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cooperation
Natural Resource Management
Rural Economy
Local Government and Civil Society

Climate Risk Management (CRM)

Synthesis Report Pakistan

Livelihoods Programme
North-West Frontier Province
(NWFP)



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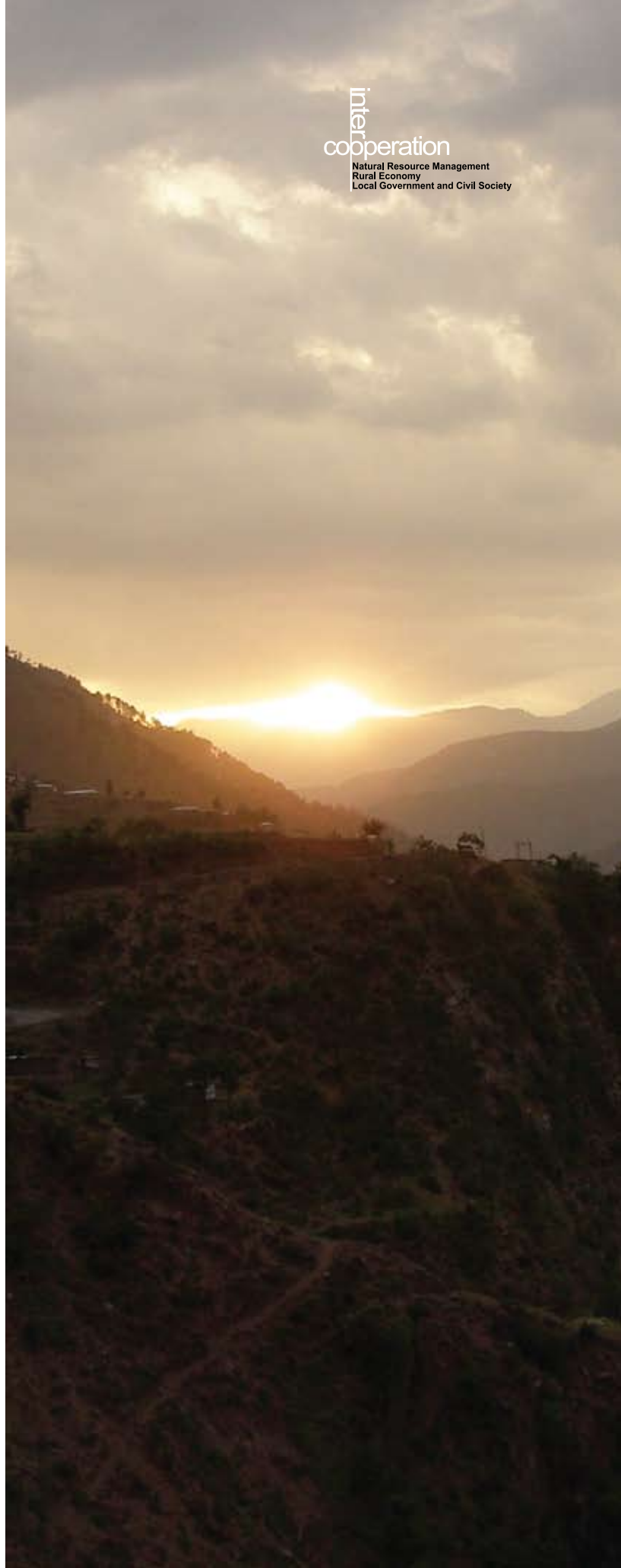
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About Intercooperation

Intercooperation (IC) in Pakistan and worldwide has been actively engaged in the development sector right from its inception in 1982. In Pakistan, IC began its interventions when the Kalam Integrated Development Project was mandated to the newly founded organization by the Swiss Agency for Development and Cooperation (SDC). Since then, IC has remained engaged in rural development at various levels with several stakeholders in the sector including technical themes such as agriculture, livestock, forestry and non formal education, with the communities together with the government, the civil society and the private sector. During almost three decades of activities in Pakistan, Intercooperation has implemented over twenty development projects, particularly in natural resource management, most of which were implemented on behalf of SDC. During recent years, IC is consistently involved in activities related to climate change and related disaster risk reduction. Most of such interventions have been in agriculture, water management and forestry, particularly focusing on arid and flood prone areas in NWFP.





About Livelihoods Programme

The 'Livelihoods Programme' (LP) started in January 2008. It merged and capitalized on the successful elements of four previous IC projects under one programme. The programmatic approach provides an opportunity for replicating and up-scaling relevant successful components. LP aims at increasing the effectiveness and efficiency of SDC's development assistance in NWFP. The Sustainable Livelihood Approach (SLA) and Human Right Based Approach (HRBA) form the basis of the Programme. LP supports people in improving their livelihood strategies based on their potentials and with concrete means to reduce their vulnerabilities caused by various factors such as natural disasters. Programme interventions are designed to emphasize on the rights of marginalized women and men (rights holders) and obligations of state institutions (the duty bearers). LP strategically builds local capacities and service delivery systems around specific resources (products or value chains), aiming at empowering communities to deal independently with various service providers. LP is implemented in close collaboration with the GoNWFP under a Memorandum of Understanding. For field activities, two geographical hubs have been established in the North and the South of NWFP. The Programme Steering Committee (PSC) comprising of representatives from SDC, IC, Government, civil society and the private sector is responsible for providing strategic guidance to the programme.



About Asian Disaster Preparedness Centre (ADPC)

The ADPC is a regional, non-profit organization based in Thailand. It is mandated to promote safer communities and sustainable development through the reduction of the impact of disasters in response to the needs of countries and communities in Asia and the Pacific. This is done by raising awareness, helping to establish and strengthen sustainable institutional mechanisms, enhancing knowledge and skills, and facilitating the exchange of information, experience and expertise. The Climate Risk Management Division under ADPC works to reduce societal and physical vulnerabilities of communities through the application of weather and climate forecast information at all time scales. Activities include the development of institutional mechanisms and capacity building of partner institutions to generate, interpret, translate and communicate climate forecast information with sufficient time to enable communities and governments anticipate and manage risks and opportunities on a proactive basis. The early warning system under CRM is called the Regional Integrated Multi-Hazard Early Warning System (RIMES) for Africa and Asia which provides an effective multi-hazard early warning system. This facilitates establishment and maintenance of core regional observation and monitoring networks with the participation of Member States, provides Regional Tsunami Watches to designated authoritative institutions, research and development support to enhance capabilities of National Meteorological and Hydrological Services. The early warning information helps in decision making and provides a base for enhancing community preparedness to respond to disasters.



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LIST OF ACRONYMS

ADPC	Asian Disaster Preparedness Centre
AJK	Azad Jammu & Kashmir
CBOs	Community Based Organizations
CC/DRR	Climate Change/Disaster Risk Reduction
CDM	Clean Development Mechanism
CERs	Certified Emission Reductions
CFA	Climate Forecast Application
COP	Conference of Parties
CRED	Centre for Research on the Epidemiology of Disaster
CRM	Climate Risk Management
DFID	Department for International Development
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EWS	Early Warning System
FAO	Food and Agriculture Organization
GCISC	Global Change Impact Studies Centre
GDP	Gross Domestic Product
GHGs	Green House Gases
GoNWFP	Government of North West Frontier Province
HKH	Hindu Kush and Himalayas
HRBA	Human Right Based Approach
IC	Intercooperation
ILO	International Labour Organization
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
KHK	Karakoram – Hindu Kush
LBOD	Left Bank Outfall Drain
LP	Livelihoods Programme
NAMA	Nationally Appropriate Mitigation Actions
NDMA	National Disaster Management Authority
NDRMF	National Disaster Risk Management Framework
NGOs	Non-Governmental Organizations
NWFP	North West Frontier Province
OFDA	Office of Foreign Disaster Assistance
P&DD	Planning and Development Department
PDD	Project Design Document
PDMA	Provincial Disaster Management Authority
PMD	Pakistan Meteorological Department
PSC	Programme Steering Committee
REDD	Reducing Emission from Deforestation and Degraded Land
RIMES	Regional Integrated Multi-Hazard Early Warning System
SDC	Swiss Agency for Development and Cooperation
SLA	Sustainable Livelihood Approach
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNIFEM	United Nations Development Fund for Women
UNISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
WFP	World Food Programme
WMO	World Meteorological Organization

ACKNOWLEDGEMENTS

We are pleased to present to our readers this publication which is an outcome of joint effort of many people. The background of this publication is the three training workshops on *climate change related disasters and risk management*, which were organized in August 2009 in Nathiagali, Pakistan. We extend our deepest appreciation to all those who contributed towards the success of these workshops organized by Livelihoods Programme (LP) for senior policy makers and planners with an intention to sensitize them regarding the need for mainstreaming the theme in development planning. Our first special thanks goes to Mr. Mohammad Ikram Khan, Secretary Planning and Development Department who took personal interest in these workshops and on several occasions emphasized the significance of this theme. Due to his personal interest and support, several senior level officers participated in the events and provided useful input. The LP team is extremely grateful to the Swiss Agency for Development and Cooperation (SDC) which is a long standing partner of the Government of NWFP and of Intercooperation. SDC has always set a high priority on the most vulnerable and marginalized through development interventions. SDC believes that the poor are most vulnerable to disasters and need a greater attention in terms of preparedness.

The workshops were organized in collaboration with the Asian Disaster Preparedness Centre (ADPC). Three experts from ADPC came to Pakistan, facilitated technical sessions in the workshop together with eminent national scientists and experts including Dr. S. Sajidin Hussain, Dr. Mohsin Iqbal, Dr. Ghulam Rasool and many others¹. They were not only available throughout the series of all three workshops, but were also able to impart knowledge in a simple and understandable manner which was highly appreciated by the participants. LP team wishes to extend a whole hearted gratitude to all these experts. We also thank participants for taking keen interest in the workshops for inducing a lively discussion in each session on various sub topics.

The workshops would not have been a success if the IC Delegation Office and LP teams would not have invested in preparations and extended support to the organizers and participants. We are thankful to them for their tireless efforts in making all the arrangements before, during and after the workshops.

This publication is a joint output of Intercooperation and ADPC. We thank the authors, peer readers, and all other contributors for their input. We very much hope that the readers will find it useful and our message of sensitizing people on the need for mainstreaming disaster risk management in every walk of life will be disseminated effectively through this publication.

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FOREWORD

When a disaster occurs, the poorest are hit first and the hardest. The entire state machinery is mobilized in order to provide relief assistance to the affectees. Citizens flood in to provide volunteer support. Humanitarian agencies mobilize themselves according to the scale and nature of disasters and try to reach the spot within no time. The media gets busy in reporting losses of lives and properties and the critics analyze how the relief operations could be made better. If all these concerted efforts are put together to reduce the chances of disaster's occurrence, would that not be more rewarding than having to lose lives and other assets?

If one computes the value of all these non-compromising operations, it is far higher than a normal development project in which every investment has a rationale and a return value expected for every rupee spent. It is believed that investing in disaster preparedness saves a lot of resources when compared to the costs paid in relief operations. In Pakistan for instance, only 2% of its budget is spent on preparedness and an overwhelming 98% is spent on response (recovery and relief).

With this rationale in mind, the GoNWFP, SDC and Intercooperation together launched a Livelihoods Programme, which is mandated to improve people's livelihoods in six districts of NWFP – all of which are prone to natural disasters. Disasters pose a great threat to people's livelihoods. The impact is more on the already marginalized sections, for example women and children. Hence one of the expected results of the programme is to take all possible measures to reduce risks and hazards which are turned into disasters.

Disasters occur for many reasons. One of the most eminent reasons is the changing climate around the globe. Pakistan has not been immune to these changes. The scientists have shown trends which suggest that the occurrence of climate change related disasters in Pakistan have increased over time. This calls for timely strategies to adapt to these changes.

Both the GoNWFP and SDC consider that this is the need of the day. We are convinced that all policy makers and planners should lend a hand in mainstreaming the theme of disaster risk reduction in their development plans. We are pleased to share that this topic became the core of the three training workshops which were organized by the Livelihoods Programme in Nathiagali in August this year. However, this was just limited to sensitizing senior policy makers and planners. What counts more, are their actions in the future.

This publication is a means to reach out to a wider audience which could not be invited to attend the workshops. We hope that the messages in this publication will have a far reaching impact and the readers will be convinced that the action starts from home. Being well prepared is as important as supporting a relief operation, in case of a disaster.

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Secretary to GoNWFP
Planning and Development Department





EXECUTIVE SUMMARY



Climate Change is a global issue and its impacts are cross cutting in all sectors and walks of life. Pakistan, though only contributing 0.04% of the total carbon emissions in the world will be severely impacted by climate change. As with other countries, Pakistan is dependent on livelihood areas that are climate-sensitive. Of these livelihood sectors, agriculture, forestry, water resources among others, are the most sensitive to climate change. Being climate-sensitive means an increase or decrease in temperature and precipitation, shifts in climatic trends or more frequent incidences of climatic extremes, will significantly impact on such sectors. By far, the projected adverse impacts of climate change on the international scale has put mankind in a position that imposes to put in place measures that will make individuals and societies resilient in the face of a changing world.

Recognizing the need to meet the challenges brought about by climate change, a series of workshops in Nathiagali, NWFP Pakistan, was convened for senior policy makers and important functionaries from the North West Frontier Province (NWFP) and other parts of the country. The workshops served as avenues for sensitizing leaders to the issues and concerns that most unequivocally affect Pakistan vis-à-vis climate change. The meetings were organized by the Livelihoods Programme (LP) in collaboration with the Government of NWFP and the Asian Disaster Preparedness Center (ADPC). They underscored current and future climate scenarios in Pakistan and put forth to the participants (mostly from the Government of NWFP) the importance of taking action at all governmental levels and in all walks of life to harness multi-level capacities in mitigating and adapting to climate change.

