

A briefing for government advisors and development practitioners

This briefing focuses on the impact of climate change on Bangladesh's rural poor. A great deal has been written on the challenges of providing clean energy and the risks to urban populations but, as this paper outlines, climate change also has many other consequences. Rural communities, whose livelihoods are intimately tied to the environment, are profoundly affected by the climate, yet have received little attention in the climate change literature. This aim of this briefing is to help address this shortcoming by first, setting out the current understanding of climate change and its impacts for Bangladesh and second, demonstrating that through immediate government action and community based adaptation the needs of those most affected by climate change can be met.

Introduction

- Global warming means more than just rising temperatures: climate change affects all aspects of the climate, making rainfall less predictable, changing the character of the seasons and increasing the likelihood or severity of extreme events such as floods.
- Poor communities face the challenge of adapting to climate change through a process of building their ability to adapt and reducing their vulnerability to the impacts of climate change.

The changing climate

In 2007, the International Panel on Climate Change (IPCC) considered data from climate observations across the world and concluded that the evidence for warming of the global climate is 'unequivocal'. Current projections estimate that the increase in global temperature by the end of this century will range from 1.8 - 4.0°C predominantly depending on the level of future greenhouse gas emissions. However, these figures demonstrate that dangerous climate change – conventionally understood as a global temperature rise of 2°C or greater – is becoming increasingly likely. And even this picture is evolving rapidly: recent studies suggest that the impacts of climate change may be even more severe and more rapid than those reported by the IPCC at the start of 2007.

Whilst many reports of climate change focus on rising temperature global warming means more this: climate change affects all aspects of the climate, making rainfall less predictable, changing the character of the seasons, and increasing the likelihood or severity of extreme events such as cyclones and floods. Worse, the impact of these changes is often aggravated by existing environmental problems, such as when deforestation and extreme rainfall combine to produce landslides or floods.

Hitting the poorest first

Far from being an issue that only has implications for energy supply or the environment, climate change touches all the resources that we depend on in life. In particular, the current and future impacts of climate change will hurt the well-being of the poor and vulnerable. Climate change puts extra burdens on the social and economic challenges that the poorest people already face. Their vulnerabilities will be emphasised and increased due to the dependence of their livelihoods on climate sensitive natural resources and their weak social protection structures. By directly eroding the resources that poor people depend on for their livelihoods, climate change makes it easier for people to fall into poverty and harder for the poorest to escape from it:

- *Physical resources.* Shelter and infrastructure will be damaged or destroyed by an increased frequency of flooding, storms and climate-related disasters.
- *Human resources.* Malnutrition and the incidents of infectious diseases are predicted to rise with changing weather patterns.
- *Social resources.* Reduced livelihood security and prolonged or more frequent droughts and floods will lead to the displacement of communities
- *Natural resources.* Ecosystems are directly threatened by climate change. Change to the natural environment undermines the poor who depend on local ecosystems for a variety of goods and services, and rely on the productivity of their environment to support agriculture. Changes in local ecosystems may require changes to agricultural systems and practices.
- *Financial resources.* The repeated failure of crops or loss of infrastructure and homes leads to increased household costs, decline in income, slower economic development and lower livelihood security.

Adaptation to meet the challenge

The scale of the long term impacts of climate change can be controlled through mitigation, the process of reducing the concentration of greenhouse gases in the atmosphere. However, the effects of climate change are being experienced now. Worse, because of long delays in the climate system, the level of greenhouse gases in the atmosphere today means that further climate change is now unavoidable, regardless of efforts to reduce greenhouse gas emissions. Thus the need to adapt to the impacts is equally unavoidable. Poor communities therefore face the challenge of adapting to climate change through a process of building adaptive capacity and reducing vulnerability.

- *Building adaptive capacity* means incorporating climate change into community-based development and improving the availability of appropriate information and skills, effective institutions, access to technology and opportunities to raise incomes.
- *Reducing vulnerability* to climate change requires the protection of existing assets (including the ecosystems on which communities depend), improving risk management, increasing assets and broadening the available range of livelihood options.

The challenge is simultaneously to protect existing livelihood assets against the new risks posed by climate change, whilst securing more assets that can be accessed to help cope with the disruption and change that climate change will bring.

