert covers about 61% of the geographical area of the state and it is “*characterized by high velocity wind, huge shifting and rolling sand dunes; high diurnal variation of temperature; scarce rainfall; intense solar radiation and high rate of evaporation*”. Although accounting for a tenth of the area of India, it contains only 5% of the total population, and a mere 1% its water resources. The temperature ranges from sub-zero in winter to more than 50 °C in summer. Annual rainfall is very low, of the order of 450 to 600 mm, and the ground water is as deep as 200 feet (60 m). Almost half of the state is affected by drought in every 3 to 4 years. Access to irrigation is patchy. Groundwater is the main source of water for irrigation and domestic consumption, and much attention is paid to water harvesting and groundwater recharge. There are increasing concerns about groundwater deficits.

The evidence on the incidence of drought is perhaps not very clear, but the report states that

“the following risks are highly associated with drought:

- *Depletion in water resources for agriculture and drinking: women walk 1-2 kms to fetch water*
- *Reduction in crop yields and change in cropping pattern*



- *Dwindling fodder stock and declining income of farmers lead to cattle selling; esp. marginal and small farmers who sell at depressed prices*
- *Increased incidences of debt*
- *Decline in nutrition and health status: malnutrition strikes Mahboobnagar in AP (especially among children and women) whenever drought occurs”*

In addition there is evidence that over-exploitation of forest for fuel wood, and overuse of land for fodder production for animals has led to further desertification, and hence a vicious cycle. Abandonment of farms and land, and migration to cities is frequently observed and debated in the State.

To investigate the impacts of - and responses to - climate-related changes, Motilal undertook a pilot study in two rural districts of Rajasthan – Barmer and Churu. About 100 families were interviewed in each district, and NGOs assisted with rapport building.

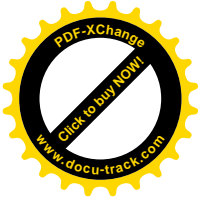
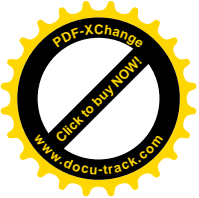
Climate change impacts

“People in these regions are aware about climate change (and) ... they have been trying their level best to cope with the changing climate conditions ... the people are terming “less rain” or “drought” as the major consequences of climate change ... they also correlate the “increasing heat” as another consequence of drought. The major impacts of drought include decline in groundwater levels, drinking and irrigation water scarcity, reduced agricultural productivity and production, fodder scarcity and reduced food security.”

Adaptative strategies.

Local communities in these areas have traditional ways of coping with droughts. Understanding such traditional coping measures including those related to livelihood strategies and innovation is important.

“The respondents opined that droughts are causing both short-term livelihood problems and also long-term development activities. Recent increase in the number of severe droughts, desertification, and salinisation has made the conditions even worse. Besides agriculture, keeping goat and sheep provide a strong supplementary income for people in these regions. Goat and sheep don’t need any additional fodder; they graze on grass and eat leaves of small shrubs in this region. But cattle [cow, bullock and buffalo] are becoming liabilities for the rural communities during drought. The respondents said that in their grandparents’ generations, there were huge numbers of cattle, buffaloes, horses in their families. There were sufficient grazing fields too in the villages/locality. But, due to less rain and increasing heat, these animals are not surviving. Milch cows are not giving proper quantity of milk as fodder is not available. Grazing lands are becoming dry lands and farmers are encroaching day by day. The only



domestic animals available these days are goats and sheep. Very few families in the village have camels as they are very expensive to maintain.”

“During drought years, the state government is trying to make the food distribution system more effective and to make the water supply (tanker, constructing new wells, overhead tanks, etc.) more frequent, but the requirement/demand is too high and hence the individual family has to make their own arrangements (as well)...(Although) there are many employment generation programs presently run by the government the benefits are going to those who are having political nexus and contact with the higher ups. It’s not that easy to avail government aid for a common man. The villagers feel that water distribution programmes should be implemented more seriously and in a planned ... manner, when rainfall pattern has become increasingly uneven.”

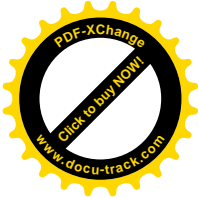
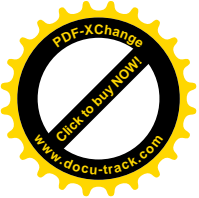
“While asking them about solving the acute water crisis – both for drinking and irrigation - they strongly feel that deepening well, construction of new water tanks with government intervention is highly needed. But as the problem is perennial and will last for decades, they feel that small check dams, artificial recharge of ground water, etc. are a must. At the same time, the respondents were of the opinion that ministry should provide and promote drought resistant seeds, breeds demanding less water consumption, etc.. In addition, promotion of cash cropping in these regions will reduce the out-migration drastically as people will get opportunity to earn locally.”