The key objectives and outcomes of the workshops were:

Objective 1: Sensitize participants on different perspectives regarding climate change.

- Climate change has varied impacts. In some sectors, it will cause positive development opportunities (at least for a short period), in others, it will cause destruction. In the long term however, if mitigation and adaptation mechanisms are not put in place, the destruction will outweigh the opportunities and will go beyond the coping capacities of individuals and societies.

- Different impacts will be felt in different areas of Pakistan. The negative impact of rise in temperature will be severe in the sub-mountain and plain areas because these areas are located in a heat surplus zone. The high mountain areas will benefit from the rise in temperature because these areas are constrained by temperatures. However the overall impacts even in mountain areas will be negative because of land degradation.
- Undeniably, the impact of climate change will be cross-cutting, affecting all sectors of life. People's livelihoods will be at stake.
- Climate change is a long term process. However, dealing effectively with climate change means dealing with current climate variabilities, extremes and shocks.

Objective 2. Identification of services which help implement measures which contribute to enhance resilience of individuals and societies in dealing with climate change.

- Climate risk management (CRM) approach involves decision-makers and stakeholders in the assessment and prioritization of risks and risk management actions. As stakeholders own the results, integration of adaptation actions into existing or future sustainable development is more likely to succeed. Dissemination of climate information from the Pakistan Meteorological Department (PMD) or other research institute should be maximized. Means and mechanisms should be identified to ensure that forecast products such as timely seasonal climate forecasts are received by end users up to the grassroots level.
- Organizational/institutional collaboration between and amongst concerned organizations/institutions should be enhanced in order to better understand the climate related information and its applications, effectively implement programs, projects and activities related to climate change mitigation and adaptation. Capacity building of institutional learning process need to be in place.
- Specific areas of development like the Clean Development Mechanism (CDM) should be clearly understood and given appropriate attention by the government to encourage more participation. The emphasis should be on sustainable development rather than to generate carbon revenue.
- Provincial and community level governments should be strengthened. Though basic frameworks for climate change mitigation and adaptation are already in place at national level, the provincial and district governments' involvement is usually minimal, if not lacking. Multi-level participation in climate change related initiatives and interventions should be given proper attention.

Objective 3. Identification of potential areas for integration of climate change mitigation and adaptation into different sectors.

- Climate change impacts being cross cutting, integration of climate change mitigation and adaptation measures should be embedded in every sector.
- Integration may be done in existing programmes/projects to maximize available resources.
- Policies pertaining to climate change adaptation should be strengthened through the provision of necessary financial support and other appropriate resources.

Disaster risk management is an entry point to climate change adaptation. We must start with 'us' – in our own positions; we need to influence whatever action plans our organizations prepare and implement. We need to integrate climate change/DRR related activities into our own work. Some of the sectors may be more vulnerable than others and some may offer support roles. Water and agriculture are most sensitive to climate change therefore necessary steps taken in these sectors may be concentrated to reduce vulnerability of farmers and the nation as a whole. Other initiatives may include health, early warning systems and climate-resilient buildings. Education, technology sectors and NGOs on the other hand can systematically strengthen a support role to enhance awareness and provide means to address the challenge.



Chapter 01 INTRODUCTION



The greatest challenge of the World today is the rapidly changing global climate. A dilemma for world economies is how to reduce the Green House Gases (GHGs) responsible for global warming while continuing to strive for our economic growth and sustainable development.

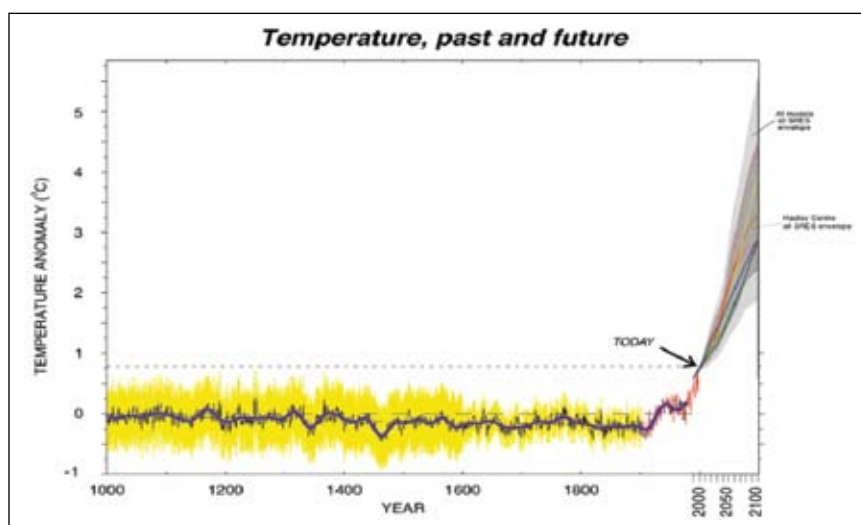
Developing countries are far more vulnerable to climate change due to lack of resources and capacities to cope against climate related hazards. Being at the bottom of the rung, the poorest of the developing countries will face the most negative impact of disasters. Taking an extremist approach in the form of intense heat waves, droughts, floods and consequent epidemics, it affects our lives severely. No longer limited to being a theme for global deliberation between climatologists, or that of Greenpeace protesting over the ozone layer, it has taken the center stage, it is here to stay. Climate change is an unequivocal reality. The Intergovernmental Panel on Climate Change (IPCC) assessment reports 2001 and 2007, the Stern Review and 'An Inconvenient Truth' - an excellent documentary by Al Gore all bear testimony to the brewing emergency. The changing climate causes several risks which in turn generate disasters, making us highly vulnerable. In our region, the poor bear the brunt of such shocks. The cost of inaction is high due to high costs associated to hazards which turn into disasters. A cheaper option would be to integrate climate change adaptation and mitigation interventions in the ongoing development programmes.

Global scenario of climate change

Globally averaged, the planet is about 0.75°C warmer than it was in 1860, based upon dozens of high-quality long records using thermometers worldwide, including land and ocean. Eleven of the last 12 years are among warmest since 1850 in the global average. Precipitation has

increased in eastern parts of North and South America, northern Europe and northern and central Asia – and decreased in the Sahel, Mediterranean, southern Africa and parts of southern Asia. The globe shows drying in much of the subtropics and more rain in higher latitudes. Broad pattern of rainfall changes has already been observed. The most important phenomenon brought by changing climate is that of climate variability and increased incidences of extreme climatic events. Future change in global average temperature is expected in the range 1.8-4.0 degree Celsius over the 21st Century. These will be accompanied by much increased impacts on global precipitation.

Figure 1 presents projections of global average surface temperature. This shows that we are heading for a climatic state far outside the range of variation over the last 1000 years. Indeed, we're on our way to making the world hotter in the 21st century than it has been in the last million years.



Livelihoods and Vulnerability

It is established that there exists a strong relation between vulnerability, natural hazards and the level of economic development. The widespread poverty, ineffective institutions, lack of information, poor social network and safety nets, weak coping mechanisms, all contribute and increase the vulnerability of the people to the natural disasters. Every subsequent disaster impacts the livelihoods rather more acutely and pushes the poor to the next lower degree of poverty. The policy makers and planners in provincial and local administrations are the first line of response to climate change. They should acquaint themselves with the changes in climate in relation to vulnerabilities and livelihoods. Impact of droughts, water shortages, wild fires, flooding, rising sea levels, diseases and infrastructure disruption are few examples of climate change borne vulnerabilities which need to be addressed not only in terms of response (after they occur) but also preparedness.

LP and climate change related Disaster Risk Reduction (DRR)

The Livelihoods Programme operates in six districts of North-West Frontier Province (Swat, Buner, Chitral, DI Khan, Karak, Haripur). All these districts are subject to different forms of disasters as proven in the recent history. Disasters such as extended droughts, flash floods, excessive rainfall/snow, landslides, earthquakes, etc. have been common and frequent in these districts. Intercooperation, during its twenty-eight years of presence in the Province, witnessed a number of them while implementing various development projects. Often, normal development funds were replanned for providing immediate relief and rehabilitation of affected partner communities to cope with a disaster. These shifts, over the past fifteen years, have

ranged from a small scale and little timeframe (e.g. flash flood in a union council) to a large scale and longer time span (e.g. earthquake 2005 or heavy snowfall in 2006). Hence the planning group of Livelihoods Programme in 2007 decided to include DRR as a mainstream theme -so that the team can systematically work on DRR and preparedness with all the relevant actors rather than switching its role as a relief agency when a disaster occurs.

LP has initiated physical DRR activities which especially focus on disaster prone communities in fragile areas. This serves three purposes:

1. The theme DRR is highlighted and service providers (especially Government Departments) recognize that reducing people's vulnerability to disaster risks is important for ensuring their livelihoods.
2. A few urgent disaster risks could be addressed in the field with little investment and immediate positive impact, hence restoring people's confidence to rebuild themselves.
3. These activities (coupled with prior assessments and stock-taking) could help in providing learning ground.

While these activities were in process in various geographical areas, the option of holding the workshops was considered. The idea was to contribute to an understanding that not only is it essential to reduce disaster risks – but equally significant to understand why these risks occur. One of the most important reasons for large scale disasters in today's era is the changing climate hence both the phenomena have a strong cause and effect relationship.

Climate Change and Risk Management Workshops (August 2009):

Three events were organized in Nathiagali:

- a. 1-day orientation workshop on Climate Change and Climate Risk Management
3 August 2009
- b. 3-day training workshop on Climate Change and Climate Risk Management
4-6 August 2009
- c. 3-day training workshop on Climate Change and Climate Risk Management
7-9 August 2009

Participants at the 1-day orientation workshop were senior government officers at policy level. Participants of the 2 sets of 3-day workshops were senior government officials coming from planning and operational levels. Sectors like agriculture, water resources, forestry, education, energy, environment, among others were represented in the workshops.

Objectives of orientation and training workshops:

An overall objective was to develop participants' understanding about the concepts; the global situation, scenarios in Pakistan and NWFP, likely impacts of climate change on various sectors in NWFP, what should be done to reduce climate related risks/disasters and attuning our development programme to become sensitive to the phenomenon of climate change. The specific objectives were to:



1. Sensitize participants on different perspectives regarding climate change and DRR.
2. Identify services which help implement those measures which contribute to enhance resilience of individuals and societies in dealing with climate change.
3. Identify potential areas for integration of climate change mitigation and adaptation into different sectors.

Synthesis report – climate change related risk management

This publication has two distinct parts:

1. A synthesis report derived from the workshop inputs, discussion with the participants and their internal group discussions. These are not the proceedings of the sessions. An ample effort has been made to extract a simple understanding on the subject with examples and suggestions on possible measures which if implemented can contribute to concrete results in the field.
2. The second part of the report comprises of all the inputs provided by the resource persons. For the benefit of the readers and for them to have a complete understanding of the topics discussed, the presentations have not been edited. Having refrained from long narratives, each topic provides a good snapshot of the related facts under the subject, along with the presenter's name and email address. The readers are welcome to contact the authors for more material or support.



The annexes cover the list of participants (Annex 1), the resource persons and contributors (Annex 2), the topics addressed during the workshop (Annex 3) as well as glossary of important terms (Annex 4) and some related reading material which may be useful (Annex 5).





Chapter 02

CLIMATE AND CLIMATE CHANGE CONCEPTS, SCENARIOS AND CHALLENGES

The problem: Climate variabilities and extremes

Climate has always played a key role in societal activities and development. It is defined as the mean meteorological conditions that prevail for a particular region. In discussing climate, it is inevitable to discuss climate variability which is defined as 'variation in climate that is usually associated with natural causes'. Climate is treated in all communities as both a resource and a hazard. As a resource, climate serves as a catalyst that facilitates daily activities of the people such as the gainful exercise of livelihood. As a hazard, climate causes disruption in the lives and livelihoods of the people and in some cases, retrogresses development. Climate variability, extremes, and shocks in societies all over the globe generate droughts, floods, hail storms, forest fires and diseases. The two facets of climate stand poles apart. While in some places, people generally have water to drink, good harvests, productive livelihoods and enjoy comfortable temperatures; in other places there are famines, destroyed houses, dead livestock, and many others associated calamities. The occurrence of increased climate variability, extreme climate events, and shocks has wrecked devastation in many societies. Extreme climate events like El Niño² and La Niña³ left staggering impacts on societal sectors like agriculture.



In the Philippines and Indonesia for example, slumps in rice production were recorded during the El Niño years. In both countries, the biggest rice production slumps were recorded in 1998 which was a year with strong El Niño phenomenon.

Asian Disaster Preparedness Centre (ADPC) - 2009

² El Niño is an oscillation of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe. El Niño is characterized by unusually warm ocean temperatures in the Equatorial Pacific. El Niño is associated with decreased precipitation, droughts and even bush/forest fires.

³ La Niña is characterized by unusually cold ocean temperatures in the Equatorial Pacific. La Niña impacts tend to be the opposite of El Niño impacts.

Coping mechanisms to climate impacts range from households to community and from national to international levels. Countries affected by climate variabilities have developed coping mechanisms to minimize the adverse impacts of the said climate variation. Ideally, multi-level, multi-sectoral resilience should be attained. In many instances though, national level resilience is increased but households remain vulnerable.