Structure of this paper

Following this introduction, the middle section of the paper considers climate change in more detail. Regional and national data are reviewed to provide summaries of recent climate change observations, the expected climate changes over the coming century and the implications for those living in Nepal. The next section explores the process of adaptation, emphasising that efforts should focus on the needs of those most affected by climate change. The principals of community based adaptation are then outlined and illustrated through examples of Practical Action's experiences. Finally, the paper concludes with a review of the key messages for those responsible for addressing the impacts of climate change in Bangladesh.

Climate change in Bangladesh

- Climate change is likely to bring particularly rapid temperature increases in Bangladesh – faster than the average global rate of warming.
- Winter temperatures will increase more than summer temperatures. The level of winter rainfall is expected to decrease, whilst summer rainfall will increase.
- Extreme weather events such as heatwaves and very high rainfall are likely to become more frequent. Tropical cyclone intensity is expected to rise by 10 - 20%.
- It is certain that sea level will rise. The lowest anticipated rise in sea level is 40cm by the end of the century.

Some level of uncertainty is inevitable in measuring and anticipating climate change. Attributing individual current events to climate change is impossible due to inherent climate variability. A lack of observations over a sufficiently long time frame or narrow geographical area can hamper the analysis of climate trends. However, the degree of certainty over all aspects of climate change has increased in recent years, in particular between the publication of the IPCC's reports in 2001 and 2007.

As a result, there is now higher confidence in climate projections, including regional-scale warming, wind patterns, precipitation and some aspects of extreme events. Country-scale trends and projections, however, remain difficult to discern and as a result there have been many more studies focussed on South Asia than on Bangladesh. However, many regional observations and predictions have particular relevance for Bangladesh and are therefore included in the following summary of current and future climate change and the associated impacts.

The following is drawn predominantly from the IPCC's 2007 report but also relies in places on Bangladesh government sources (including the 2005 National Adaptation Programme of Action - NAPA) and Practical Action's own experiences in Bangladesh.

Climate change today

The South-Asia region is broadly defined by the IPCC as consisting of Pakistan, India, Nepal, Sri Lanka, Bhutan, Bangladesh, Myanmar and the Tibetan Plateau. However, the whole region has large climate variability, making climate change harder to identify and meaning that the current level of understanding of how the climate is influenced by human activity is low. Despite this, climate anomalies and changes in extreme events have been observed throughout the region, with intense rains and floods, droughts and cyclones/typhoons reported. Of particular note is severe and recurrent flooding in Bangladesh over recent years and the decrease in frequency (but increase of intensity) of monsoon depressions in the Bay of Bengal since 1970. More gradual year-on-year temperature and precipitation changes have also been observed in Bangladesh. In the 14 years between 1985 and 1998 the temperature in May has risen by 1°C and by 0.5°C in November. Decadal precipitation has been recorded above the long term average since the 1960s.

It is important to note that many of the impacts of climate change are experienced because changes in rainfall, sea level and temperature aggravate existing vulnerabilities. For example, upstream deforestation is a major factor behind recurrent flooding – but the impact of flooding becomes increasingly severe as rainfall increases or extreme rainfall events become more frequent. Similar impacts have been felt across different sectors in Bangladesh:

- Fisher communities in Bangladesh report that the availability of many local species has declined with the silting up of river beds, changes in temperature, and earlier flooding. Communities are coping by selling labour, migrating and borrowing money from money lenders.
- Water shortages and poor water quality have been attributed to the effects of rapid urbanisation and industrialisation, aggravated by climate change, across the South Asia region including in Bangladesh.
- Coastal zones throughout the region have suffered a vast loss of mangroves during the last 50 years, mainly due to human activity, but also due to salt water intrusion in Bangladesh.
- Droughts and lower precipitation have also contributed to the loss of wetlands and the severe degradation of ecosystems around the deltas of Pakistan, Bangladesh, India and China.
- The incidence of diarrhoeal diseases and other infectious diseases such as cholera, hepatitis, malaria and dengue fever increases during severe floods, rainfall and droughts in combination with poverty, poor access to safe water and poor sanitation. High temperatures and poor hygiene contribute to bacterial proliferation.
- Many parts of Asia have suffered a reduction in food production due to reduced water availability following increases in temperature, reduction in rain fall days and increased frequency of the El Nino Southern Oscillation (ENSO).