“Besides agriculture, the respondents also feel that in the long run, provision of free and professional education should be promoted so as to engage the new generation in formal jobs. They will get economic face lift and can earn more.”

“Against all odds, people are leading a very cooperative life in this region. Interpersonal relations are very highly integrated and they exchange goods and services among themselves as they all are under the same umbrella and struggling for survival in these regions. People want the NGOs, government and others to do something to improve their quality of life. At present they feel that there has not been any planned adaptation strategies undertaken by anybody at any level. They are surviving with their own traditional ways of adapting to nature and climate change. They strongly feel the need of government and voluntary sectors’ involvement and implementation is highly solicited.”

Conclusion

In Rajasthan, drought and other water-temperature related issues are causing rural hardship, loss of livelihoods, and rural-urban migration. Although there are adaptations by individuals and communities, the role of the State and Government in relation to water management and education is emphasised.



8. Venezuela: Community resilience and preparedness in coping with impacts of climate change and natural disasters [Quotes from the report by Hilda Zara Montilla]

The study was undertaken in the rural community of El Guayabalin the Mocotíes River valley, which is located in the Mérida ranges of the Venezuelan Andes. Local livelihoods depend largely on agriculture and livestock especially coffee growing and green banana crops, citric fruits, corn, poultry and pigs, although many young adults currently work in nearby towns in third sector activities.

"In the main, climate changes perceived by members of the community of El Guayabal refer to periods of intense rainfall and drought, in recent years... recently, drought periods last longer and temperatures have risen significantly. Consequently, streams and rivers have experienced a reduction in water levels. In fact, the community members report a reduction in water levels each year, during the dry season. Earlier on, rainfall was experienced in the zone, even during the dry season; which was a positive aspect for crops."

"Intense and prolong drought impacts crops, especially, coffee trees. "Now, the bean becomes ripe when it is still very small, during the dry season." "If you don't have an irrigation system, the crop just doesn't make it." "Those who don't have an irrigation system are at risk of losing their crop."

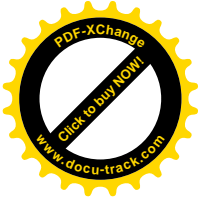
"... During the rainy season, continuous rain is experienced for days. This means a sudden increase in stream water levels, as well as occasional landslides... This was the case during the floods of 2005. After days of continuous rainfall during an unexpected time of the year, landslides did away with houses and other infrastructure."

"These cycles of intense rainfall and droughts generate conditions for pest reproduction and fungus such as the Monilia, in cacao crops and coffee pests."

"An important aspect made explicit by people, one which has created restlessness especially among those who directly work with the land, refers to how they are less likely to be able to predict the weather, the rainy or dry seasons: "You can't trust the weather anymore, not like you use to. Before, we would plant the seeds in August and September because it was dry season; and November and December was rainy season. That can't be done, now. November was summer, October was summer."

Decreasing Resilience

"The community believes climate change is mainly related to environmental damage and pollution ... (due to) to United State's oil consumption."



However, some community members *“relate such changes to the negative effects caused by “damage” done to the community’s environment. They reported “harmful ways” which the community itself identifies as dangerous to the integrity and strength of the ecosystem... (such as) indiscriminate forest fires and tree felling.”*

Waste management is another problem for the community. *“As a result of the floods, the access road is restricted to 4x4 vehicles. Because of this, the community has only three ways to dispose of organic waste: carry the waste themselves for 40 minutes to where vehicles may have access, burn the waste or throw them in the ravine... the community fears that burning waste may have a direct negative impact on families and the environment. They also believe it to be risky, to throw waste into the ravine since it is highly polluting and because they, again, might end up with the same flood results, when natural water ways were blocked.”*

Response to climate change effects

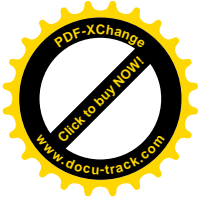
The report identifies immediate or short run effects, and longer term effects and responses... *“Even though, at the time of the flood, immediate actions were taken by individuals and the community in order to deal with the emergency situation, this study focuses on the responses given on a short-term basis and the projections made into the future, in terms of preventing negative impacts in light of climate change.”*

Immediate responses tend to be individual in character and depend on the impact these changes have on the productive activity carried out by the individual. These impacts are uneven – there are losers, such as farmers on the lower slopes, and gainers such as coffee growers on higher land who *“reported that the activity is now less complicated because temperatures which were usually low have now risen, which makes it easier for them to harvest the coffee beans. In this case, recent changes in weather have become an opportunity in terms of their immediate production capacity.”*

“One answer to unexpected climate changes has been crop changing. In some cases, the tendency is changing to less water consuming crops. In addition, farmers have begun to harvest crops with a shorter production cycle than coffee, for instance, which gives them greater flexibility when deciding when to plant, and considering climate variations.”