The impact of climate variability and extremes is felt globally. However, it is felt more strongly in developing countries where governments and people have less resources and therefore less capacity to cope with. Where the people's individual losses in developed countries may be high, the consequences of such losses in the countries' GDP are low. People's individual losses in developing countries may be low but their impacts on the countries' GDP are very high. The impacts of climate variability and extremes are felt even more strongly as the population mushrooms.



The increase in population means that there are more people to feed which implies that intensification of food production becomes inevitable to cater to the increasing demand. Consequently, crop intensification has been undertaken in many communities to counter the shortfall of food production against the population. While crop intensification bridges the gap between food production

and the population's needs, it also exposes the agriculture system to multiple hazards such as moisture and fertility loss, soil erosion, exposure to high wind velocity, etc.

Climate change: attributions and projections

The 21st century is beset by the worldwide phenomenon called climate change. Climate change is the rise in global temperatures and other associated climatic changes caused by global warming. Climate change entails an increase in climatic variability, extreme events and shocks.

Climate change is attributed to green house gases (GHGs). Green house gases like Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Chloro-Fluoro-Carbons (CFCs) among



others, naturally exist in the atmosphere to form a "blanket" that maintains the earth's temperature. Without the naturally existing GHGs, the earth's temperature would be very cold and life would not be possible. However, anthropogenic or human activities associated with development have increased the concentration of GHGs in the atmosphere thereby thickening the "blanket" which prevents excess heat from escaping the earth thereby causing a rise in temperature. The emission of GHGs has increased by 70% since the rapid economic growth from 1960s caused by the industrial revolution. Manifestations of climate change are by now prevalent – one of which is the unusually warm temperatures. The warmest years recorded in history were (starting from the warmest recorded year): 1998, 2005,

2003, 2002, 2004, 2006, 2007, 2001, 1997, 2008, 1995, 1999, 1990 and 2000. Corollary, frozen ground anomalies have been recorded as increasing and glacial resources have also drastically declined from 1960 to 2000.

Findings of the 3rd Assessment Report of the Inter-governmental Panel on Climate Change (IPCC) reveal that the average global temperature has increased by 0.6°C during the 20th century and predicts a future increase in global temperatures in the range of 1.4°C to 5.8°C by

the end of the current century. Based on the same report, the IPCC predicts that the average annual temperatures in South Asia could rise between 3.5°C to 5.5°C by 2100. Moreover, IPCC's 4th Assessment Report indicates that a global temperature rise of 2°C to 4.5°C is almost inevitable in the current century, if we fail to arrest the current critical rate of GHG emissions. Hence countries of the world have to take serious actions to mitigate Climate Change and devise ways to adapt to the risks associated with the climate change impacts.

International response to climate change and Pakistan's cooperation

In response to the overwhelming threat posed by climate change, the United Nations Framework Convention of Climate Change (UNFCCC) was adopted in June 1992 by over 180 countries at the Rio Earth Summit. In 1994, the convention was signed by 154 states and entered into force. The UNFCCC aims at stabilization of GHG concentration in the atmosphere and stop temperature increases. Subsequently, the Kyoto protocol was



adopted in Japan in 1997. The Protocol sets quantifiable emission reduction targets. It says that developed countries should reduce their combined GHG emissions by 5.2% below the 1990 level during the period 2008-2012. The Protocol introduced a market-based flexible mechanism for emissions reduction called **Clean Development Mechanism (CDM)**

Also, Article IV of the IPCC provides for the obligations of countries, to:

1. develop, periodically update, publish and make available national inventories of GHG emissions;
2. take climate change considerations into account, to the extent possible, in its relevant social, economic and environmental policies and actions; and
3. promote scientific research to understand and quantify impacts, and to assess the economic and social consequences of various response strategies.

Pakistan is a signatory to the UNFCCC since 1992 and a Non-Annex 1⁴ party after UNFCCC's ratification in 1994. The country also ratified to the Kyoto Protocol in 2005, albeit delayed, to fully capture the benefits from the sustainable development initiatives under the CDM. Also in 2005, Pakistan submitted its Initial National Communication to UNFCCC and initiated the process for its Second National Communication. As with the Initial National Communication, the process for Second National Communication also started late and the process was slow. The following actions have been taken in Pakistan since 2005:

- The Prime Minister Committee on Climate Change has been set up to guide the climate change policy process.
- The Federal Ministry of Environment, which has been identified as the focal ministry on this issue, has set up a CDM Cell and is also a host to it.
- An autonomous Global Change Impact Studies Center (GCISC) is engaged in modeling based on research on climate change in the country.
- A high level Task Force has been formed under the Planning Commission of Pakistan to devise policy guidelines for climate change.

At the outset, the climate change is a global phenomenon. While it is unequivocally true, the disparity lies in the fact that the poorest developing countries will be hit earlier and harder by 4 Annex I countries are those 36 industrialised countries and Economies in Transition (EIT) which are listed in Annex I of the UNFCCC. These countries have taken emission caps – regulatory devices that set a ceiling on emissions that can be released into the atmosphere from any one country within a designated timeframe. All the countries which are not listed in this annex are called Non-Annex 1 countries.

climate change even though they have contributed little to causing the problem⁵. Hence taking practical steps to mitigate the risks of changing climate is in their own interest.

Clean Development Mechanism (CDM) is intended especially for developing countries. However, only a few developing countries have taken advantage of the CDM because of 1) complicated procedures; 2) lack of knowledge and awareness; 3) lack of sufficient technical capacities to develop such projects 4) and lack of validation mechanism and its high costs.

At the moment, further negotiations are taking place to finalize the post-Kyoto arrangements through a series of meetings that may set the stage for the Conference of Parties (COP) 15 meeting in December 2009 in Copenhagen. It is hoped that an international global warming treaty is reached in the COP 15 that may cover the period up to 2020. In the COP 15, it is anticipated that Nationally Appropriate Mitigation Actions (NAMA) may be agreed for developing countries. It may involve 3 types of actions, such as:

1. actions that are voluntarily taken up by developing countries through their own resources;
2. actions that require external support for resources and technology transfer; and
3. activities that may be introduced through the CDM.

Under the NAMA, there is also the possibility that the scope of CDM may be extended to a) Reducing Emissions from Deforestation and Degraded land (REDD) in developing countries; b) reduction of emissions through improved agricultural-based activities – soil conservation/management, improved method and practices in rice plantation; and c) improved livestock feeding and management practices.





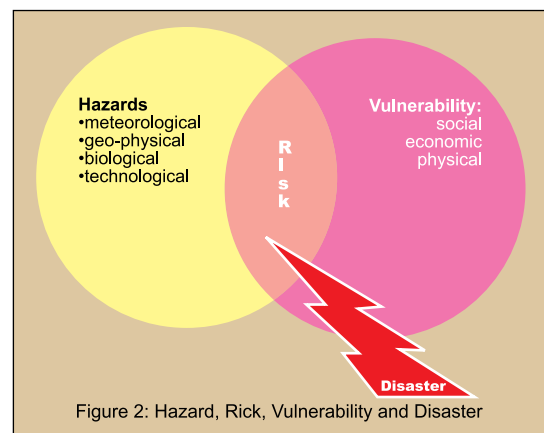
Chapter 03

WHY CLIMATE RISK MANAGEMENT? WHY IN PAKISTAN?



Disaster risk management is the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of a society to lessen the impact of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit adverse effects of hazards (mitigation and preparedness). As climate change presupposes increase in climatic variability, and more frequent occurrence of extreme events and shocks, disaster risk management is a natural entry point for climate change ‘adaptation’.

Climate change is regarded as the greatest challenge facing the world since the beginning of the present century⁶. Natural variability, together with anthropogenic activities, results in climate change. Some of the indicators of climate change are increased temperatures in most parts of the country, changes in precipitation in an uneven pattern, melting of glaciers, rise of sea level, increased frequency and intensity of extreme weather events. These will result in uncertain water availability and stream flows, reduction in crop yields, newer perspectives for energy (e.g. solar, nuclear), loss of biodiversity and increased risks to human lives. Though Pakistan is not a significant contributor to greenhouse gas emissions but globally it is one of the countries which are highly vulnerable to the impacts caused by these global phenomena.



Vulnerability, hazard and disaster

Vulnerability is the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change, including climate variability and extremes⁷. Vulnerability is a function of 1) character, magnitude and rate of climate change to which it is exposed; and 2) sensitivity and adaptive capacity for the system itself. Vulnerability can be exacerbated by non-climatic stresses like poverty, food security, conflicts, incidence of diseases such as HIV, AIDS, unequal access to resources, economic globalization, etc. Given different hazards, different capacities and different resources, the adaptive capacity and vulnerability may vary from region to region and even in zones within regions.

Disaster risk is a combination of potential hazards and all sorts of vulnerabilities including social, economic and physical. Hazards turn into a disaster when they have an impact on vulnerable segments and cause collateral damages.

Is Pakistan vulnerable to climate change?

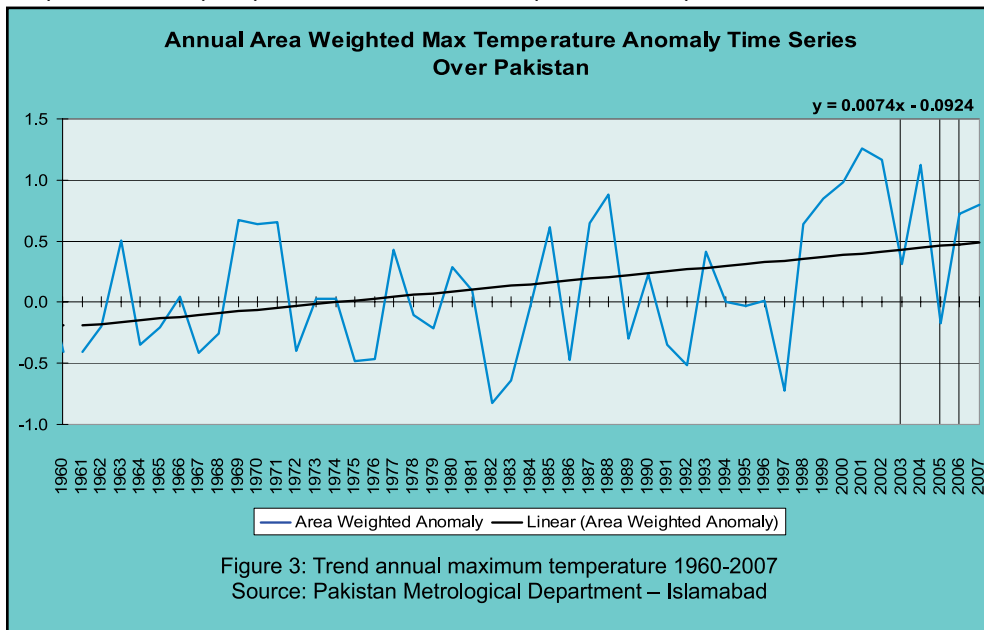
The Centre for Research on the Epidemiology of Disasters (CRED) Brussels conducted an Annual Disasters Statistical Review in 2007 which suggests that while the extreme climatic events in the form of hydro meteorological disasters (floods, cyclones and droughts, etc.) as caused by climate change variability have *increased* all over the world, these disasters have also become more *frequent*. This finding is also supported by data in Pakistan. Table 1 indicates only a few disasters which have occurred since 1976 causing large collateral damages. The frequency of these events has increased over years:

Table 1: Disasters since 1976 causing large collateral damages

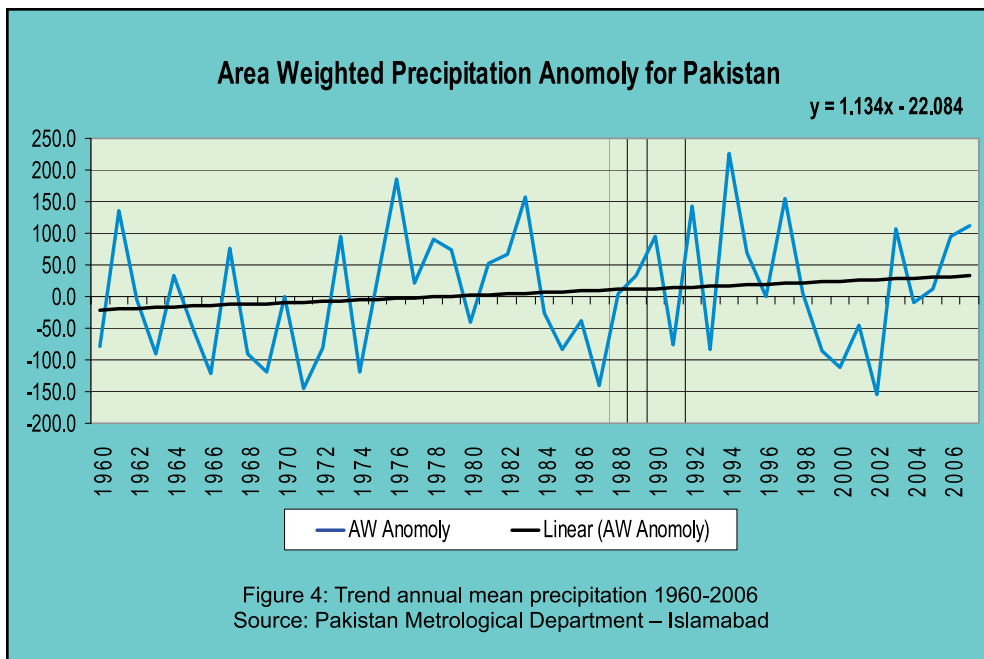
Year	Event	Intensity	Losses
1976	Flood	Heavy	Crops and public infrastructure, livestock and human life losses
1978	Flood	Heavy	Crops and infrastructure, livestock and human life losses
1998	Flood	Heavy	Crops and infrastructure, livestock and human life losses
1992	Flood	Severe	Huge damages to houses, public infrastructure, livestock and erosion. Several cases of human life losses
1995	Floods	Heavy	Crops destroyed, livestock losses and human life losses
1997-98	Rains	Heavy	Damages to houses, crops and erosion
1998-99	Drought	Severe	Destroyed crops, shortage of grasses, lowering water tables, several livestock perished
2001	Floods	Moderate	Damages to houses, crops and losses of livestock and human lives
2002-05	Drought	Severe	Destroyed crops, shortage of grasses, lowering water tables, several livestock perished
2001	Hailstorm	Moderate	Destroyed crops, and partially damaged houses
2003	Flood	Heavy	Damages to houses, crops and losses of livestock and human lives
2004	Snowfall	Heavy	Destroyed houses, crops and perished livestock. Some cases of human life losses
2004-08	Windstorm	Moderate	Destroyed crops, partially damaged houses
2004	Flood	Moderate	Destroyed crops, livestock and life losses
2005	Heat wave	Extreme	Several losses of human lives
2005	Flood and hailstorm	Heavy	Destroyed crops, livestock perished and human life losses
2007	Hailstorm	Moderate	Destroyed crops
2007	Avalanche	Large scale	Destroyed houses, losses of human lives, livestock and crops
2007	Heat wave	Extreme	Several losses to human lives
2008	Flood	Moderate	Losses of crops and damages to houses

Sources: (1) South Asian Disaster Report 2005: Tracking Disaster and Tremors. Duryog Nivaran through Rural Development Policy Institute (RDPI) Pakistan and Practical Action Sri Lanka. 2006 (2) Disaster preparedness for natural hazards: Current status in Pakistan. EC Human Aid and ICIMOD. 2007. (3) Mainstreaming Disaster Risk Reduction and Development: experiences and opportunities in South Asia by Intercooperation Bangladesh, India, Nepal and Pakistan – Intercooperation 2008.

