BUILDING CLIMATE CHANGE RESILIENCE IN INDIA

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Abstract

Although climate change affects all people, the poor are the most vulnerable because of their dependence of their livelihoods on climate sensitive natural resources and their weak social protection structures. As about one fourth people in India are still below poverty line, climate change will deepen poverty and make poverty eradication a challenging issue here.

COP14 has already realized the long term co-operative action on mitigation, adaptation, technology and finance. But it is high time Government of India immediately put forward some concrete community based solutions through various government and non-government sectors as a part of climate resilient activity. The most profound impacts of climate change in India will be in agriculture and food security, water resources, water induced disasters, biodiversity changes and human health. Increasing the resilience of communities to cope with climate change demands some effective strategies in state or national level and practical implementation and integration of those strategies in India's long term development plans. Practising policy through the implementation of different projects, encouraging vulnerable communities to take part in decision making processes on climate related adaptation strategies, revising climate change policy to enable local-level action, continuous monitoring and analysis of predicted climate change by agriculture, energy, health and water departments of government and empowerment of community to prepare themselves for climate-induced hazards should be focused at the moment.

All the work on developing climate resilient strategies will be of little value unless developed countries heavily cut green house gas emissions within the next few years. Thus, good homework needs to be done by government of India for COP15 too.

1. INTRODUCTION

Climate change, as the United Nations Secretary-General has said, is "the defining challenge of our generation." In its Fourth Assessment Report (AR4), published in 2007, the Intergovernmental Panel on Climate Change (IPCC) has said that the global average surface temperature is likely to rise by 1.8-4 degree Celsius this century if further action to reduce greenhouse gas emissions is not taken immediately. Climate change is affecting all aspects of the climate, making rainfall very unpredictable, changing the pattern of seasons, rising sea levels due to melting of glaciers and increasing the severity of extreme weather events like floods, landslides and droughts.

2. CLIMATE CHANGE: WHY INDIA NEEDS TO BE MORE CONCERNED?

2.1 POOR SOCIOECONOMIC STRUCTURE

Although India is not a potent contributor to the greenhouse gas emissions, it can't escape from the hazardous effects of climate change. The poor are the most vulnerable because of their dependence of their livelihoods on climate sensitive natural resources like agriculture and their weak social protection structures. So, it puts extra burden on the social and economic challenges that the poorest already face. As about one fourth people in India are still below poverty line, climate change will deepen poverty and make poverty eradication a challenging issue.

2.2 MORE PRONE TO GLOBAL WARMING

The level of greenhouse gases today depicts that the further climate change is unavoidable. So, poor communities must be ready to face this challenge, for which we must start thinking about the different adaptation and climate resilient measures.

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. The 'high emissions' by the most developed countries in the West have an impact on South Asia.

The IPCC has offered the following summary of the vulnerability of key sectors in the South Asia region. The South Asia region has the highest proportion of 'highly vulnerable' sectors of all the Asia sub regions.

Food and fiber	Biodiversity	Water Resource	Coastal Ecosystem	Human Health	Settlements	Land Degradation
-2/H	-2/H	-2/H	-2/H	-2/M	-1/M	-2/H

Vulnerability	Level of Confidence
-2 Highly Vulnerable	VH- Very High
-1 Moderately Vulnerable	H- High
0 Slightly not vulnerable	M -Medium
+1 Moderately Resilient	L- Low
+2 Most Resilient	VL -Very Low

IPCC holds that Asia faces a heightened risk of flooding, severe water shortages, infectious disease and hunger from global warming this century. The region is confronted by 90% likelihood that more than a billion of its people will be 'adversely affected' by the impacts of global warming by 2050.

2.3 EXPENSIVE ALTERNATIVES

India's main energy resource is coal. Owing to worldwide concern about climate change, India has been asked to reduce coal consumption and use other energy sources like oil, gas, renewable and nuclear energy. For a developing country like India, these alternative energy sources may prove expensive.

