Background Paper
Impacts, Vulnerability and Adaptation to Climate Change in Asia

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General Social and Environmental Condition

- The world's largest and populous continent
  - 30 percent of the world land area that contains more than 60 percent human population
  - Almost half of the people are living in the coastal area or near to the coast
- Culture, environment, and economy differs widely within and between the nations.
  - China, the largest economy in the Asia and second largest in the world
  - There are Least Developed Countries also
- In most cases, Central Governments are playing key role in economic planning to achieve development goals

General Social and Environmental Condition

- Protection of Natural Resource Base and Environment is still one of key challenges
  - Land and ecosystems are being degraded
  - Threatening to undermine food security
- The region is highly subject to natural disasters
  - Indian Ocean Tsunami in 2004, Pakistan Earthquake in 2005, Philippines landslide in 2006
  - There are Least Developed Countries also
- There is evidence of prominent increases in the intensity and/or frequency of many of the extreme weather events

General Social and Environmental Condition

- Water, agriculture and land use, ecosystem and biodiversity are common problems
  - Adequate supply of water against growing demand driven by economic growth, urbanization etc.
  - Scarcity in Arid and Middle Eastern Region is a major problem
  - Irrigation for agricultural production is key and demand is high (e.g. in Iran more than 90 percent water is consumed by agriculture)
  - Some parts also suffer from both abundance as well as scarcity of water (Bangladesh, India)

General Social and Environmental Condition

- Rate of retreat of glaciers in the Himalaya and permafrost thawing in north Asia has rapidly increased in the last decade
- Hydrological cycle in many river basins has been changed due to land-use change, water storage, inter-basin transfers, and irrigation and drainage
- Change in the onset, continuity and withdrawal patterns of the summer monsoon in recent years has led to considerable spatial and temporal variations in rainwater availability

General Social and Environmental Condition

- Most affected ecosystems in Asia are coastal and marine, forest and mountainous region
- Mangroves and coral reefs are important support system for coastal people and livelihoods
- Coastal forest play significant role in protecting inhabitant from natural disasters like cyclone and Tsunami
- Increased coral bleaching is noticed Asian countries (Indonesia)
- Sustainable agriculture is also a major challenge as climate and resource base is becoming more stringent

Climate and Observed Change

Region	Changes in Temperature	Rainfall	Example
Boreal Asia	Increase in surface air temperature of about 2.9°C in the past 100 years. More pronounce in winter and summer	Highly variable, decrease 4.1 mm/month/100 and increase in last 10 years	Summer temperatures in central Siberia have exhibited decreasing trends
Arid and semi-arid Asia	Increase in surface air temperature of about 1.3°C during 1894–1997	Region and temporal variability is quite high. Annual mean rainfall is considerably low in most parts of the arid and semi-arid region	In the arid regions of China, air temperature has increased since the 1970s.

Climate and Observed Change

Region	Changes in Temperature	Rainfall	Example
Temperate Asia	Increased by 0.7°C in Mongolia in last 50 years; noticeable changes in the length of the cold and warm seasons. Temperature in northeast China has increased in winter but decreased in summer since 1905	Summer rainfall has declined over the period 1970–1990 in Gobi; the number of days with relatively heavy rainfall events has dropped significantly.	In China, annual precipitation has been decreasing continuously since 1965
Tropical Asia	Several countries have reported increasing surface temperatures	Highly variable and monsoon play significant role in temporal and spatial scale	Increased 0.32°C in Vietnam over the past three decades Increased 0.57°C per 100 years in India

Future Change in Climate

- Annual mean warming is projected to be about 3°C by the 2050s and about 5°C by the 2080s over the land regions of Asia
- Temperature is projected to be most pronounced over North Asia
- Increase in annual precipitation in most of Asia is predicted with the relative increase being largest and most consistent in North and East Asia
- Decline of precipitation is predicted in summer over the central parts of arid and semi-arid Asia
- Increased rainfall intensity, particularly during the summer monsoon, could increase flood-prone areas in East Asia, South Asia and Southeast Asia

Future Change in Climate

- The International Commission of Snow and Ice (ICSI) and the DFID, have predicted that Himalayan glaciers might disappear within 40 years time
  - Water stress will be pronounced to millions in India and China depending on glacier fed rivers
  - Drought will increase in Bangladesh
- The Chinese Academy of Sciences states that as many as 64 % of China's glaciers will not exist by 2050 if current trends continue