Metrological data in Pakistan also show some trends. Two examples of mean annual temperatures and precipitation have been taken up to show the past trends:



Similarly the precipitation trend over four decades shows a slightly increasing but highly variable trend.



According to meteorological data, the changes in temperatures and precipitation in the past show the following trend in Pakistan:

Table 2: Changes during 1971-2000 compared with long term average of 1931-1960)

Region	Temperature rise °C	Temperature fall °C	Precipitation rise	Precipitation fall
North East	Nil	0.5-1.0	15-20%	nil
North West	0.5-0.8	Nil	Nil	10%
South East	Nil	0.3-0.7	5-10%	
Coastal	Nil	0.1-0.3	Nil	5-10%
Central	0.5-1.1	Nil	Nil	7-15%
Northern Areas	0.7-1.5	Nil	Nil	5-12%

Source: Dr. Ghulam Rasul. Pakistan Metrological Department (2009)

Table 2 illustrates that the North-West, Central and Northern regions are most vulnerable due to increasing temperature on one hand, and decreased precipitation on the other. The trend over the next twenty years is sustained. North-Western, Coastal, Central and Northern areas will receive lesser precipitation while temperatures will continue to rise, as can be seen in the following table:

Table 3: Future Projections for 2030 compared with long term mean 1971-2000

Region	Temperature rise °C	Temperature fall °C	Precipitation rise	Precipitation fall
North East	Nil	0.8-1.2	20-25%	Nil
North West	1.0-1.5	Nil	Nil	10-20%
South East	Nil	0.5-0.8	5-15%	Nil
Coastal	0.3-0.5	Nil	Nil	15-25%
Central	1.0-1.5	Nil	Nil	20-30%
Northern Areas	1.5-2.5	Nil	Nil	20-25%

Source: Dr. Ghulam Rasul. Pakistan Metrological Department (2009)

Pakistan is highly vulnerable to climate variabilities and extremes. Firstly, the country has high climatic and geographic diversity. This diversity is an opportunity. However it poses an institutional challenge since it adds a variety of risks to cope with. Secondly, a large part of Pakistan's economy depends on agriculture and livestock which are highly climate sensitive.



Does (only) half a degree rise in temperature per year matter?

The example of wheat, our main food crop, can explain this better. With every 1 degree rise in temperature, the ripening of wheat will set earlier in a season while it is quite likely that the number of days available for wheat crop will decrease. Besides, regions previously too cold for wheat may become suitable for introducing the crop. This requires wise adaptation measures to match the changing growing seasons and regions, in order to avoid reduced production of this important staple.

Source: Asian Disaster Preparedness Centre (ADPC) 2009.

Thirdly, majority of Pakistan's rural population is poor and therefore, they have an increased vulnerability due to low capability to withstand shocks.

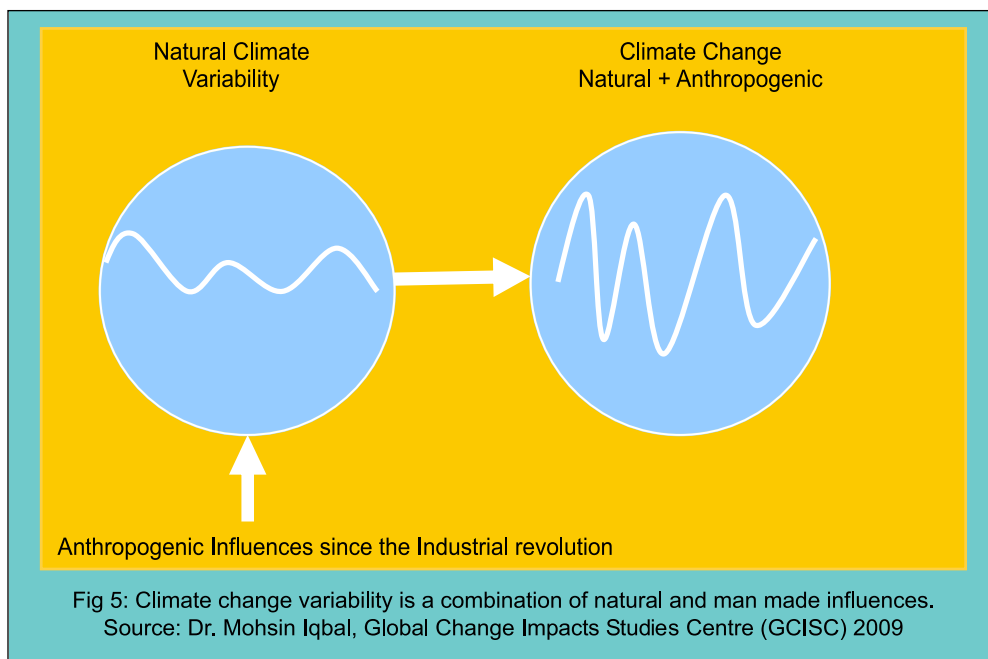
Most of these natural calamities have increased since 1990. These events match with the decade of 1990's where rising trends in temperature were also observed. Increasing frequen-

cies of the climatic variabilities are strongly associated with the disasters which have major implications for the rural population in Pakistan. Those who are largely dependent on climate sensitive natural resources, particularly agriculture, face immense problems in food production and ultimately in earning their livelihoods.

Anticipated impacts on climate sensitive sectors in Pakistan

Development, in the context of climate change, necessarily relates to the resilience of people's livelihoods. Most livelihood sectors in Pakistan are climate-sensitive and therefore initiatives to suit current livelihoods to climate variability are a must.

For addressing DRR and climate change in a holistic way, it is necessary to assess the possible impact of climate change and also to assess vulnerabilities especially the coping capacities of the communities to adapt to these threats. This understanding should lead to planning measures to reduce risks and livelihood vulnerabilities which in turn should enhance communities' preparedness. It should include early warning systems, structural measures, innovative farming practices, alternate and efficient energy systems and mitigation measures in the industrial sector. It is important to understand that climate change is a natural phenomenon and this will continue even when all sorts of anthropogenic interferences are frozen. Combined with human activities, these changes and their impacts are further triggered hence. Thus, we can make a difference through adjusting our practices in whatever sector in question.



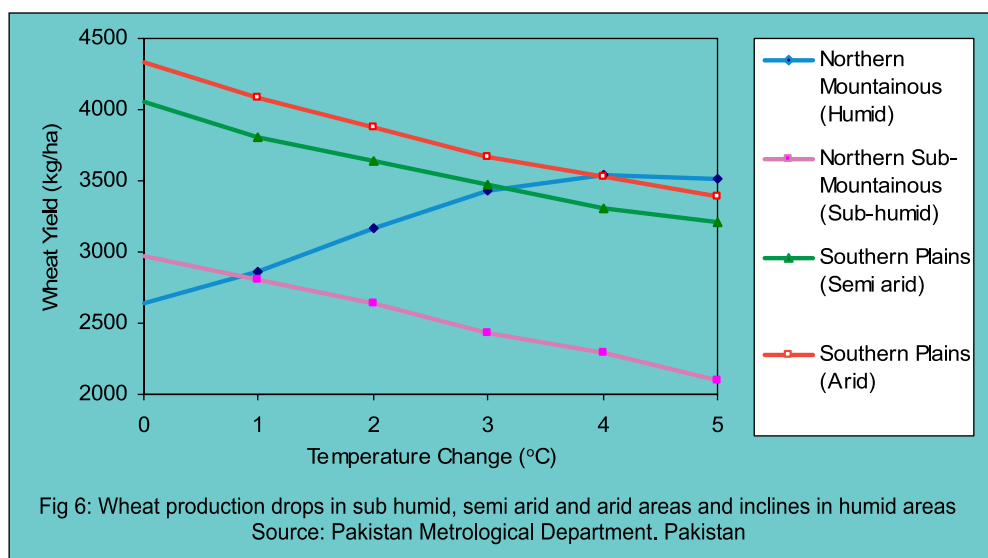
The following puts into perspective the anticipated impacts of climate change on climate-sensitive sectors in Pakistan.

Agriculture

Agriculture plays a vital part in the country's economy. Pakistan has a total area of 79.61 million hectares and 22.3 million hectares of this are devoted to farming. Of this, 19.12 million hectares are irrigated and 3.67 rainfed. The irrigated area consumes about 80% of the country's freshwater resources, covers 84% of cultivated area and hugely contributes to the national food production. On the other hand, rainfed hilly and dryland agriculture cover 16% of the total cultivated area of the country and has little contribution in the national food basket. Despite this little contribution, these areas serve as a basic source for meeting the subsistence need of

farming families living in the areas. Our production system is not strong enough to support itself due to environmental fragility. With increasing risks of droughts and flash floods, these areas will be most affected and hence subsistence economy will be hard hit, resulting in change of livelihood patterns (e.g. agriculture to pastoralism), displacement of people (climate refugees) and in an increased burden on irrigated agriculture for feeding the growing population.

An important source of fresh water for agriculture in Pakistan is water from melted glaciers in the Karakoram-Hindu Kush (KHK) and Himalayan ranges. One school of thought is that due to climate change, glaciers are becoming thinner and irrigated areas for agriculture are foreseen to be vulnerable in the long run due to decreased flow of water. Semi-arid and arid areas will also be vulnerable because of the changes in quantity, intensity and frequency of rainfalls. Both areas will be vulnerable to extreme climate events and shocks such as floods, droughts, heat waves, cold waves, dust storms, hail storms, sea storms, etc. The other believes that glaciers in HKH region are growing – yet the impact on agriculture is not clear in the long run. It is also said that climate change is not only a risk, but also an opportunity. A recent study highlighted that climate change could be beneficial for mountain agriculture. However, the graph in Fig. 6, shows that except for mountainous regions, other areas will experience drop in wheat production. A possible impact on crops can be shortening of growing season, losses in yield, heat stress at sensitive growth stages (i.e. flowering and grain initiation stages), increased pest/disease incidence, etc. In warm moist temperatures pests /diseases may thrive while in dry, drought-like conditions insects such as locusts may swarm in.



In conclusion, high mountains of Hindu Kush and Himalayas are getting warmer. If this trend continues, glaciers will recede soon and both the mountain communities as well as the whole country might face severe water shortages in the near future. While agriculture might benefit from climate change (increase in temperature) in the mountainous regions, the ongoing process of land degradation might counterbalance the climate-induced positive impacts. An integrated adaptation strategy would be needed for the mountainous areas to timely cope with the adverse impacts of climate change.

Livestock

Livestock is considered a foreign exchange earner in the country and a living bank for the rural poor. Its contribution to agricultural GDP is equal to the crop sub-sector. In the rural areas, it is also a source of fuel and fertilizer. With climate change, livestock is expected to be impacted in the following ways:

- Physiological stress on animals due to high temperatures
- Reduced fodder production in arid areas due to increased temperatures and changing rainfall patterns

- Productivity losses (milk and meat) due to high temperatures. Some indirect factors such as decreased quality and palatability of forages, reduced availability of water to fodder crops will also have a negative impact
- Stress on conception and reproduction due to high temperature
- Climate-related diseases and epidemics

This implies that production from livestock will diminish in the long run. An adaptation strategy should look into the quality of livestock rather than the quantity, and their ability to cope with the above mentioned stresses.

Land degradation

The following statistics reflect the current state of land degradation in Pakistan (source, GCISC, 2009):

Water erosion	-	17%
Wind erosion	-	8%
Salinity and sodicity	-	9%
Water logging	-	5%
Low organic matter	-	96%

Land degradation therefore, is not spared from the impacts of climate change. Apart from what is caused by anthropogenic activities, it is anticipated that climate change will cause:

- Salinization possibly due to sea intrusion (and less waters in the rivers).
- Erosion due to detachment of top soil layer caused by the action of flood water or wind.