3. VULNERABLE SECTORS OF INDIA

3.1 AGRICULTURE

About 70% of Indian population is dependent on agriculture and area under agriculture is 50% of total land area. A study done by Parikh J and Kavi Kumar shows that an increase of temperature by 2.5 degree Celsius decreases the rice yield by 15 % and wheat yield by 25% without carbon fertilization effect. Increased variability in both temperature and precipitation will present significant challenges to farming practices. Irrigation fed agriculture will be increasingly threatened as water resources deplete. Landslides and flash floods have already reduced the area of land available for cropping and are likely to reduce productivity in the future. This shows that the global temperature rise has a direct impact on the people who depend on the agriculture for their survival. Increases in the frequency of droughts and floods due to climate change effects are projected to affect local crop production negatively, especially in subsistence sectors at low latitudes.

3.2 WATER RESOURCES

Reductions in winter snow means less precipitation stored on the glaciers, in turn decreasing spring and summer runoff. However, earlier snowmelt and precipitation falling as rain rather than snow due to increased temperatures will increase winter runoff. Glacier melting has a significant impact. As glaciers start to melt, river runoff will initially increase during winter or spring, but beyond 2050 the ice resource is predicted to deplete and the supply of water will reduce. Those areas that rely on irrigation for agriculture will be particularly affected. Ground water depletion is likely due to long dry seasons, irregular seasons, irregular rains, and high intensity rainfall leading to high run off rather than water absorption.

3.3 FORESTS AND BIODIVERSITY

India's forests, which cover nearly 20% of the country's geographic area, are important for biodiversity, biomass supply, watersheds and livelihoods of forest dependent communities. Climate change is predicted to alter existing biome types, cause forest dieback, and loss of biodiversity. These shifts will require adaptation of communities dependent on forest resources, as well as at the regional and national level as shifts occur in timber production. The impact of climate change on forests and on forest dependent people in India are already evident in increased incidences of forest fires and outbreaks of forest pests and agro-ecosystems (crops, livestock and grasslands) forests and woodlands, inland waters and coastal and marine ecosystems.

3.4 COASTAL AREAS

Coasts are projected to be exposed to increasing risks, including coastal erosion, due to climate change and sea-level rise. The effect will be exacerbated by increasing human-induced pressures on coastal areas. Those densely populated and low-lying areas where adaptive capacity is relatively low, and which already face other challenges such as tropical storms or local coastal subsidence, are especially at risk. Adaptation for coasts will be more challenging in developing countries like India than in developed countries, due to constraints on adaptive capacity. The most vulnerable industries, settlements and societies are generally in the coastal and river flood plains whose economies are closely linked with climate-sensitive resources.

3.5 HUMAN HEALTH AND MIGRATION

Projected climate change-related exposures are likely to affect the health status of millions of people, particularly those with low adaptive capacity, through increases in malnutrition and consequent disorders, with implications for child growth and development; increased deaths, disease and injury due to heat waves, floods, storms, fires and droughts; the increased burden of diarrhoeal disease; the increased frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change; and, the altered spatial distribution of some infectious disease vectors. Cholera and malaria could increase due to flooding and a wider habitat range for mosquitoes. Human migration following extreme weather events is also to be anticipated.

4. BULIDING RESILIENCE IN INDIA: APPROACHES TILL DATE

The adverse impacts of current climate have already threatened the livelihoods of many Indians, especially the poorest. Current government expenditure on adaptation to climate variability, as shown in Figure below, already exceeds 2% of the GDP, with agriculture, water resources, health and sanitation, forests, coastal-zone infrastructure and extreme weather events, being specific areas of concern.