“When possible for the producer, because of land extension or because she has the support of family members, they move to higher lands where the temperature is lower than lands in nearby villages.”

“Those keeping coffee crops have changed some of their harvesting practices in order to diminish negative effects, especially during the dry season or droughts.”



For instance, we were able to observe that banana plants, which provide shade and prevent fast water evaporation, can now be found near coffee crops. “Before, during the times of chemicals, experts would tell us that it was best to remove the trees; that the coffee plant should be out in the open. Now, with the drought, we must provide shade, instead.”

“One other response deals with changing from agricultural products to livestock. In some cases, farmers, as an alternative, are beginning to raise pork and poultry in light of the difficulties in crop growing and water management. In this case, tending to diverse productive activities reduces the negative impact of climate change.”

Responses with long term implications

“The first action taken in response to the disaster of 2005 was the mobilization of families exposed to the river’s high water levels to move to safer grounds. In order to do this, the families lend their co-operation, as well as the rest of the community, state institutions and other private entities. Some families were even lodged by neighbors for the time it took government to provide safe housing.

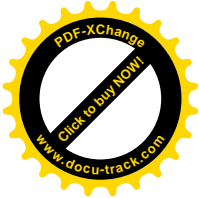
Nowadays the community has a rule that no houses are built in vulnerable areas closest to sources of ravines and rivers. In addition, the communities have committed themselves to keep the areas of source waters and tributaries clean to prevent blockages and overflow.

The Ministry of Environment, Ministry of Infrastructure and the Mayor’s Office also constructed concrete channels and retaining walls for the ravine and its tributaries, which overflowed with consequent damage in the 2005 floods.

“Recently, a proposal was made under the name of Early Alert System. It is a local proposal introduced initially by a member of the community of El Guayabal (Marilúz Chacón), which has gained the support of national and international organizations”.

“Other protection factors generated by the community include the use of bamboo trees alongside the El Guayabal ravine and the use of the Vetiver system, as a natural way to stabilize slopes ... The bamboo trees were planted by zone students alongside the El Guyabal ravine, as a means of reducing landslides owing to an increase in water levels. With a simple technique, hundreds of trees were planted among rocky sediments left after the flood. The plants grew rapidly and the roots formed a net which stops the soil near the river from loosening.”

“The Vetiver system works with a plant, similar to grass, but edible for animals. It was planted in steep slopes near houses and social areas and it is a natural and very low cost way of stabilizing the areas. The roots of these plants can extend to a depth of up to eight meters and thus work as a highly effective retaining wall. “



“... at the time this study was being completed, the organized communities of La Cascada of El Guayabal and the villages La Primavera I y II were designing, at their own initiative, an irrigation system which takes water by recycled cable cars from a nearby source to the producers’ lands.”

Increasing community capacities and diminishing vulnerabilities

A series of events have also occurred within the community aiming at strengthening response capacities in adverse situations. *“Local initiatives which have made the ecosystem and the community more resilient are included.”*

The Government is currently creating Community Councils across the country. *“These councils comprise members of a community. That is, families or citizens which inhabit a determined geographical area, share the same background, interests, use the same services and share similar needs and potential. The most important aspect is that the concept refers to people which relate to each other on a daily basis, consider themselves part of the community and voluntarily have decided to formalize their relationships by means of a community council. This is about being an organized community.”*

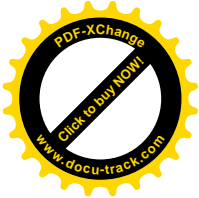
Functions of a Community Council include:

- *“Drafting development plans for the community.*
- *Assess the impact of public policies on the community.*
- *Creating co-operative organizations and community enterprises.*
- *Exercise social control over all activities undertaken in the community, of a local, state, private or public nature.*
- *Create work groups in order to solve problems with the means and resources of the community itself.”*

“During the time this study was in progress, within the community of El Guayabal there were four community councils legally established ... each had identified, within their frame of interest, the problems associated to environmental issues ... (which is) an indicator of the existing interest within the community to preserve the environment.”

“During the undertaking of field work for this study, two concrete actions were executed by the community councils to denounce indiscriminate tree felling near sources of water. The complaints were made before the Ministry of Environment and Natural Resources, which took the necessary action.”