Climate change predictions

The vast majority of climate change predictions relevant to Bangladesh have been made using regional climate models. These indicate that warming across Asia will accelerate. The rate of warming in the South Asia is projected to be significantly faster than that seen in the 20th century, and more rapid than the global mean rate of warming.

- During December, January and February warming is expected to be at its greatest and associated with a decrease in precipitation, whilst the consensus of regional models is that summer rainfall will increase.
- Extreme weather events are projected to increase in frequency in South Asia, including heatwaves and high rainfall. Tropical cyclone intensity is also expected to rise by 10 - 20% as sea surface temperature rises by 2 - 4°C.
- Glacial and sea-ice melt and the expansion of the oceans due to increased temperature mean that a rise in sea level is certain. The minimum change, suggested by the most conservative climate change models, is for a 40cm rise by the end of the century.

The predicted seasonal changes for the South Asia region are summarised in the table on page 6. The changes have been calculated relative to the average temperature and precipitation in the period 1961-1990. Note that the results of climate projections for high and low future global greenhouse gas emissions are presented – demonstrating the enormous difference in the impacts that result from alternative future levels of greenhouse gas emissions, particularly by the end of the century. The figures also demonstrate the impact that the highest emitting countries – the most developed countries in the West – have on South Asia. The ‘high emissions’ figures assume rapid, fossil fuel-intensive economic growth over the coming century: very much a business as usual in the global economy.

The ‘low emissions’ figures, on the other hand, assume reductions in the use of natural resources and the introduction of clean and resource-efficient technologies during the course of this century. The implication is clear – large cuts in carbon emissions and radical changes in global patterns of consumption, particularly in the West, will be required to prevent climate change from bringing catastrophic changes across South Asia.

A simplified illustration of the data in the table is offered in the two graphs on page 6, in which an average of the high and low future emissions results have been plotted.

Future impacts and vulnerabilities

- The impacts of climate change are not restricted to sea-level rise. The most profound impacts will be in agriculture and food security, water, biodiversity changes, human health and human migration.
- The reductions in yields of staple crops such as rice and wheat are anticipated to be huge: by 2050 rice yield could drop by 8% and wheat yield by 32%.

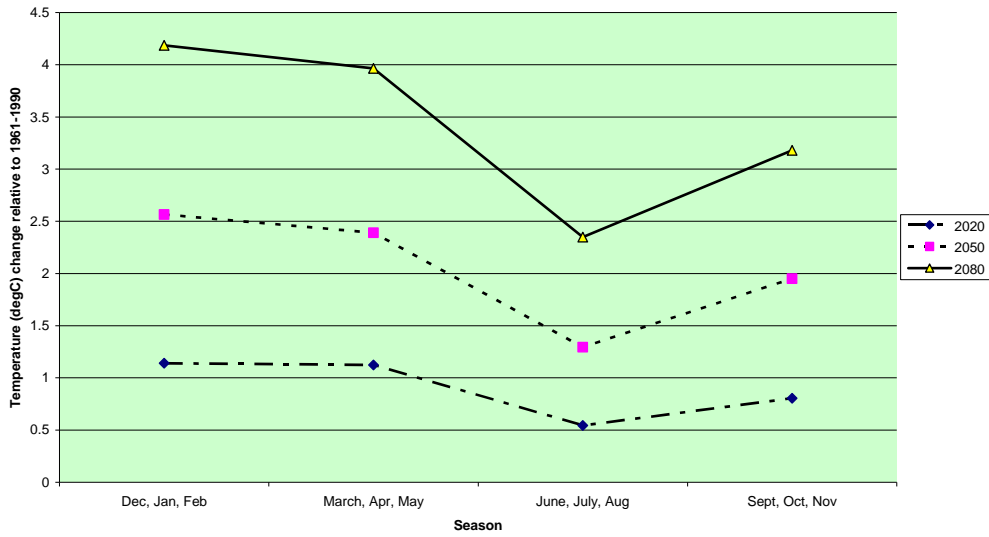
The IPCC identify South Asia as having the highest proportion of ‘highly vulnerable’ sectors of all the Asia sub-regions, with food, biodiversity, water, coastal ecosystems, human health and land degradation all judged to be ‘highly vulnerable’ to the impacts of climate change. Bangladesh’s National Adaptation Programme of Action (NAPA) provides more detail about the most vulnerable sectors and localities in Bangladesh, reproduced below:

<i>Climate and Related Factors</i>	<i>Most Vulnerable Areas</i>	<i>Highest Impact Sectors</i>
Temperature rise and drought	<ul style="list-style-type: none"> • North west 	<ul style="list-style-type: none"> • Agriculture (crop, fisheries, livestock) • Water • Energy • Health
Sea level rise and salinity intrusion	<ul style="list-style-type: none"> • Coastal area • Islands 	<ul style="list-style-type: none"> • Agriculture (crop, fisheries, livestock) • Water (water logging, drinking water, urban) • Human settlement • Energy • Health
Floods	<ul style="list-style-type: none"> • Central region • North east region • Char land 	<ul style="list-style-type: none"> • Agriculture (crop, fisheries, livestock) • Water (urban, industry) • Infrastructure • Human settlement • Health • Disaster • Energy
Cyclone and storm surge	<ul style="list-style-type: none"> • Coastal and marine area 	<ul style="list-style-type: none"> • Marine fishing • Infrastructure • Human settlement • Life and property
Drainage congestion	<ul style="list-style-type: none"> • Coastal area • Urban • South west 	<ul style="list-style-type: none"> • Agriculture (crop) • Water (navigation)

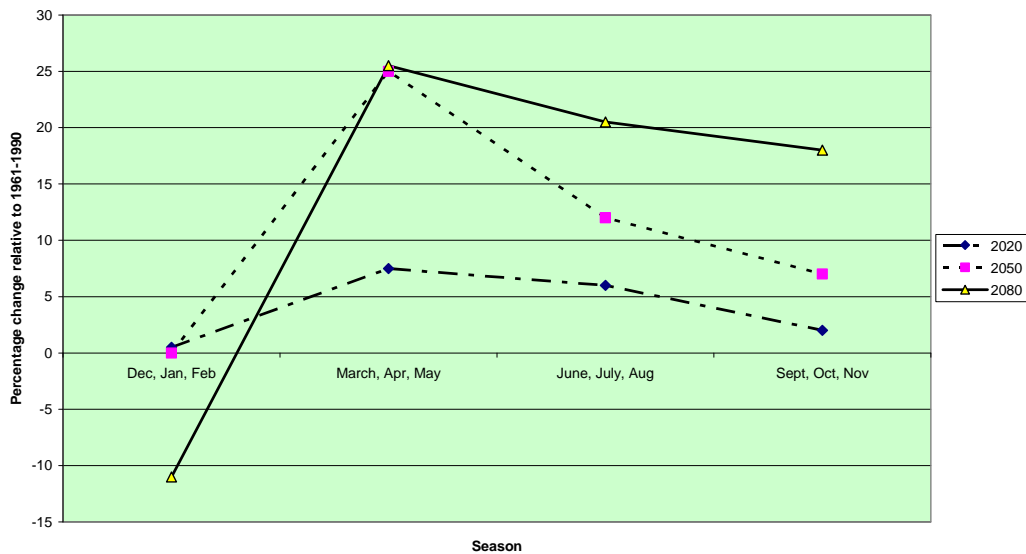
South Asia seasonal temperature and precipitation projections (relative to 1961-90 average)

Future emissions	2010-2039				2040-2069				2070-2099			
	Temperature change °C		Precipitation change %		Temperature change °C		Precipitation change %		Temperature change °C		Precipitation change %	
	High emissions	Low emissions	High emissions	Low emissions	High emissions	Low emissions	High emissions	Low emissions	High emissions	Low emissions	High emissions	Low emissions
Dec, Jan, Feb	1.17	1.11	-3	4	3.16	1.97	0	0	5.44	2.93	-16	-6
March, Apr, May	1.18	1.07	7	8	2.97	1.81	26	24	5.22	2.71	31	20
June, July, Aug	0.54	0.55	5	7	1.71	0.88	13	11	3.14	1.56	26	15
Sept, Oct, Nov	0.78	0.83	1	3	2.41	1.49	8	6	4.19	2.17	26	10

Projected seasonal temperature change (South Asia, average of high and low emission scenarios):



Projected seasonal precipitation change (South Asia, average of high and low emission scenarios):



The most profound impacts of climate change in Bangladesh will be in agriculture and food security, coastal areas, water, biodiversity and ecosystem changes, and human health. These impacts are outlined in more detailed below.