Future Impacts of Climate Change

- Agriculture and Food Security
  - Substantial losses are likely in rainfed wheat in South and Southeast Asia
  - The net cereal production in South Asian countries is projected to decline at least between 4 to 10% by the end of this century
  - Farm level net revenue loss between 9% and 25% will occur due to the drop in yields in non-irrigated wheat and rice for a temperature increase greater than 2.5°C
  - Agricultural irrigation demand in arid and semi-arid regions of Asia is estimated to increase by at least 10% for an increase in temperature of 1°C

Future Impacts of Climate Change

- Water
  - Highly variable – spatial and temporal scale
  - Melting of snow and intensification of the monsoon rain is likely to contribute to flood disasters in Himalayan catchments
  - Reduction of annual surface runoff and increase in temperature will reduce total availability of water both in surface and groundwater in the western region of Asia.

Future Impacts of Climate Change

- Ecosystem and Biodiversity
  - Freshwater ecosystem will suffer, such as lake and river
  - Northeast China may become deprived of conifer forests
  - Grassland productivity is expected to decrease by as much as 40–90% for an increase in temperature of 2–3°C combined with reduced precipitation in the semi-arid and arid regions of Asia

Future Impacts of Climate Change

- Coastal Zone
  - Much infrastructure and economic activity is located in coastal zones
  - These are vulnerable to sea level rise and more frequent weather events (e.g. cyclones, storm surges)
  - Economic activity will suffer most in the coastal area

Future Impacts of Climate Change

- Human Health
  - Climate change will have a wide range of health impacts all across Asia
  - Risk of mortality and morbidity will increase with an increase in the frequency and duration of severe heat waves and humid conditions
  - Malaria in tropical Asia may become more prominent with a rise in surface temperature and changes in rainfall patterns
  - Global warming will also increase the incidence of respiratory and cardiovascular diseases, in arid and semi-arid, temperate, and tropical Asia

Development Consequences

- The impacts of climate change on Asia will place additional stress on socioeconomic and physical systems.
- Increase in floods, cyclone, droughts and coastal floods intensity will result loss of agriculture, job etc and could led large-scale demographic responses—for example through migration

Capacity for National Climate Change Study

- Capacity vary across the nations – institutional, human and financial
- Data is being collected and used for developing future climate change scenarios, impacts, and vulnerability assessment in Asia
- The NCs used General Circulation Models (GCMs) and Regional Circulation Models (RCMs), downsized using MAGICC/SCENGEN software
- Resolution of the global scale models are not very suitable for assessing adaptation at local level
- NAPA has used vulnerability bottom up approach that allows designing adaptation considering national circumstances

Adaptation to Climate Change

- NCs and NAPAs of Asian countries have reported existing coping strategies and adaptation measures
- Asian region have much in common as far as vulnerability to climate change is concerned
- However, priority areas to deal with climate related problems vary due to the scale of impacts and national development priorities
  - Agriculture and water in Tropical Asia;
  - Ecosystems and water in Arid and Semi Arid Asia;
  - Water and agriculture in Temperate Asia.

Adaptation to Climate Change

- NAPAs have identified immediate and urgent needs
  - Bangladesh NAPA gave emphasis on coastal afforestation, development for agriculture, water resource management, increasing infrastructure resilience community based adaptation, and insurance options.
  - The Bhutan NAPA gave emphasis on disaster management, landslide restoration, artificial lowering of glacier lakes, and hazard zoning.
  - Awareness raising and capacity-building for vulnerable communities, planners and policy makers are common in the NAPAs.

Integration of Adaptation to Climate Change in the follow up Assessment

- Future impacts, vulnerability and adaptation assessment can be built on initial NCs
- An integration of scenario based and vulnerability based assessment would be helpful for assessing both vulnerability of biophysical and social systems
- Involvement of different policy makers (national and sectoral) and other stakeholder groups in the preparation process will help in future integration into sectoral policies and plans.

Integration of Adaptation to Climate Change

- The link between climate change and development is obvious.
- Showing linkage between adaptation to climate change and its contribution to development, and how adaptation to climate change will bring increased sustainability is crucial for motivating national and sectoral policy makers.
- Many local communities are already adapting to the impacts of climate variability and climate change on a daily basis.
- Experiences can offer lessons for national governments wishing to support adaptation activities.
- Experiences from disaster preparedness, and mainstreaming climate change adaptation measures to disaster management are essential.