In general, land degradation is enhanced due to wind and water erosion as a result of low and high rainfall. Water logging and salinity will occur as a result of greater evaporation from land surface.

Forestry

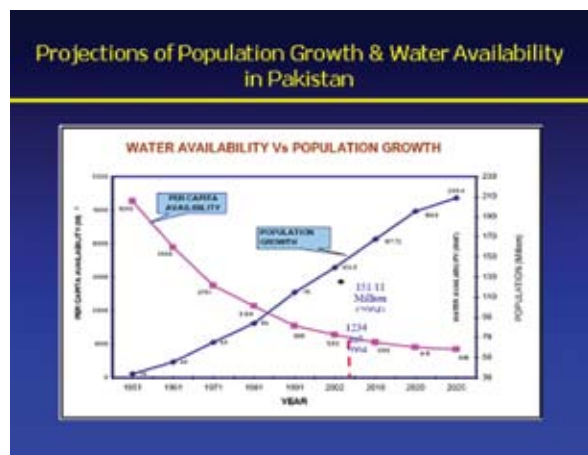
Forestry is the most discussed natural resource and various studies as well as development experiences show that anthropogenic interference is the highest in this sector for meeting subsistence needs and commercial interests. While these pressures have a negative impact on forests and contribute to aggravating climatic factors and risks, there are also certain impacts of climate change on the forests as projected by the scientists:

- Loss of biodiversity due to changes in temperature regimes;
- Shifting of forest areas northwards to cooler places while lower reaches will give way to other vegetation types (if left alone and not taken up for agricultural purposes);
- Shifting of cropping zones in higher slopes for food production

This would require a very close observation on natural trends in forest development. Ways need to be sought for adapting silvicultural management to changing needs.

Water resources

According to the figures presented by Pakistan Council of Research in Water Resources, a total volume of water on earth is 1386 million cubic kilometers of which, 97.5% water is saline while 2.5% is fresh. Of fresh water, 68.9% is locked up as snow in the Arctic and the mountains. Only the rest of 31.1% is lakes, rivers, reservoirs, groundwater and other forms of water such as soil moisture, swamps, frost, etc. Accessible fresh water is only 13% of the total freshwater volume on earth.



Per capita fresh water availability in Pakistan from 1947 to 2025 has been reported as decreasing from 5600 cubic meters to 834 cubic meters⁸ (figure 7). This is mainly attributed to changing climate as well as increasing population which is continuously depleting resources. Glaciers, snow and ice are considered to be the most sensitive indicators of climate change. Ice-cap on the North Pole is shrinking (over 10% since late 1960s). Another concern raised by water scientists is that the huge water banks in the high mountains (glaciers) are melting. There are evidences that several world glaciers are retreating fast, although there are debates that some of the glaciers may have demonstrated an opposite trend.

The vulnerability of water resources to climate change could be summarized as follows:

- More water may be available in the first few decades but the flows would decrease thereafter due to reduced glacier volumes.
- Changes in the intra-annual pattern of river flows (uneven flows).
- Floods resulting from outburst of glacial lakes (GLOF) may cause severe damages downstream.
- Increased variability of monsoon – Increased risks of floods and droughts.
- Reduction in capacity of natural reservoirs due to rise in snowline
- Drying up of mountain springs and glacial streams.

As a result of these factors, the availability of water for agriculture, industrial and domestic sectors will continue to reduce. Serious efforts for water conservation and maximum efforts for storing excess flows during summers are highly needed to prepare for this scenario.

Pakistan glaciers

Glaciers in Pakistan cover 13,680 square kilometers or 13% of the mountain regions of the Upper Indus Basin (UIB). Water from annual glacier melt contributes to more than 60% of the flow from the UIB. The World Bank in 2006 projected that “Western Himalayan glaciers will retreat for the next 50 years causing increase in Indus River flows. Then the glacier will be empty, resulting in a decrease of flows by up to 30% to 40% over the subsequent fifty years”. Moreover, IPCC in its 4th Assessment Report presented in 2007 provided that “glacier melt in the Himalayas is projected to increase flooding within the next 2 to 3 decades. This will be followed by decreased river flows as the glaciers recede”. In 1999, the International Commission for Snow and Ice reported that glaciers in the Himalayas are receding faster than in any other part of the world and that if the present rate continued, the likelihood of them disappearing by 2035 is very high. However, in 2005, Dr. Ken Hewitt, a famous geo-scientist, reported widespread evidence of glacier

Baltoro glacier is larger now than it was in 1947

There have been several articles in the Pakistani press recently quoting scientists as saying that the glaciers in the Karakoram are actually growing because of the strengthening of the Westerly winds that bring winter snows. The conclusion being drawn is that we need not worry about climate change affecting our water supply adversely! In fact, I have heard some people argue that we might even “benefit” from climate change.

I met the geo-scientist Ken Hewitt who said, “Nowhere in the upper Indus Basin do you have the collapse of glaciers like in Nepal and the Alps. They are actually holding their own or growing. They could well be growing because of climate change. The summer weather is cloudier and there is more snowfall. The Baltoro glacier is larger now than it was in 1947”. Hewitt pointed out that there was a serious need to look closely at what is happening and that more glaciers needed to be tracked. WAPDA, he says, is starting to operate field stations again to monitor the glaciers. Growing glaciers, however, are not exactly good news. Hewitt says: “Surging glaciers are dangerous because they store water. The Hunza River has declined by 20% due to the advance of glaciers in the area. These glaciers are storing ice. This is a different problem and needs to be investigated”.

Source: Rina Saeed Khan. The Great Glacier Debate, Climate Change Media Partnership, 2009.

Photo: Nisar Malik



expansion in the late 1990s in the Central Karakoram in contrast to a worldwide decline of mountain glaciers. Nevertheless, it is debatable according to him if this expansion is a positive development. Another question is about the depth of glaciers which is not necessarily explained by expansion, suggesting that expanded glaciers may be thinner and could be subject to melting rather earlier. This debate shows that often claims regarding glacial retreat or expansion are generalized and are based on assumptions.

Fisheries and coastal zones

Fisheries and coastal zones are highly climate-sensitive. At higher elevations, fisheries are likely to be adversely affected by lower availability of oxygen due to a rise in surface air temperatures. In the plains, the timing and amount of precipitation could affect the migration of fish species from the rivers to the flood plains for spawning, dispersal, and growth (FAO 2003). Future changes in ocean currents, sea level, sea water temperatures, salinity, wind speed and direction, and predators' response to climate change have the potential to substantially alter fish breeding habitats and food supply for fish and ultimately the abundance of fish population in Asian waters.

Similarly, inundation of coastal areas will pose risk to mangrove forests, coral reefs, breeding ground of fish and infrastructure. Upstream intrusion of saline water in the Indus delta will pose risk to agriculture, fresh drinking water and livelihood of dependent communities. Thousands of hectares of fertile soil will become saline. Temperature increases could also adversely affect local flora and fauna of coastal areas, as well as the biological equilibrium of marine life. Even with drastic reductions in GHG emissions, sea level will continue to rise for centuries beyond 2100 because of the long response time of the global ocean system.

Human health and dimensions

Mankind is vulnerable to climate change. As climate change progresses and its manifestations become more prevalent, humans are increasingly exposed to its impacts.

The build-up of high concentrations of air pollutants such as CO₂, NO₂, ozone, and air-borne particulates in large urban areas will lead to adverse health impacts. Increased incidence of respiratory and cardio-vascular diseases is also expected. Likewise, increase in the incidence of vector borne diseases and epidemics like malaria, dengue fever, etc. are also likely to occur.

Climate change will affect everyone especially the elderly, women and children who are the most vulnerable. Heat strokes, heat exhaustion and incidence of weakened immune systems are likely to increase. Another huge impact on human beings is caused by events due to climatic extremes. Climate refugees are expected to increase with the increasing number of disasters such as droughts and floods.

Energy

As climate changes, dependence on energy is expected to increase. Manifestations of climate change coupled with the increase of population will mean a larger dependence on energy sources, e.g. more food to be cooked, need to maintain homes in comfortable temperatures, more transportation requirement, etc. In the hydropower sector, it is foreseen that generation of energy will decline due to lower water supply.

Windmills as a mechanism in harnessing wind power will be vulnerable in coastal areas due to increased cyclonic activity. Similarly, solar energy utilization is expected to be reduced because of increased cloudiness as a result of higher evapo-transpiration.

Given the expected impacts of climate change on different sectors in Pakistan, the survival of people and their livelihood depend on how resilient they will make themselves to increasing risks. The fact is that if people and institutions do nothing in the face of such impacts, the effects of climate change will be felt very strongly and will be devastating in Pakistan.

Adaptation and mitigation – concepts differentiated

Since Pakistan's graph for natural disasters is rising over the last few decades, there has been a normal tendency to attend to a 'post disaster situation' in the form of providing relief and rehabilitation. Little has been done on preparedness and risk reduction measures in order to minimize both the impact and the risks from these catastrophes. The discussion on issues and concerns about climate change brings forth two primary concepts: mitigation and adaptation. In simple words, both concepts are hereby defined as follows:

- Mitigation – to curb carbon emissions. Mitigation might be done through the following methods:
 - To do without (change behavior)
 - Emit less (be more efficient)
 - Emit differently (switch fuels or processes)
- Adaptation – learn to live with climate change

Mitigation refers to the measures that can help reduce greenhouse gas (GHG) emissions in the atmosphere e.g. less use of fossil fuels through introduction of new technologies for improved efficiency, alternate cleaner technologies and energy resources, etc. GHG mitigation may also be possible through more afforestation for carbon sequestration or some improved land management practices. In the context of DRR, mitigation refers to the interventions that reduce the risk and occurrence of disasters especially by using preventive measures.

Adaptation refers to adjusting ourselves to the changing scenario of the climate. For instance, if we realize that the growing seasons are now different from the past, or that we have less water than we used to for our crops, how do we adapt our cropping practices? We may need to change varieties, farming systems or cultural practices.

Examples of adaptation measures include watershed management, physical structures for the diversion of floods, earthquake/flood/cyclone resistant houses, etc. At the same time, there are other concepts like early warning systems which can be developed for populations which are highly prone to risks such as droughts or floods as part of the preparedness activities under DRR. This will not only reduce life losses in case of a large scale disaster, but also reduce costs involved in case of post disaster situations. DFID analyses that *for every single US Dollar invested in DRR, 2 - 4 dollars are returned in terms of avoided or reduced disaster impacts*⁹. More recently the Asian Disaster Preparedness Centre (ADPC) showed that for every single US Dollar invested in preparedness for early warning, a return of USD 40.85 in benefits over a ten-year period may be realized.¹⁰

From managing disasters to managing risks

Managing climate risks has existed for some time but pro-actively managing risks through the use of scientifically-generated climate information is a fairly recent development. Climate information may be grouped into four broad categories, namely:

- 1) Historical climate data;
- 2) Current climate information (real-time) and observable trends;
- 3) Climate forecasts (medium-range, extended range, and seasonal); and
- 4) Projection of long-term climate change scenarios

Climate information provides institutions with tools to understand, anticipate, and respond to the opportunities and challenges brought about by the climatic system. It can be used to improve policy making outcomes and avoid anti-developmental consequences, such as crop failures, flood damage, disease outbreaks, and livelihood losses.

⁹ Reducing the Risk of Disasters – Helping to Achieve Sustainable Poverty Reduction in a Vulnerable World: A DFID policy paper (2006).

¹⁰ ADPC, 2009, Climate Forecast Application in Bangladesh. Final Report on 'Long Lead Flood Forecasting for Disaster Preparedness' and Report on " Post Flood Assessment 2008- Community Response to Early Warning"



Chapter 04

ADAPTIVE MECHANISMS AND COPING STRATEGIES



Most countries are giving importance to both climate change mitigation and adaptation measures necessary to address climate change issues and concerns without compromising their growth and sustainable development objectives. On the basis of strategies and introduced/implemented interventions in other countries, a logical conclusion would be that Pakistan should also apply initiatives similar to those implemented by other developing countries. As part of the mitigation measures, the proposed actions should cover sectors in the economy such as agriculture, water, energy, transportation and forestry.

Climate does not change overnight. Full blown alterations in temperature brought about by climate change will not be felt until the end of the century. However, manifestations of change are already evident. Climatic variability, incidences of climate extremes and shocks, among others, have certainly increased.

While mitigation seems an ideal course, its defined targets and means to achieve such targets are “ambitious” and under the current circumstances might not be “do-able”. Though many countries have been campaigning for energy efficiency, the bulk of anthropogenic activities and reliance on energy make it impossible to have a substantial impact on lowering carbon emissions. As a matter of contradiction, big carbon-emitting countries still continue to profusely emit carbon for economic reasons. On the contrary, sustaining development through economic activities is very important in developing countries like Pakistan. Therefore while mitigation has its own significance, it is more important for such countries to learn to live with climate change. The objective of climate change adaptation is to minimize the risk (climate as a threat/hazard) and maximize the opportunities (climate as a resource).

A. Climate Change Mitigation through CDM

As mentioned in the previous chapters, Clean Development Mechanism (CDM) introduced under the Kyoto Protocol is a cost effective option to mitigate climate change. It has been introduced particularly to initiate climate friendly projects in developing countries. The following are provided under the CDM:

- Assist developing countries in sustainable development while at the same time contributing to the ultimate objective of the convention;
- Developed countries to support project activities that reduce GHG emissions in the developing countries in return for certified emission reductions (CERs)
- The CERs generated by such project activities can be used by developed countries as credits to meet their emission targets under the Protocol.