Agriculture and food security: Overall crop yield (wheat, maize and rice) could decrease in South Asia by up to 30% by the end of this century (compared with an increase of up to 20% in East and South East Asia). In cereal production alone, the most conservative climate change projections suggest a minimum decline across South Asia of between 4 and 10%. In Bangladesh, rice production could fall by 8% and wheat production by 32% as early as 2050. Substantial losses in rain fed wheat are also anticipated – studies in India suggest that a 0.5°C rise in winter temperature would reduce wheat yield by 0.45 tonnes per hectare. Similarly, a rise in temperature of beyond 2.5°C would reduce non-irrigated wheat and rice farm revenue by 9-25%. Flood water and saline intrusion will also undermine agricultural productivity in Bangladesh. Global climate change and the increased frequency of ENSO events affect the migration routes and numbers of fish larvae currently present in South Asian waters and as a result a general decline in fishery production is anticipated across the region. Fish stocks of local species are currently reported to be in decline due to early flooding, temperature fluctuations and river bed siltration. However, predicting fish stocks is complex and multiple overlapping factors will all contribute to future availability of fish supply.

Water resources: Glacier melting has a significant impact for much of South Asia. River runoff initially increases during winter or spring but as the ice resource depletes, the supply of water will reduce. Those areas that rely on irrigation for agriculture will be particularly affected. Increasing demand for water from an expanding population, increasing evaporation, and increased sedimentation are all expected in Bangladesh. These effects, combined with decreases in winter precipitation, will lead to an expansion of the areas in water stress. All future emissions scenarios predict increasing water stress, with the effects being felt as early as 2020. Moreover, increasing sedimentation reduces the navigability of rivers which are required for around 30% of freight transport in Bangladesh, increases flood risk and causes the development of charlands (sandbanks).

Flood risk: Existing vulnerability to flooding, caused by upstream deforestation, will be aggravated by the effects of climate change. Climate change is anticipated to bring increased sedimentation and an increase in extreme rainfall events, both of which will increase flood risk beyond its current high levels.

Coastal/low lying areas: All coastal areas in Asia are currently facing increasing stress with threats to human and environmental resilience. However, rising sea levels will have further, major impact on coastal and low lying communities in South Asia. The most conservative climate change scenarios predict a rise in sea level of 40cm by the end of this century, which will increase the annual number of people affected by flooding in Asia from 12 million to 94 million, with almost 60% of these people living in South Asia (including the coastlines of Pakistan, Sri Lanka and Bangladesh). Modelling suggests that 1 million people will be directly affected by sea level rise in 2050 in the region of the Bangladesh Ganges-Brahmaputra-Meghna mega-delta. Moreover, Bangladesh's coastal areas will continue to suffer from saline water intrusion, coastal land degradation, storm surges and drainage congestion due to high water flow and sedimentation in the flood plain.

Ecosystems and biodiversity: Increased salinity/ salt water intrusion is likely to adversely effect the trees of the sunderban, whilst lower river and ground water flows may lead to desertification in some areas of the coastal zone. It is estimated that a 45cm rise in sea level would inundate 75% of the sunderban.

Human health and migration: The burden of climate attributable diarrhoea and malnutrition is already high in Bangladesh relative to elsewhere in Asia. Future climate projections suggest that this large relative risk is expected to increase, with flooding and sea level rise causing pollution in surface water and an increase in cholera and diarrhoeal diseases. Increasing temperatures are likely to yield a spread in insect borne diseases,

whilst warmer sea-surface temperatures support phytoplankton blooms that are the breeding ground for bacterial diseases such as cholera. Climate change is also likely to worsen the present problems of land degradation, food supply, drinking water supply, rural poverty and urban unrest in Bangladesh. Migration following extreme weather events is also to be expected. Temporary migration to sell labour is a response already employed by fisher communities suffering from reduced fish stocks.