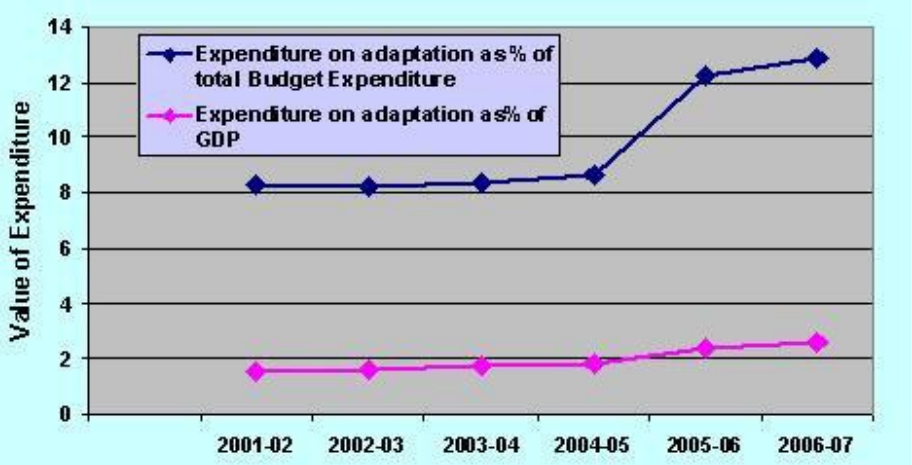

Fig.: Expenditure on Adaptation Programmes in India

4.1 NATIONAL ACTION PLAN ON CLIMATE CHANGE

The Government of India has already taken many policy decisions that reduce risks and enhance the adaptive capacity of the most vulnerable sectors and groups. These efforts are primarily driven by the objective of sustainable livelihoods and poverty alleviation.

On June 30, 2008, Prime Minister Manmohan Singh released India's first National Action Plan on Climate Change (NAPCC) outlining existing and future policies and programs addressing climate mitigation and adaptation. Adaptation and climate resilient development is emphasized in the plan. The plan identifies eight core "national missions"- National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Ecosystem, National Mission for a "Green India", National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change. The NAPCC also describes other ongoing initiatives, including Power Generation, Renewable Energy and Energy Efficiency.

4.2 SUCCESSFUL INDIA-US COOPERATION

On the bilateral front, India and the U.S. have collaborated on many specific climate-related projects including the 'Methane to Market' partnership for the commercial utilization of coal-bed methane. India was also a partner in the U.S.-led Future Gen project to develop a zero-emission coal based thermal power plant. The U.S. was a leader in development of methane technology until low oil prices led to its neglect. India believes methanol can be used as a low-emission transportation fuel and is therefore ready to support the resumption of aggressive R&D on methane technology.

The positive experience of working together on energy and climate issues, including the Indo-U.S. Civil Nuclear Agreement, has enabled these two countries to plan a much more ambitious agenda for collaboration under President Obama's Renewable Energy Initiative. This low carbon initiative by India has earned a goodwill from most of the developed countries and it can possibly result in greater financial contribution to India to support its climate resilient activities.

4.3 MAINSTREAMING CLIMATE CHANGE IN SUSTAINABLE DEVELOPMENT

Government initiatives for the diffusion of renewable energy and energy-efficient technologies, joint forest management, water resources management, agricultural extension services, web-enabled services for farmers and rural areas, and environmental education in schools and colleges represent a broad spectrum of efforts to integrate climate change concerns in sustainable development. This integration is institutionalized through specialized institutions, such as the Ministry of New & Renewable Energy, the Bureau of Energy Efficiency, and the Technology Information, Forecasting & Assessment Council, with specific mandates to promote climate friendly technologies.

The **National Committee to Assess the Impacts of Climate Change** is chaired by the Principal Scientific Advisor to the Prime Minister, and includes meteorologists, climate modelers, hydrologists, energy economists, as well as representatives of key Ministries. The Committee is evaluating the impact of climate change on key development activities, and assessing options to mitigate climate risks.

At the national level, the integration of climate change in national development is guided by the **Prime Minister's Council on Climate Change**, which includes representation of key Ministries, as well as experts, and representatives of industry and of media. The Council provides overall strategic guidance on mainstreaming climate change in development, identifies key intervention priorities, and monitors the implementation of these interventions.

4.4 MAJOR INITIATIVES IN AGRICULTURAL SECTOR

Various following initiatives are already taken in different parts of India to address problems arising in agricultural sector due to climate change:

-Drought proofing measures
-Promoting zero tillage practices
-Developing drought – resistant varieties
-Promoting crop diversification
-Promoting on – farm water efficient technologies
-Farmer credit and loan system
-Promoting the National Agricultural Insurance Scheme
-Encouraging resource conserving technologies for crop production
-Risk Financing: The Crop Insurance scheme supports the insurance of farmers against climate risks, and the Credit Support Mechanism facilitates the extension of credit to farmers, especially in instances such as crop failure due to climate variability.