In CDM, the usually accepted sustainable criteria which a host country has to approve are social, economic and environmental well-being for its people. In practice, emphasis is mainly on large-scale CDM projects in the industrial sector that may not bring direct benefits to poor communities/households. Small scale community/household-based CDM projects when implemented particularly in the area of renewable energy (biomass, wind, hydro, solar) and energy efficiency (efficient lighting, efficient cooking stoves) have proved sustainable development benefits for the communities/households. The following are the eligible/potential sectors for CDM projects:

Table 4: Sectors for CDM Projects

• Energy	<ul style="list-style-type: none"> • Renewable/alternative energy • Energy efficiency/conservation • Fossil fuel cogeneration • Gas flaring and recycling
• Waste Management	<ul style="list-style-type: none"> • Landfill gas capture • Recycling/composting • Energy from solid waste/animal waste, etc.
• Transportation	<ul style="list-style-type: none"> • Alternative fuel vehicles (CNG, bio-diesel) • Mass transit systems • Cleaner engines
• Industrial Processes	<ul style="list-style-type: none"> • Sugar, cement, fertilizer, textile, paper, steel, bricks, etc.
• Land, Land Use and Forestry	<ul style="list-style-type: none"> • Afforestation and reforestation
• Agriculture and livestock practices	<ul style="list-style-type: none"> • Cattle waste, rice fields, etc.

CDM has given Pakistan an opportunity to finance sustainable development projects which have the potential to reduce GHGs in the atmosphere in the fields of energy efficiency, renewable energy and waste management. Pakistan is expected to gain a number of advantages from the CDM projects, viz:

- a) Provide additional energy sources (energy efficiency and renewable/alternate energies);
- b) Save foreign exchange through reduction of usage of fossil fuel;
- c) Help make projects viable with carbon revenues which otherwise would not have been considered as viable by investors/leading institutions;
- d) Attract additional private sector financing for local sustainable development priorities;
- e) Serve as an instrument for the transfer of "appropriate" technologies; and
- f) Help solve local environmental issues such as air and water pollution, municipal solid waste management and other related concerns.

The CDM project approval is a lengthy process that involves project identification and formulation, host country approval, validation, registration, implementation and monitoring, verification, certification and issuance of CERs. On a global scale, a total of 1,750 CDM activities have been registered with

China (34.23% of the total number registered worldwide) and India (following with 25.60%). Energy (renewable/non-renewable sources), holds the highest registration with 59.50%. In Pakistan there are more than 30 CDM projects in the pipeline while only 2 were registered with the CDM Executive Board. There are no community-based CDM projects in Pakistan.

Pakistan lacks local capacity in establishing baseline emissions, conceptualization, Project Design Document (PDD) development under CDM and passing through the CDM registration process. Relevant policies (i.e. Renewable Energy Policy, Draft Energy Efficiency Policy, etc.) are aligned with CDM policy. Awareness raising, capacity building, encouraging community/household CDM projects, strong supportive institutional framework and development of programs on the most viable sectors are needed to harness potential of CDM in the country.



B. Climate Change Adaptation through CRM approach

Climate Risk Management is essential to:

- a) ensure that development does not create new or additional climate vulnerability;
- b) buffer the different sectors from adverse impacts of climate change since it is a cross-cutting issue.
- c) protect development from climate shocks (prevent potential reversal of development gains)

The climate risk management approach to climate change adaptation emphasizes the development of coping strategies for current climate variability based on anticipation of changes. In order to maximize the opportunities based on future climate scenarios, adaptation to climate change should be integrated into development planning. The climate risk management approach also considers:

- a) Evidence-based decision-making in climate-sensitive sectors (proactive and precautionary);
- b) Use of climate information in an inter-disciplinary and multi-stakeholder context;
- c) Means to achieve broader development goals (sustainable development, disaster risk reduction, poverty alleviation, etc.); and
- d) Partnership of national, sub-national and community-based institutions

Climate Change stakeholder mapping and power analysis

The essence of the climate risk management approach is the linkage of science, institutions and societies to build resilience of communities in coping with changes, extremes and shocks. A look into the institutional and inter-institutional framework of organizations in Pakistan reveals that the current state of climate information systems at the federal and provincial levels is weak because of limitations of institutional capacity. Investment on building institutional capacities of primary and frontline agencies for climate information and communication remains inadequate. There is also an increasing need for scientific information to be adapted to local needs.



Case Study 1: Climate Change Stakeholder Mapping and Power Analysis (Presentation made by Dr. Sajidin Hussain from a study conducted for Oxfam GB)

Per result of the study, the following are the climate change policy priority needs in Pakistan:

- National climate change adaptation policy as envisaged in the National Environmental Policy
- National level support to meet financial needs as well as institutional/infrastructure development and capacity building needs
- Adaptation to climate change remains the first priority but attention should also be given to climate change mitigation through increased efficiency in the energy sector, introduction of renewable/alternate energy technologies and minimizing industrial pollution
- Focus should also be given on preparedness. Early warning systems and vulnerabilities/risk assessments should be implemented/conducted to reduce impacts
- A comprehensive research covering all diverse regions and sectors has to be undertaken
- Local testing of the proposed adaptation measures and a feedback on best practices and indigenous knowledge for adaptation would be necessary for developing adaptation strategy and action plan based on needs and priorities of the grass roots communities
- Awareness raising campaign through NGO fora should be initiated to inform policy makers, scientists, politicians, business community, media and civil society
- Mandatory involvement of private sector to allocate funds for adaptation to climate change.

Early preparedness

Many countries which are prone to hazards (i.e. flood and drought) have developed and implemented initiatives to minimize the impacts of climate risks. Some of such initiatives have indeed produced good results in terms of saving lives, avoiding huge economic losses to the country in managing climate refugees and tangible economic benefits to the communities. Some of the important elements of early preparedness are as follows:

Timely climate / weather information

The key is correct and timely weather / climate forecast which can ultimately be translated to user's context. This follows assessing and translating its likely impact for various sectors. For instance, an



early forecast for a strong El Nino year can be produced by climatologists at least six months in advance (case study 2). This information must quickly flow down to all sorts of users for preparing plans for the year in various sectors. In urban areas, for instance, it would be essential to plan energy supply to households and industrial units since a higher pressure must be expected due to huge power needs for combating with high temperatures. In rural areas, drought may be expected and farmers have to plan their food crops in a manner that they do not record substantial losses, especially in case of subsistence farms. The strategies for preparedness will be more relevant if the messages regarding climatic events are transmitted in an understandable manner. Weather / climate information

must be translated for a common person's use and should quickly flow down to users for their adaptation and preparedness.

Case Study 2

Climate Forecast Applications for Disaster Mitigation in Indonesia and Philippines

(Condensed from the presentation made by Ruby Rose Policarpio)

The El Nino years of 1997-1998 demonstrated that the availability of forecasts would not necessarily translate into action on part of the stakeholders.

In the Philippines and Indonesia, forecast of the occurrence of a strong El Nino was released by the national meteorological agencies in both countries 6 months prior to the event. Yet, the institutional linkages and measures that would mitigate the impacts of the forecasted event were not put in place. As a result, both countries were hit hard by the El Nino, especially in the agriculture sector. A study of the 1997-1998 El Nino in both countries revealed that usable climate information in both countries was not available due to the following:

- 1.) absence of participatory mechanism for identifying user forecast requirements;
- 2.) available climate information was not tailored to users' needs and requirements;
- 3.) weak forecast producer-user communication channel;
- 4.) users have difficulty understanding forecast language;
- 5.) community-level dissemination is weak;
- 6.) users have no mechanism for processing climate information once it is received ;
- 7.) feedback channel from forecast user to producer is weak or non-existent

The Climate Forecast Applications for Disaster Mitigation Program in Indonesia and Philippines aimed to address the above-identified gaps in climate forecast application. It was implemented by the ADPC with support from the Office of Foreign Disaster Assistance (OFDA) of the USAID. ADPC worked on linking the hydromet agencies, agriculture agencies and the end users in both countries following an end-to-end climate information, generation and application system. Pilot sites were identified. These were the Municipality of Dumangas in the Philippines and the District of Indramayu in West Java, Indonesia. In both pilot sites initiatives were undertaken to address the gaps above identified and connect the science of climate forecast generation and forecast application by end-users. The CFA project achieved 5 major outcomes:

1. Establishing institutional mechanisms that connect hydro-meteorological communities, risk management institutions and societies;
2. A pool of meteorologists formed to provide tailored climate information. Through their interactions with institutions and communities under the program, they understand that meteorologists should not just produce information but have to relate to the end-user context;
3. Institutional and community level dissemination channels in demonstration sites strengthened. Community's capacity to use climate information have been built primarily through the Climate Field School, climate forum and community-level workshops;
4. Forecast application for disaster mitigation is now internalized and owned by local governments

Lesson learned:

Weather/ climate information can save lives and produce tangible economic results.

Participation / social coherence

This element helps in preparedness in many ways:

- a) Communities with strong social coherence can produce useful monitoring indicators on climate changes through sharing and collective opinion.
- b) Researchers, in collaboration with disaster-prone communities, can design their research programmes to complement scientific knowledge with local know-how.
- c) Early preparedness is largely facilitated by community participation, especially when they are eager to assume responsibilities. No external organization can have resources which can cater for all aspects in case of a wide-scale risk factor.
- d) In case of disaster, community participation serves as a quick outreach factor to provide relief and assistance.

Case Study 3

Participatory methods and tools for climate change adaptation

(Condensed from the presentation of Ms. Javeria Afzal, Oxfam GB)

A study on impacts of and community perceptions on climate change was conducted by Oxfam GB. The study focused on the disaster-prone communities of Badin, Rajanpur and Khuzdar.

The study methodology included:

- 1) Study correlation of past trends and future modeling on climate change based on international and local research;
- 2) Ground truth results of this activity against the perceptions of the communities in Badin, Rajanpur and Khuzdar; and
- 3) Correlation of community perceptions and research will lead to the development of "systems" to prepare communities for the impact of climate change.

The study revealed the following impact on the communities:

- Increased intensity of extreme events
- There is sea intrusion of 50 kilometers inland
- Brackish groundwater/land degradation
- Traditional coping mechanisms insufficient
- Seasonal in-migration
- Summers have become hotter and winters have become much warmer
- Bund height was insufficient
- Marginalized communities are unable to grow second crops due to summer floods
- Rangelands are sinking and grass quality is deteriorating, hence reduced livestock productivity

Learning:

- There is strong correlation between research and community feedback; therefore, future projections for climate change coming from communities may be used.
- It is important to translate research results for communities.
- Communities can recommend useful monitoring indicators on climate.

Climate change monitoring indicators may include: Changes in temperatures, history of extreme weather events, level and quality of groundwater, extent of sea intrusion, sea surface temperature, changes in extent of vegetation, livestock health and performance, crop yields, fish/prawn catch and locations, fuel consumed for heating, changes in dwelling construction style, etc.

Adaptation to climate change could be done through the following:

- 1) Identification of current climate-related vulnerabilities
- 2) Assessment as to why communities are vulnerable
- 3) Designing of interventions that help communities become less vulnerable
- 4) Understanding future climate
- 5) Understanding future opportunities or vulnerabilities the future climate may cause
- 6) Designing of interventions that will empower communities to respond to such opportunities or vulnerabilities through incorporating into development plans.

Although participation is not a final solution or a remedy to climate change related risks, it can serve as a medium for disseminating information, seeking local and indigenous feedback on climate change dynamics and ultimately reducing collective risk of disaster prone communities.

Case Study 4

Information Management and data base systems Climate Change disaster preparedness Hazard, Livelihood, Vulnerability (HLV) baseline and contingency planning project

(Condensed from a presentation made by Dr. Sajidin Hussain)

Pilot areas:

Province	District	Main Natural hazards
Sindh	Badin	Monsoon flood and cyclone
Sindh	Tharparkar	Drought
Punjab	Rajanpur	Riverine flood, flash flood
AJK	Bagh	Earthquake, landslide, flash flood, snow, windstorm
Northern Areas	Astore	Glacial outburst, landslide, flash flood, snow, windstorm

The methodology for the study included participatory methods like group discussions to obtain qualitative/quantitative data from field using participatory risk assessment tools, triangulation of field findings with secondary data and WFP food security questionnaire.