Adaptation: responding to the threat of climate change

- Adaptation must focus on the needs of the people most affected by climate change impacts and aim to secure their livelihoods and reduce the most significant hazards they face.
- Identifying communities' own priorities and needs, and valuing their knowledge alongside science-based knowledge is key to development of sound adaptation strategies.
- The primary role of governments is in developing policies that are enabling for local-level action. However, important adaptation activities, such as planning for reduced food security and management of increasingly scarce water resources, will require coordination and investment at the national and intergovernmental levels.

Climate change is currently causing increased hardship for rural communities throughout Bangladesh. Moreover, current global levels of greenhouse gas pollution means that the impacts of climate change are now set to worsen over the coming decades regardless of future emissions. However, whilst the most profound impacts of climate change may still be some years away, our understanding of future climate scenarios means that actions to help prepare communities can be taken now. Importantly, strategies that build community's ability to adapt to climate change can and must be undertaken now: it will be too late to act once the last crops have failed or glacial lakes have burst.

Strategies for adaptation need to focus on the needs of the people most affected by climate change impacts and aim to reduce the most significant hazards they face. Identifying communities' own priorities and needs, and valuing their knowledge alongside science-based knowledge is key to developing sound adaptation strategies. Sharing experiences, obstacles and positive initiatives with other communities and development policy-makers must be an integral part of national adaptation strategies. The primary role of governments and international processes is in developing and implementing policy that is enabling for local-level action. However, some important adaptation activities, such as management of increasingly scarce or flood prone water resources, will require coordination at the regional and intergovernmental levels.

Development of adaptation strategies at the national level is underway in some Least Developed Countries, including Bangladesh, where National Adaptation Programmes of Action (NAPAs) identify priorities for adaptation projects. To ensure a positive impact on the most vulnerable communities, climate change adaptation should support the development of community based systems of adaptation. These should be based on sustainable livelihood options and sound management of ecosystems through strengthening capacities, skills and institutions to react and adapt to climate generated changes. More specifically, climate change adaptation strategies, including the NAPAs, should:

- Begin with vulnerability assessments based on strong gender analysis to focus on the most vulnerable and their needs within the communities and to identify and reduce the most significant vulnerabilities they face.
- Value the knowledge and strategies that the poor are already using to cope with climate change and use this as a basis to identify priorities and define action.

- Empower communities to participate in the development of climate change sensitive interventions and policies, ensuring effective interaction between decision-makers and planners from key climate change affected sectors in both government and donors' structures.
- Require agriculture, energy, transport and health departments of Government to undertake an analysis of predicted climate change and how it will impact on their sector.
- Facilitate delivery of resources, support and services to community level, including information, skills, technology, finance and basic services and activities aimed at Disaster Risk Reduction.
- Ensure that risks related to climate change and community-based responses to adaptation are mainstreamed into the most appropriate planning frameworks and development plans (including PRSPs).

Community based adaptation - reaching Bangladesh's rural poor

Climate change will have a significant impact on Bangladesh's rural poor. The impacts will force profound lifestyle changes and destroy livelihoods if communities are not made aware of climate change and supported in finding ways to adjust. However, through community based adaptation, there is much that can be done:

- Awareness of climate change is a key pillar of community based adaptation. Active participation in workshops, meetings and events that have been organised within communities can allow them to relate their own experiences to climate change and understand how future weather patterns may differ to those they have known in the past.
- Action on adaptation can produce benefits now and in the future. Many adaptation activities help to provide communities with diversified livelihoods, alternative sources of income, or better infrastructure. Such 'no regrets' strategies are attractive as they have immediate positive impacts whilst also supporting the ability of communities to adapt to climate changes in the future.
- Adaptation can be made more effective by focussing on two existing areas of policy: disaster risk reduction and supporting livelihoods. When undertaken through community organisations, these overlapping activities address key climate vulnerabilities and build capacity to deal with future challenges.