“Usually, community members do not report illegal and environmentally damaging actions out of fear and the possibility of “gaining an enemy”. What would traditionally happen was that some of the individuals felling trees or starting indiscriminate forest fires ..., made a profit from such activities and the neighbors, although aware of the impact of such activities, would “keep quiet out



of fear". Eventually, the authorities would attend to the complaint only to find great damage had already been done."

"even though actions taken are intended to reduce the negative effects of inadequate environmental practices, the organized community has already recognized the importance of maintaining a favorable relation with the environment and, as a group, it is slowly acquiring strength. When a complaint is made by the community council, they are dealing not just with an individual opposed to activities that threaten his/her integrity; they are dealing with the community as a whole.

"... the community council constitutes a social support network not only destined to formalize complaints against potential threats to the community, but also as an entity which can generate innovative proposals and adapt them to the reality of the community in order to make the environment less vulnerable".

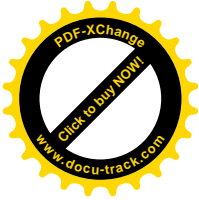
Other responses include a return to traditional practices and organic farming by farmers in the Mocotíes Valley, *"A co-op organization, from a nearby municipality, is responsible for the production of organic and biological pest controls. They distribute their certified products in the Andean region, but, more importantly, they simultaneously carry out the task of sensitizing and training farmers ... One co-op members is responsible for teaching the benefits of organic crops to producers who so want it. The organization hosts the communities and organizes technical visits to producers who wish to and acknowledge the need to change their farming methods.. (its) most important task is to rescue traditional ways and technologies lost with the arrival of chemicals."*

Information, Knowledge and Education

Members of the community expressed a need for more information and knowledge about how their daily practices may directly harm or alter the environment. They *"expressed the need of making an explicit relation between climate change and human actions; in particular, that the community may recognize what types of materials and procedures are really harmful to their environment."*

"Another concern is sensitizing and teaching children and young people from the village. Besides teaching them ways to adequately relate to the environment, it is important that young people and children realize the potential the land has for productive activities, with which they can have a dignified and satisfying life."

"After the flood, with all the infrastructure works in the region, many abandoned the crops to begin working in construction and bricklaying. What seems so worrisome for the community is what will follow after construction work is over:



“Are they going to return to work the land and find that it is useless, especially because of the drought.”

“Not knowing how to respond in disaster situations was a common concern in all three discussion groups and the people interviewed expressed their interest in having the organized community design specific action plans for such cases.”

“Finally, but extremely important, is the need to rescue traditional local knowledge on the environment as part of an educational program for children and adults. Traditional tales win environmental references, songs, life experiences from families working the land, animals and plants; are all valuable sources of information.”

“Individuals and discussion groups interviewed agreed on the need to transmit the knowledge base on natural resources of elderly found in the area, their knowledge about the weather, ravines and, above all, the way families used to harvest and raise animals.”

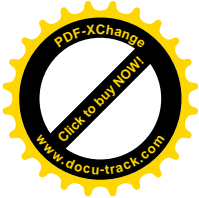
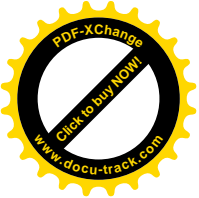
“We used to listen to grandparents, who are very wise on how to listen to the river, how to handle the animals and how to harvest the land without damaging it.”

This kind of knowledge is perceived as a useful tool in order to prevent and prepare for natural disasters. “Before, people —just by the way rocks came down from the river— knew what was coming.”

In this same manner, it is all related to organic crops, that is, the use of “traditional technology” in order to produce without negative effects on the environment. “In the old days, people did not use any chemicals; when companies arrive to sell us all that, everything else was forgotten.”

9. Conclusion

If in some the cases reported here much has been done at community, NGO and governmental levels to respond and adapt to the impacts of climatic and related changes, it is clear that in most cases much remains to be done if remoter and mountain communities are to survive. Actions seem to be needed in areas that are often sensitive, such as a return to culturally-specific and place-based education and learning which helps people to understand and better cope with - and adjust to - consequential environmental, livelihood, and general quality of life effects. This requires viable local institutions, like the community councils being introduced in Venezuela. In addition, the most vulnerable areas seem to be those that are either already lacking basic services such as education, health care, and transport infrastructure, or are losing these because of the impacts of climate change. Often these are the more remote and mountainous rural regions.



Migration and land abandonment is a common response to additional environmental and social pressures on such areas, which leads in turn to a vicious cycle of environmental and social degradation.

Yet there are also examples of powerful local responses, strong community action in the spirit of self-determination, and solid cooperation, as well as appropriate governmental and NGO support.

It seems important to encourage further exchange of experiences in this important area for rural research and action. The seminar will provide the forum to discuss what form these might best take, and what other actions might be recommended to follow up the work of the Fellows.