Focusing on Badin, key livelihood means are fishing and agriculture. The study also took stock of the wealth / vulnerability status of the fishing community, as follows:

Livelihood group	Characteristics	Wealth and vulnerability status	Proportion in overall population
Boat owners/ large net owners (225 boat and 200 net owners)	<ul style="list-style-type: none"> Hire 2-3 labors for fishing. 5% of the HH own livestock 2% HH own/cultivate land (16-20 acres farm size, about 3 acres cultivated). Motorbike 1 – 2 pick-ups in the whole area. 	Better off	15%
Small net owners (Bhan)	<ul style="list-style-type: none"> 2-3 Bhans / HH on average Wage labour (agriculture) and some wood cutting. 10% HH own livestock 10% HH own and cultivate land (partly cultivated) Motor bike with almost every HH. Do some migrant labour in off season (10%), go to Golarch for rice harvesting. 	Medium	60%
No net, no boat (Mari)	<ul style="list-style-type: none"> Daily wage labour for fishing (hired by boat owners) Labour in cities (during off season) 5% HH keep small livestock Wood cutter/charcoal labour 	Poor	25%

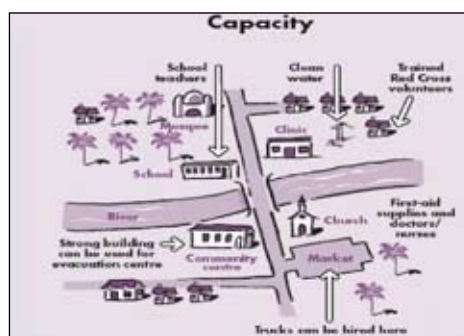
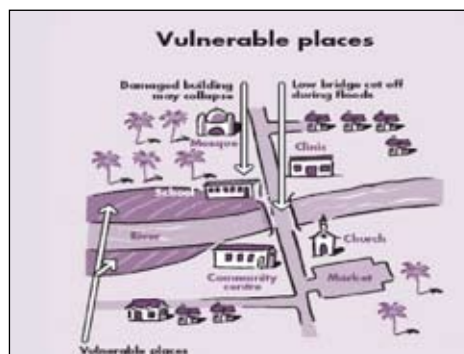
Seasonal activities were noted as well the impacts of cyclones on the fishing community. Response options were identified. The longer-term risk reduction priorities identified in the study are as follows:

- Improved construction of housing – raised platforms, relocation onto higher ground.
- Capacity building for livelihood diversification (e.g. micro-credit and agricultural diversification).
- Improved maintenance of Left Bank Outfall Drain (LBOD) to reduce flooding and salinisation of soil.
- Improved irrigation practices in areas further north to reduce salinisation of soil.

Vulnerability assessment

An assessment on vulnerability to hazards aims at having a deeper insight about areas prone to hazards/disasters, what are the kinds of hazards/disasters risks, their frequency and intensity. It gives an understanding of how communities can cope with disaster risks and who remain most vulnerable? Good quality information and analyses leads to chalk out an action plan for development interventions to create resilience. Based on the situation, a combination of methods/exercises can be used to ascertain the required information/data:

1. Know the potential disasters and disaster prone areas within your project: Quick appraisals of potential for DRR and resilience. Communities' knowledge can be highly useful in this exercise. They can help identify risks and frequency and can also rank disaster risks in the order of priority in which their lives and livelihoods are affected.
2. Conduct vulnerability / hazards assessment
 - a) Identification of hazards/ disaster prone areas through mapping (see examples).
 - b) Take historical accounts of disasters and extreme climatic events
 - c) A seasonal calendar of disasters / risks can be a good exercise to show anticipation of a disaster in a particular time of the year
 - d) How do they cope with the disaster/ minimize hazard – take stock of their indigenous warning systems with the help of which they try to avoid risks.
3. Analyze the information/data, draw conclusions and share them with the community.
4. Based on the nature of hazard risks, devise interventions comprising of capacity building of community in disaster risk management as well as mitigation and adaptation measures.



Possible tools for this exercise are focused group discussions or brain storming sessions involving a mix of elderly and young, men and women in the community, probing techniques and continuously observing the surroundings.

Case study 5

SDC/IC Livelihoods Programme

Disaster risk reduction in Wagi Banda Village, District Karak

Proposed Action Plan

On the basis of hazard assessment exercise conducted in Wagi Banda village, following conclusions were drawn. The hazards identified in order of severity and frequency for undertaking interventions to minimize the risks/damages:

1. Flood - every year in July & Aug. Usually devastating
 - Depending on the situation, possible interventions could be: Identification of vulnerable places.
 - Construction of protection structures with vegetation at those places.
 - Construction of flood water storage facility with vegetation.
 - Community owns the Operation and Maintenance system for structures.
 - Installation of flood gauges at most vulnerable points.
 - Identification of roles and responsibilities among communities and other stakeholders.
1. Windstorm – every year in May, June, July, Aug. Mostly devastating
 - Possible interventions:
 - Planting wind break.
 - Identification of roles and responsibilities among communities and other stakeholders.
2. Drought – every 2nd year in May, June, Oct, Nov, Dec. Mostly devastating
 - Possible interventions:
 - Rain-water storage.
 - Dryland management/moisture conservation techniques including plantations.
 - Introduction of drought resistant crop varieties.
 - Sand dunes stabilization.
 - Identification of roles and responsibilities among communities and other stakeholders.
3. Lightning – every 2nd year. Threatening and sometimes damaging
 - Possible interventions:
 - Installation of earthing equipment (lightning arresters) on the top of the tallest buildings.

Common interventions:

- Orientation of community to CC/DRR.
- Training of community/activists in disaster management including first-aid.
- Strengthening indigenous early warning systems or in their absence introduction of new EWS through community participation.
- Establishment of linkages between community and district MET office/agriculture department for early warning.
- Facilitate community for making emergency preparedness plan (should be translated in local language and/or in Urdu and shared with community).
- In case of annual recurrence of disasters, communities to develop a checklist for arrangements before the occurrence of disaster.

Institutional mechanism to manage risks:

Institutional collaboration and mechanisms contribute to organizing necessary networks with complementary strengths.

One UN/NDMA Joint Disaster Risk Management Programme in Pakistan is an example. As part of the UN reform process where disaster risk management is one of its thematic areas, the One UN/NDMA Joint Disaster Risk Management Programme is being implemented in Pakistan. UN agencies involved in the program are UNDP, WFP, FAO, UNESCO, UN HABITAT, ILO, UNFPA, UNHCR, WHO, UNIFEM, UNAIDS and IOM. Under the programme, an integrated concept of disaster risk management has been adopted.

Similar coordinated mechanisms can be worked out by other organizations, NGOs and government institutions aiming at disaster risk management and preparedness.



Case Study 6

Outcomes and outputs under the One UN/NDMA Joint DRM programme:

(Condensed from the presentation made by Dr. Sajidin Hussain)

The One UN/UNDMA Joint Programme in Disaster Risk Management focuses on principal guiding criteria, as follows:

- Pro-poor focus – targeting the groups at the lower end of the socio-economic indicator ranks, as well as those prone to specific environmental conditions and disaster risks.
- Federal-Provincial balance – balance on the interest and expectations of the federal and provincial governments as well as the emerging needs of district and local communities.
- Builds on past experience – lessons learned from existing and past programs will guide the adaptation of rational, harmonized and workable systems suited to Pakistan’s conditions for delivery of impact.
- Sustainability – ensure that future programmes/projects developed in line with UN objectives and in accordance with national priorities of the Pakistan Government will contain inbuilt financial mechanisms for sustainability through pilot projects to become a showcase for reference/ replication.

Outcomes	Outputs
1. Strengthened policies, norms (gender/rights-based), institutional and coordination mechanisms for DRM with emphasis on preparedness and response	<ul style="list-style-type: none"> • Advocacy for coherent legal, regulatory, and policy framework for DRM covering federal, provincial and district levels • Disaster management authorities and other relevant institutions including sector-specific line departments at national, provincial and district levels strengthened in preparedness and response • Disaster preparedness and response plans at various levels with clearly defined roles of government departments, NGOs, private sector, and civil society organizations • Joint contingency plan of government and UN for large scale disaster response and recovery • Mainstream DRM in policy sectors with the objective of making DRM and climate risk management an inter-sectoral programme
2. Reliable integrated multi-sectoral knowledge, information and communication system developed for DRM that reaches out to the grass roots level.	<ol style="list-style-type: none"> 1. Establish Early Warning Systems and disaster loss databases for major hydro meteorological, geophysical and communicable diseases-related hazards and food security 2. Development of hazard risk and vulnerability assessment for all major hydro-meteorological, geophysical and communicable diseases-related hazards
3. Capacities of key educational and training institutions and professional bodies enhanced for development of human resources for disaster risk reduction and response	<ol style="list-style-type: none"> 1. Inclusion of DRR and response subjects in curricula for architecture, engineering, medicine and agriculture/fishery 2. Curricula/modules on DRR and response developed and introduced in pre- and in-service training of selected public sector and armed forces training institutions 3. Prepare master trainers and cadres of education, health and agriculture personnel with the ability to plan appropriate responses and respond to emergencies 4. Develop expertise of construction workers in disaster-preventive construction technologies in 3 priority trades in high risk regions 5. A comprehensive pilot School Safety Program for primary and secondary schools introduced.
4. Vulnerable groups, grassroots organizations and local authorities in high risk areas empowered with resources and capacities to prepare for, respond to and recover from disasters.	<ul style="list-style-type: none"> • Strengthen local DRM mechanisms in high-risk areas in 20 districts including 8 cities • Community-based mitigation and preparedness programs in 20 districts

Indigenous knowledge based Early Warning System

In the world, many indigenous early warning indicators for climate-related hazards are being used. Though correlation between the said indigenous early warning indicators and scientific weather and climate indicators has not been established yet, the former have served effectively in giving early warning to communities in view of the weather or climate ahead that helped them overcome potential disaster risks.

Case study 7 is a documentation of the indigenous early warning indicators for drought in the district of Tharparkar, Sindh Province of Pakistan.

Case Study 7

Indigenous knowledge-based Early Warning System (EWS) indicators for drought in Tharparkar

(Summarized from the study presented by Mr. Girma Makonnen World Food Programme)

Area studied	: Tharparkar
Area	: 20,000 square kilometers
Population	: 1.24 million
Cultivated area	: 759,000 hectares
Agriculture	: 98.4% rainfed – dependent on monsoon rains
Climate	: highly drought prone
Normal Year Rainfall	: 200-300 mm

Drought History

Per recorded major drought events in Tharparkar since 1956 to 1995 had severe impacts on the communities. Droughts from 2001 to 2008 impacted moderately on the affected areas.

Community Early Warning Indicators include the following:

- Wind direction and speed
- Morning dew quantity
- Plant behaviors
- Animal behaviors
- Lightning and thunder

Conclusion:

- 1) Indigenous knowledge-based indicators have evolved over time with communities' experiences and folk wisdom
- 2) Communities start monitoring closely the weather conditions, especially wind directions and temperature from April to early July
- 3) Communities also observe the behavior of flora and fauna
- 4) Such indigenous knowledge has been passed over the generations
- 5) Indigenous knowledge is not well conceived in the young generation
- 6) It is anticipated that the community-based EWS could help in retaining this indigenous knowledge
- 7) Little variation was observed across Thar agro-ecology, proving that the community indicators, by and large, are credible.

Integrating climate change adaptation into development planning

This starts with risk assessment and analysis. In risk assessment and analysis, we take stock of the hazards affecting the community, the vulnerabilities of the community vis-à-vis the hazard affecting it and the capacities of the community to overcome the hazard.

Approaches and mechanisms in dealing with climate change will depend on the result of the risk assessment/analysis. The said approaches and mechanisms relative to climate change adaptation will eventually lead to the overall goal of the least number of people vulnerable at a certain period

of time. The effectiveness of plans in relation to climate change and development are measured to ensure that the said plans are in line with the developmental goals that have been set. Possible areas of integration include:

- Developmental – in the wake of the climate change challenge, development would inevitably point to the thriving of people's livelihoods. Most livelihoods like agriculture and fisheries, to mention a few, are climate sensitive so being similar to climate changes, livelihoods should also change.
- Sectoral – the impacts of climate change will not spare any sector of the society. The best and most efficient way therefore to integrate climate change adaptation into development planning is to integrate on a sectoral scheme where institutional frameworks, human resource, linkages, machineries, among others, already exist.
- Financial – supporting plans and planned initiatives with financial resources. In many governments, plans fail to materialize because of the lack of financial resources and therefore machinery, to be implemented.

Livelihoods Programme (LP) Integrating DRR

From the beginning, Intercooperation has been working in situations where climate change and disaster risks were high. Often communities faced disasters of various kinds. In such cases when a disaster had occurred, IC's response was to provide immediate relief and later rehabilitation of affected partner communities. Over recent years, IC and its partners have gained a collective understanding that the theme of disasters risk reduction should be mainstreamed in the development programmes due to its direct link with communities' livelihoods and vulnerability.

The Livelihoods Programme is funded by Swiss Agency for Development and Cooperation and implemented by Intercooperation in collaboration with the Planning and Development Department GoNWFP. LP is one such example in which DRR practices, tailored to specific programme contexts, have been ensured for a wider integration in its development operation. Out of 7 development outputs the programme has laid out in its planning matrix, one is fully devoted to building an understanding on reducing disaster risks, enhancing preparedness mechanisms at community level and building capacities at various levels on the theme. At the same time reducing vulnerabilities through various measures has been integrated in all other outputs and interventions.

Recent initiatives:

1. Hazards / risk assessment in districts Karak and Chitral
2. Documentation of indigenous knowledge of communities in districts DI Khan and Chitral on climate change and possible hazards and risks (e.g. drought).
3. Physical measures to protect settlement from floods and land slips
4. Reclaiming marginal lands through fertility enhancement and dryland management
5. Introducing adaptation in cropping systems through early food varieties
6. On farm water management and counseling on appropriate use of water depth for irrigation

Future:

1. The programme will build on successful experiences made so far and up-scale them (e.g. flood protection, dryland management).
2. Develop early warning system using communities' indigenous knowledge coupled with scientific information which can be translated by communities.
3. Continue to sensitize partners / service providers on DRR, especially as caused by changing climate.

Recent initiatives in Pakistan on disaster risk management

Currently in Pakistan, some initiatives on disaster risk management are already in place while others are in the pipeline. Few major examples are as follows:

- Basic legislative arrangements for disaster risk management (Ordinance XL, December 2006)
- National Disaster Management Commission
- Disaster Management Authorities at National (NDMA), Provincial (PDMA) and District (DDMA) levels, are in the process of establishment
- National Disaster Risk Management Framework (NDRMF) in place
- Disaster Risk Management Programme of the One-UN/NDMA
- Flood Commission
- Response capacity in various departments/sectors
- Civil societies – the Red Crescent, charity organizations and various NGOs which provide relief efforts
- 2005 earthquake experience in terms of experienced CBOs and NGOs.