Examples of Practical Action's experience with community based adaptation in Bangladesh are provided below and demonstrate how low cost interventions can make a huge difference to those most affected by climate change. However, whilst local community based interventions are an essential aspect of adaptation, there is also an urgent need for adaptation planning and investment across all sectors of government. Water stress, biodiversity changes, human health, rural-urban migration, and in particular the potentially profound and devastating impacts on agriculture and food security are all examples of anticipated climate change impacts that need planning for now. Government at all levels needs to support both community based adaptation and, together with communities, develop and implement strategies that respond to these wider and larger scale implications of climate change.

Experiences of community based adaptation strategies

Practical Action's experience of community based adaptation demonstrates that support for communities facing climate change can be provided now, and at little cost. For example, Practical Action has worked with communities to establish 'floating gardens' as a mechanism to secure vegetable production in regions that are subjected to repeated flooding. It is anticipated that climate change will increase the likelihood of very high rainfall, meaning that the problems presented by flooding are likely to get worse. Using water hyacinth or other local water plants as the base for the growing media, floating gardens have been successfully employed to allow vegetables to be produced in water logged areas, protecting the poor from malnutrition and providing a source of income during the post monsoon and peak rainy seasons. The approach brings areas of land that cannot be used due to flooding under cultivation, and increases the fertility of the land when the decomposed contents of

the garden are deposited. However, communities require support to make the approach successful, as many lack a right of access to appropriate land or body of water, are unable to access finances and materials to establish floating gardens, or require training on how to create and maintain the gardens or how access markets for their products.

New farming techniques such as floating gardens are low-cost changes that can directly address the threat to the livelihoods of the rural poor. Whilst these strategies provide for improved livelihoods for the communities involved, they are ‘win-win’ approaches to adaptation as they also target the twin goals of community based adaptation: building adaptive capacity and reducing vulnerability.

Potential adaptation strategies exist for all sectors and can be implemented as community based adaptation projects:

Agriculture sector

- Diversification of crop agriculture is a key approach in addressing climate change, but requires research on appropriate varieties for the new physical, social and climatic conditions. Diversification should be coupled with the revitalization of local varieties that have a greater resilience to extreme climate events.
- Household and community assets can be reinforced through alternative livelihood options such as homestead gardening, horticulture, floating gardens and handicraft production. Increasing assets and diversifying livelihood options are key components in ensuring that communities are able to adapt to meet the challenges that climate change brings.
- Information on pest control and methods to protect winter vegetables from extreme cold and fog needs to be disseminated.
- Seed banks can be established to ensure that varieties remain available following disaster periods.
- Awareness raising on strategies for building adaptive capacity and the implications of climate change amongst local level non-government organizations, agricultural extension officers, block supervisor of Department of Agricultural Extension (DAE), and farmers.

Housing and settlement

- Flood risk can be alleviated through building raised house plinths for the homes of affected people.
- Homestead plantations can protect settlements from flood and erosion.
- Raising water pumps so that flood water does not contaminate drinking water.

Rivers

- Dredging of river beds combats increased sedimentation, thereby improving navigability.
- Increasing vegetative coverage along river banks protects against erosion resulting from increased flow and flooding.

Awareness raising and capacity building

- Mass awareness raising on the impacts of climate change and how to cope with the challenges can be carried out through a variety of means, such as the distribution of posters or leaflets, running discussion sessions with different groups such as NGOs, Upazila level officials (agriculture, disaster management unit), or setting up school and college environmental clubs that can arrange discussions on local issues.

Community based adaptation also emphasises the need for communities to understand that climate change means that traditional responses to climate variation may no longer be sufficient when long term shifts in temperature and rainfall are predicted. Women, who frequently manage local natural resources, are central to ensuring that the impacts of climate change are properly understood. By building on their understanding of the climate and their environment, and by sharing their experiences with others, communities are able to develop their own strategies for climate change adaptation. Local and national government policy is therefore needed to support the communities in this process of defining and achieving their own goals.