4.5 MAJOR INITIATIVES IN WATER RESOURCES SECTOR

-Integrated Water Resources Management strategy
-The National Water Policy (2002)
-Revival of diverse and community-based irrigation systems, soil and water conservation etc.
-Technological management of drought through early warning, flood mapping etc.
-Appropriate drought protection measures
-Reducing the water requirement of crops and developing crops that are less dependent on water through application of biotechnology

4.6 MAJOR INITIATIVES IN COASTAL REGIONS

-Coastal regulation zones have been formulated.
-Restrictions have been imposed in the area between 200 and 500 m of the HTL (high tide line) while the area up to 200 m has been declared as a ‘no development zone’.
-The coastal zone regulations are under major review, which will also take account of vulnerability to sea level rise.

4.7 ACCCRN IN INDIA

Six Indian cities are among the 17 in South Asia chosen for implementing a component of a major international climate change initiative that concentrates on building resilience to a changing, challenging natural environment. The Asian Cities Climate Change Resilience Network (ACCCRN), spearheaded by the Rockfeller Foundation, is expected to help a network of cities in Asia develop robust plans to prepare for, withstand and recover from the predicted impacts of climate change by 2012. The selected Indian cities are: Hubli Dharwad (Karnataka), Surat (Gujarat), Jodhpur (Rajasthan), Gorakhpur (Uttar Pradesh), Indore (Madhya Pradesh) and Kakinada (Andhra Pradesh). The ACCCRN aims to catalyze attention, funding, and action on building climate change resilience for poor and vulnerable people by creating robust models and methodologies for assessing and addressing risk through active engagement and analysis of various cities. These cities will be at the forefront of research and development on climate change resilience, setting an example to a future network of Asian cities and leading preparedness for the current and future impacts of climate change.

Potential resilience strategies could include the development and use of policy incentives, attraction and implementation of investment funds, and improvements to infrastructure. The Rockefeller Foundation is looking to engage with city partners to pilot tools, techniques and strategies to build resilience to climate change.

4.8 USAID'S EFFORTS

USAID is working with Indian partners to reduce the negative impacts of climate change while achieving development goals. USAID has also put efforts on focusing on the development and dissemination of productivity enhancing technologies and innovations, including conservation agriculture, biotechnology, and supporting research on new crop varieties, including wheat resistant to stem rust and drought and salinity tolerant rice and wheat. The key ongoing programs are:

USAID is working with Indian partners to increase viability and efficiency in the power sector, conserve resources, and promote clean coal technologies and renewable energy. USAID focuses on creating demonstrable pilot projects to catalyze change and training for future leaders in the clean energy sector.

With nearly 70 percent of India's population living in rural areas and around 60 percent of the labor force engaged in agriculture, sustaining increases in agricultural productivity and efficient use of land, water, and energy resources will have a large impact on the livelihoods of hundreds of millions of people. Indian farmers face a difficult task of meeting the food needs of a growing population while coping with decreased areas of arable land, increasingly scarce water supplies, and greater intensity and frequency of extreme weather events. USAID efforts focus on the development and dissemination of productivity enhancing technologies and innovations, including conservation agriculture, biotechnology, and supporting research on new crop varieties, including wheat resistant to stem rust and drought and salinity tolerant rice and wheat.

India consistently ranks among the top five countries in the world in lives lost, people affected, and economic impact of disasters. Major rivers flood every year. Drought is a recurring phenomenon. Cyclones threaten 5,000 miles of coastline. The greater frequency and intensity of extreme weather events due to climate change indicate an even greater need for disaster risk reduction to save lives and reduce economic impacts. USAID is working to build capacity in India for enhanced disaster preparedness and response while linking disaster risk reduction to adaptation to climate change. U.S. disaster experts share expertise with their Indian counterparts about what is needed for a successful, integrated disaster management system, including state of the art tools for better forecasting and early warning for extreme weather events.

4.9 CASE STUDY BY WORLD BANK

A report, **Climate Change Impacts in Drought and Flood Affected Areas: Case Studies in India,** by World Bank presents an excellent, timely and balanced analytical study that can strengthen India's climate change resilience through a combination of measures and right incentives aimed at multiple levels of government-local, state and national.

The report has called for setting up a climate information management system to help integrate baseline information into policy, planning and investment decisions. It advocates building climate risk assessment as a requirement for all long-lived infrastructure projects; explores new and innovative financial instruments to promote income diversification in rural areas; emphasizes the need for aggressively pursuing water conservation and controlling groundwater demand at a larger geographical scale and suggests strengthened support for agricultural research and extension to promote sustainable modes of dry land farming.