All the above-mentioned initiatives put together, can contribute to a good start in outlining disaster risk management and preparedness strategies at various levels. Disaster risk reduction requires interventions that include policies, legislations and information management systems (mapping of hazards, vulnerabilities and risks, livelihood assessments, and early warning system for major hazards). Focus should also be given to locally-based adaptation measures to cope with climate change and disasters focusing on risk reduction and preparedness of communities.

Though processes for climate change mitigation and adaptation in Pakistan have been initiated, there is still no established national policy/strategy on climate change in the country. Contrary to what was envisaged in the National Environment Policy for the country to a) effectively participate in the global climate change dialogue; and b) prepare for addressing the issue, especially adaptation to climate change/extreme climatic events caused by climatic variability, Pakistan lacks Climate Change Policy and Action Plan. There is limited research effort to understand the problem and devise actions to address such problems. Furthermore, the only research, conducted so far by research organizations and international NGOs, has been funded only through donor support, on ad hoc basis.

Little effort has been made for addressing vulnerability of the poor and the communities at risk. Funding for adaptation is a major constraint in Pakistan. Much of the country's resources still go to disaster response.





Chapter 05

WAY FORWARD FOR PAKISTAN



Disaster risk management is an entry point to climate change adaptation. We must start with 'us' – in our own positions. We need to influence whatever action plans our organizations prepare and implement. We need to integrate climate change/DRR related activities into our own work. Some of the sectors may be more vulnerable than others and some may offer support roles. Water and agriculture are the most vulnerable sectors which can step in to reduce vulnerability of farmers and the nation as a whole. Other initiatives may include health, early warning systems and climate-resilient buildings. Education, technology sectors and NGOs on the other hand can systematically strengthen a support role to enhance awareness and provide means to address the challenge.

Begin with self – changing attitudes

Many of us still consider the theme as a far fetched global discussion. We must change our own attitude and try to learn to link things happening closely around us with global phenomena. Do we have longer and more intense summers, warmer or colder winters, longer dry spells, untimely rains, food shortages, etc.? If yes, it is logical to conclude that something changing in the globe also affects us individually. Hence as individuals, active in any discipline, we must learn to live with changing climate and contribute to be part of simple measures which reduce the impact of such phenomena. The awareness of the politicians, media and common masses must be raised on climate change and risks or opportunities attached to this change.

The Communities knowledge – an asset for building early warning systems

At the same time, community based awareness is a must and their indigenous knowledge is a great asset that should be utilized for addressing and adapting to the climate change. Complementing this with scientific knowledge is important so that we fully understand the issue and pass on the knowledge and proposed actions to the policy makers and politicians to take timely decisions. Early warning system is one tool that can make an effective use of the existing indigenous and scientific knowledge in the community.

Strategy for climate change adaptation

We have not yet developed a strategy on climate change adaptation. The issue of vulnerability has also not been studied yet at all so that we could know who are the most vulnerable to climate change and who are at the largest risk to the changing climate/variability in the country? Pakistan being largely an agrarian economy with a large population (more than 60%) dependent on agriculture especially in the rural areas, is at risk from the impact of climate change and related hazards. The most urgent need is to address the issue of food security in the country in the changing scenario. Hence, the agriculture sector should look into adaptation without any loss of time! There is one strategy that can help – context specific options must be studied and taken up with farmers.

Beyond awareness – Building capacity on adaptation and mitigation

Climate change adaptation needs utmost political and government commitment. Other sectors like media and the private sector should be aware of the issues and concerns on climate change. Pakistan drastically lags far behind in integrating climate change considerations into development planning, policies and actions. There has been limited work done to promote scientific research. The same goes for mitigation and adaptation. Pakistan has hardly any local capacity in developing CDM projects, due to which we do not receive much benefits which we could as a country through carbon financing.

Clean Development Mechanism – late arrival but on fast track

The Clean Development Mechanism is a great opportunity for Pakistan yet it stands largely untapped due to being a late comer in this mechanism. Pakistan can explore several potential areas through it and can sell reduction of greenhouse gases as credits. These financial benefits, in a flexible market mechanism, can bring a substantial benefit to the country in the form of additional revenues, technology transfer and added sustainable development practices. Energy, transport and forestry can bring the most wanted and significant start in this regard.

Organisations to take a stand

National and international NGOs promoting climate change theme are important players but it is essential that they adapt their roles with time. A classical approach aiming only at 'raising awareness' on global issues, is just not sufficient. Together with national and local players, they must bring climate change issues and risk management measures closer to the duty bearers and people who are likely to be affected by those risks.

Institutional collaboration

The country has a large institutional set-up and can be highly instrumental to timely address the issue. This would however, require a high political commitment and a support which currently is inadequate. Some of the key actors, who can influence the change, include the Ministry of Environment as the focal point on climate change and the Planning Commission, Federal and Provincial Planning and Development Departments, National, Provincial and District Disaster Management Authorities as well as line ministries.

Global negotiations on climate change

The Foreign Office together with the Ministry of Environment represents Pakistan during international events and negotiations. They have an important role to play. They should be well versed with the subject and be well informed about the national priorities at levels including the needs of the rural and urban communities. This would only be possible if the delegation from Pakistan conducts consultative meetings with the experts, involving the relevant stakeholders *before* the international events. On their return it is necessary that *feed-back* is provided on the conclusions and outcomes of the negotiations, along with the implications for Pakistan. Ideally, the delegation attending such negotiations should *not* only defend Pakistan's position in a global articulation but *also* play an active role on its return to guide the main players eventually working in this important arena.

Disaster preparedness at all levels and early warning systems must be on our priority list now. A lot of work is required to ensure this. The price of non action is much higher in the form of life and livelihoods than what is required to adapt to the change which is inevitable!!



ANNEXES

Annex 1

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Annex 3

List of contributions

Sr. No.	Title	Presented by
1.	Global Warming/Climate Change Observations/Predictions	Rosalina G. de Guzman
2.	Introduction to Climate Change and Disaster Risk Management	Dr. Syed Sajidin Hussain
3.	Climate Change in Pakistan Past, Present and Future perspectives	Dr. Ghulam Rasul
4.	Climate Change Related Challenges	Rosalina G. de Guzman
5.	Climate Affairs and Disaster Risk Management	S.H.M. Fakhruddin
6.	Climate Change Impact on Water Resources of Pakistan	Dr. Syed Sajidin Hussain
7.	SDC Tools for Assessment	Iftikhar Hussain
8.	Adaptation Strategies to counter the negative impacts of Climate Change in Agriculture	Dr. M. Mohsin Iqbal
9.	Vulnerability of Pakistan to Climate Change Impacts	Dr. M. Mohsin Iqbal
10.	Livelihood Adaptation to Climate Change in Drought Prone Areas of Bangladesh	S.H.M. Fakhruddin
11.	Participatory methods and tools for Climate Change Adaptation	Javeria Afzal
12.	The Clean Development Mechanism (CDM) under the Kyoto Protocol and its potential in Pakistan	Dr. Syed Sajidin Hussain
13.	Post Kyoto Climate Change Discussions and Way forward	Dr. Syed Sajidin Hussain
14.	Information Management and data base systems for climate change disaster preparedness. A case study by FAO/WFP Hazard, Livelihood, Vulnerability (HLV) Baseline and Contingency Planning Project 2008	Dr. Syed Sajidin Hussain
15.	Community Based Flood Early Warning System	Rosalina G. de Guzman
16.	Indigenous Knowledge-Based Early Warning System (EWS) Indicators for Drought in Tharparkar District	Dr. Syed Sajidin Hussain
17.	A case study Climate Variability in Mountain Regions of Pakistan – Implications for Water and Agriculture	Dr. Syed Sajidin Hussain
18.	Application of Climate Information to decision making for addressing issues and opportunities of climate variability and change – the CFA Philippines and Indonesia Experiences	Ruby Rose Policarpio
19.	Energy Vs Environment Implication in Pakistan	A. N. M. Obaidullah
20.	Integrating climate change adaptation into development planning	Ruby Rose Policarpio
21.	Climate Change: Stakeholder Mapping & Power Analysis	Dr. Syed Sajidin Hussain
22.	Institutional Collaboration to Response, Mitigate and Adapt Climate Change Related Challenges	S.H.M. Fakhruddin
23.	“One” UNNDMA Joint Disaster Risk Management Programme in Pakistan	Dr. Syed Sajidin Hussain



Annex 4

Glossary of Terms



Adaptation (IPCC): Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change. Adaptation refers to adjusting ourselves to the changing scenario of the climate. Learning to live with climate change is called adaptation.

Capacity in disaster risk reduction (UNISDR): A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personnel or collective attributes such as leadership and management. Capacity may also be described as capability

Climate (IPCC): It is an 'average weather' or a statistical description of the weather in terms of the mean and variability of relevant quantities over periods of several decades (typically defined as three decades as defined by WMO). These quantities are most often surface variables such as temperatures, precipitation and wind.

Climate Change (UNFCCC): It is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere which is in addition to natural climate variability observed over a comparable period of time.

Climate Change (UNISDR): Climate is changed if over an extended period (decades or longer) there is a statistically significant change in measurement of either the mean state or variability of the climate for that place or region – may be due to natural processes, or persistent anthropogenic changes in atmosphere or in land use.

Climate variability

Variation in climate that is usually associated with natural causes – unprecedented changes in the climate around the globe.

Coping capacity (UNISDR): The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. This involves managing resources, both in normal times as well as during crises of adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-included hazards.

Disaster (UNISDR): A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources. A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risks.

Disaster Risk Management (UNISDR): The systematic process of using administrative decisions, organizations, operational skills and capacities to implement policies, strategies and coping capabilities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster Risk Reduction (UNISDR): The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development. The disaster risk reduction framework is composed of the following fields of action, as described in ISDR's publication 2002 "Living with Risk: a global review of disaster reduction initiatives", page 23:

- Risk awareness and assessment including hazard analysis and vulnerability/capacity analysis;
- Knowledge development including education, training, research and information;
- Public commitment and institutional frameworks, including organisational, policy, legislation and community action;
- Application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments;
- Early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.

Early warning (UNISDR): The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response. *Early warning systems include a chain of concerns, namely: understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warnings.*

El Niño: El Niño is an oscillation of the ocean-atmosphere system in the tropical Pacific having important consequences for weather around the globe. El Niño is characterized by unusually warm ocean temperatures in the Equatorial Pacific. El Niño is associated with decreased precipitation, droughts and even bush/forest fires.

Emergency management (UNISDR): The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particular preparedness, response and rehabilitation. *Emergency management involves plans, structures and arrangements established to engage the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.*

Environment Impact Assessment (UNISDR): Studies undertaken in order to assess the effect on a specified environment of the introduction of any new factor, which may upset the current ecological balance. *EIA is a policy making tool that serves to provide evidence and analysis of environmental impacts of activities from conception to decision-making. It is utilised extensively in national programming and for international development assistance projects. An EIA must include a detailed risk assessment and provide alternative solutions or options.*

Global warming (ADPC): Increase in the earth's mean temperature due to the so-called enhanced greenhouse effect.

Greenhouse effect (ADPC): The way in which gases in earth atmosphere warm the earth like a glass roof in a greenhouse by letting the sunlight in but keeping the reflected energy trapped inside.

Greenhouse gas (UNISDR): A gas, such as water vapour, carbon dioxide, methane, chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), that absorbs and re-emits infrared radiation, warming the earth's surface and contributing to climate change (UNEP, 1998).

Hazard (UNISDR): A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. *Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability*

La Niña: La Niña is characterized by unusually cold ocean temperatures in the Equatorial Pacific. La Nina impacts tend to be the opposite of El Nino impacts.

Mitigation (IPCC, UNISDR): Measures that can help reduce greenhouse gas (GHG) emissions in the atmosphere. In the context of DRR, mitigation refers to the interventions that reduce the risk and occurrence of disasters especially by using preventive measures. Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Preparedness (UNISDR): Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention (UNISDR): Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters. *Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction changing attitudes and behaviour contribute to promoting a "culture of prevention".*

Recover (UNISDR): Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk. *Recovery (rehabilitation and reconstruction) affords an opportunity to develop and apply disaster risk reduction measures.*

Relief / response (UNISDR): The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

Resilience (UNISDR): The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Risk (UNISDR): The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. *Conventionally risk is expressed by the notation: Risk = Hazards x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.*

Risk Assessment (UNISDR): A methodology to determine the nature and extent of risk by analysing

potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend. *The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.*

Sustainable Development (UNISDR): Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of “needs”, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and the future needs. (Brundtland Commission, 1987). *Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction.*

Vulnerability (UNISDR): The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. *For positive factors, which increase the ability of people to cope with hazards, see definition of capacity.*

Vulnerability assessment: An assessment on vulnerability to hazards aims at having a deeper insight about areas prone to hazards/disasters, what are the kinds of hazards/disasters risks, their frequency and intensity. It gives an understanding of how communities can cope with disaster risks and who remain most vulnerable.

Annex 5

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This synthesis report is derived from inputs and discussions with the participants of the three workshops organized for senior policy makers, planners and operational players on CRM in 2009. An ample effort has been made to extract a simple understanding on the subject with examples and suggestions on possible measures which if implemented can contribute to concrete results in the field. The folder also compiles all the inputs provided by the resource persons. For the benefit of the readers and for them to have a complete understanding of the topics discussed, the presentations have not been edited. Having refrained from long narratives, each topic provides a good snapshot of the related facts under the subject, along with the presenter's name and email address.



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