Summary of recommendations for Bangladesh

Policy makers from all sectors urgently need to focus attention on the implications of climate change. Support for adaptation to the impacts must start now. Many aspects of climate change and variability are already having a profound effect on the livelihoods of poor rural communities and enough is known about the future impacts of climate change for action to be taken now. The vulnerability of the poorest to climate change is a central challenge. 'No regrets' adaptation options, which focus on poverty relief through diversifying livelihoods and extension support for sustainable agricultural systems, must be a priority.

In particular, action is required in the following areas:

Central government

Impact

- Climate change is not just an issue for those in government with responsibility for the environment.

Recommendations

- All government departments must acknowledge the importance of climate change and analyse the impacts for their sector. Disaster planning and risk reduction strategies must account for the new challenges of climate induced disasters.
- Central government will need to support decentralised policy development so that appropriate adaptation activities can be planned and prevent the imposition of 'one size fits all' solutions. National level activities need to support the distribution of resources and extension services to the local level, training and awareness-raising in communities, research for technology generation, information provision, and take forward international lobbying.

Coastal and river zones

Impacts

- 1 million people are expected to be affected by sea level rise in the region of the Ganges-Brahmaputra-Meghna mega delta by 2050.
- Sea level rise leading to saline water intrusion, coastal land inundation and storm surges are unavoidable.

Recommendations

- Policy makers must start planning now to protect the infrastructure and settlements of the rural poor in the region of the Ganges-Brahmaputra-Meghna mega delta and identify whether mass migration can be avoided.
- The implications of sea level rise are profound and must be prepared for in the areas of government responsible for agriculture, trade, population planning, disaster preparedness, the environment and finance.
- Government should explore methods for construction of embankments to protect communities from saline water intrusion and tidal surge. Communities should be involved in routine maintenance of embankments. In addition, support should be given to farmers to cultivate saline tolerant paddy.

Agricultural and fishery policy and extension support

Impacts

- Huge reductions in the levels of rice and wheat production are anticipated in the coming years. Estimates suggest that rice production could fall by 8% and wheat production by 32% by as early as 2050. Fish stocks are already reported to be in decline due to early flooding, temperature fluctuations and river bed siltration.

- Increased water stress is expected by 2020 and will have a huge impact on the productivity and viability of irrigation fed agriculture.

Recommendations

- Government should provide support to farmers in their use of alternative technologies in the agriculture sector. Strategies such as floating gardens, fish cultivation cages, adjustments to the cropping calendar, flood tolerant paddy cultivation, plus alternative crops and livestock that are resilient to climate change (and higher winter temperatures in particular) should all be promoted.

Health

Impacts

- Water supply, food security and land degradation or inundation will all place pressures on rural populations that will lead to deteriorating health in, and reduced viability of, existing rural population centres.
- Flooding and sea level rise will lead to the pollution of surface water, an increase in water borne diseases such as cholera and an escalation of current high rates of diarrhoea.

Recommendations

- Specific health and sanitation measures will need to complement alternative livelihood strategies if a widespread deterioration in health is to be avoided.
- The impact of the government plan for sanitation in all villages by 2010 initiative should be maximised by inviting NGOs to create awareness in the communities. Existing community clinics need to be fully operationalised and the necessary logistical support ensured to meet the challenges that climate change presents.

Practical Action is a UK-based development organisation that has offices in seven countries in four regions of the world. Practical Action works with communities to develop appropriate technologies to ensure sustainable improvements in their lives. Practical Action advocates an integrated approach to tackling climate change and poverty reduction, based on justice for poor men and women.

Our current work on climate change includes:

- Programmes on community based adaptation to climate change
- Programmes for access to clean energy
- Policy influencing work in the UK and internationally.

PRACTICAL ACTION UK

The Schumacher Centre for Technology & Development, Bourton on Dunsmore, Rugby, Warwickshire, CV23 9QZ
T +44 (0)1926 634400
F + 44 (0)1926 634401
E practicalaction@practicalaction.org.uk
W www.practicalaction.org

PRACTICAL ACTION BANGLADESH

(GPO Box 3881, Dhaka 1000)
 House 32, Road 13/A, Dhanmondi R/A
 Dhaka 1209
T +880 2 811 1934
F +880 2 811 3134
E bangladesh@practicalaction.org.bd

Practical Action is the working name of Intermediate Technology Development Group | Registered Charity No 247257