The report also warns of high risks associated with complacency and considerable human toll from climate change. It highlights the need for mitigating avoidable costs, particularly among the vulnerable sections of society.

This report by World Bank has compelled the Government of India to think about some effective climate resilient activities immediately.

5. RECOMMENDATIONS

5.1 SUPPORT LOCAL LEVEL ACTION PLANS

Communities can't do everything on their own, so different institutions at state and central government must give an emphasis to build climate change resilience through different actions like prioritizing the most vulnerable areas and populations and involving local people in planning for resilient measures; awareness raising activities about climate change and likely expected changes to local climate; focusing on programmes to strengthen and diversify livelihoods to increase resilience; providing funding for small-scale infrastructure projects such as dykes and dams to reduce local hazards; enabling vulnerable communities to take part in decision-making processes on climate-related adaptation strategies.

At the local level, action plans and concrete implementation activities are required for irrigation systems, drinking water, and water induced disasters. Training, awareness raising and mobilization of resources are essential at the local level; this will require decentralized funds that are managed at the local level, for example through community based organizations.

Community forestry approaches will be a key component in developing and preserving the ecosystem resources (livelihoods, flood and landslide protection, and carbon sinks).

5.2 DECENTRALISED POLICY

All government departments must realize the importance of climate change and analyse the impacts for their sector. Each department must formulate disaster planning and risk reduction strategies as well as explore new and innovative financial instruments to promote income diversification in rural areas. For that, central government must support the state governments in planning decentralized policy. Some pilot adaptation programmes need to be launched for "learning by doing".

Attention should be paid to alternative livelihoods as the current natural resource based livelihoods are likely to be affected by climate change. Strategies for alternative livelihoods must offer affected communities a range of employment opportunities and should include support for local labour, industrial and business initiatives.

5.3 BUDGT ALLOCATION FOR RESEARCH

All state governments must start their own research departments to make a thorough analysis of climate change impacts and carry out research for effective climate resilient technology generation. A climate management information system may be developed for efficient addressing of climate related problems. Greater support for agricultural research and extension to promote sustainable modes of dry land farming is immediately needed. Research on appropriate cropping patterns and systems, crop varieties and species, emerging pests and diseases, and evolving and anticipated climate stresses on crops and livestock is needed. For all these activities, the central government must allocate enough budget to the states.

5.4 DRAW MORE INVESTMENT FROM DEVELOPED COUNTRIES

The fragile and developing countries like India are facing challenges to counter the damages not created by them but by the developed countries. Thus, in addition to development support to them, an additional amount of share is needed to manage the miseries of the climate change created as a result of the carelessness of their developed counterparts. India should negotiate with the developed countries of the West to draw significant financial and technical support from them in coping with the possible tragedies due to climate change because climate resilient development demands a greater investment.

5.5 DIVERSIFYING LIVELIHOODS THROUGH NEW TECHNOLOGIES

For the threats by increased levels of flooding from monsoon swollen rivers, various techniques can be applied like construction of houses on raised plinths to reduce risk of flooding, construction of floating vegetable gardens to provide food during flood periods, cages for fish culture when river flows are too fast for safe fishing. To tackle landslides and erosion in steep slopes, we can put Gabion spurs along a tributary to deflect flood flows away from bankside houses and plant fruits and fodder trees to stabilize hillsides. To protect the coastal communities, we can develop a coastal belt of salt-tolerant trees (including mangroves) to reduce the erosive impact of wave action.

6. CONCLUSION

It is true that India and other developing countries are not responsible for the threat of climate change and unsustainable consumption patterns of the rich industrialized nations is responsible for the current problem. But for a growing economy like India, entangling into these cheap aspects is self-destructive. Taking considerable actions in terms of policies, programmes and projects to combat the hazardous effects of climate change is the immediate requirement. India must give the greatest emphasis on community based actions to build climate resilient platform for its poor people. But at the same time, India must convince the world that GHG emissions by the poor should not be expected at the expense of development. In the COP15 this December, India must be able to make a good deal with the developed countries to provide it finance and technology to build climate resilient environment in India. At the same time, India must give a logical and practical suggestion about how to set carbon emission cap to stop global GHG emission. Much homework need to be done by India before taking a final decision to walk the low-carbon path at the cost of millions of its poor people.

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