Local Level Coping Strategies

- Asian region has a large body of knowledge and experience at the local level on coping with climatic variability and extreme weather events such as floods, drought and cyclones/typhoons.
- Explicit adaptation strategy for each country is not available except NAPA for LDCs
- But National Communications have identified and highlighted several adaptation needs and strategies for implementation

Local Level Coping Strategies

- Several Community Based Adaptation (CBA) activities to climate change, variability and extreme events are implemented or being implemented in Asia
- Most of these adaptation activities are small-scale and concentrate on agriculture, water and natural disaster amelioration
- Most of the CBA projects have an emphasis on livelihood of the impacted community, diversification of agriculture, conservation of water and awareness raising to change practices
- Many examples are available in the UNFCCC website and website of CBA workshop

Adaptation Strategies

- Adaptations are already required to deal with vulnerabilities associated with climate variability
- Priority areas for adaptation are land and water resources, food productivity and security, and disaster preparedness and planning
- Development of adaptation options need to be evaluated along with present and future development plans
- Strategies require local involvement, inclusion of community perceptions, and recognition of multiple stresses on sustainable management of resources

Adaptation Strategies

- A common Framework for developing adaptation strategies is essential at the country level in order to design and implement adaptation options in an integrated manner
- Adaptation is location specific and therefore implementation of adaptation measures at cross-national and regional level would be difficult
- However, maladaptation can be avoided, particularly in large watersheds shared by more than one country or regio

Adaptation Strategies

- Most importantly
  - Processes of identifying adaptation measures,
  - Development of policies and strategies,
  - Engagement of different stakeholders, and
  - Linking adaptation with development
- Above can be shared among the countries having common characteristics and strength of economy
- Institutional capacities are a key element of community-based adaptation. Not just within the communities themselves, but also the institutions that interface with them

Opportunities

- GEF Trust Fund
  - Strategic Priority on Adaptation
- Least Developed Country Fund (LDCF)
- Special Climate Change Fund (SCCF)
- Bilateral Funds
  - DFID
  - DANIDA

Regional and International Cooperation

- The Asia-Pacific Network for Global Change Research (APN)
  - Capacity-building, Comprehensive Research, and Adaptation to Climate Change, for example the 'Linking Climate Change Adaptation to Sustainable Development in Southeast Asia'
- SysTem for Analysis, Research and Training (START)
  - Completed its Assessments of Impacts and Adaptation to Climate Change (AIACC) project in Asia where potential impacts of climate change and vulnerability and adaptation assessment have been carried in selected sectors and countries
  - Advancing Capacity to Support Climate Change Adaptation (ACCCA) is an ongoing project with community focus
- The International Center for Integrated Mountain Development (ICIMOD) and UNEP
  - Inventory of glacial lakes; establishment of early warning systems; and development of adaptation measures

Regional and International Cooperation

- Centre for International Forest Research (CIFOR)
  - Forestry and Livelihood
- The International Water Management Institute (IWMI)
  - Collaborative research with partners in the North and South, develop tools and practices to help developing countries to eradicate poverty and better manage their water and land resources.
- The Asian Disaster Preparedness Center (ADPC)
  - Raising awareness, strengthening institutions, providing training and mainstreaming disaster reduction in development management in Asia
- The Institute for Global Environmental Strategies (IGES)
  - Working on mainstreaming adaptation, adaptation beyond 2012

Regional and International Cooperation

- The Red Cross/Red Crescent Climate Centre
  - Climate Change and Disaster Linkage
- SouthSouthNorth (SSN)
  - Development of tools and methodology for community based adaptation, piloting CBA
- Capacity Strengthening of LDCs for Adaptation to Climate Change (CLACC)
  - Raising awareness of development NGO, strengthening capacity through training and undertaking small scale activities
- The Energy Resources Institute
  - Working on climate change (energy and adaptation)
- Bangladesh Centre for Advanced Studies
  - Climate change works are related to energy, adaptation and adaptation at community level

Future Need

- Adaptation strategies should take a more systems-oriented, people centred approach, emphasizing multiple interactive stresses
- Adaptation should aim to strengthen traditional coping mechanisms: optimizing current systems whilst building flexibility to cope with the uncertainties posed by climate change
- Strengthens adaptive capacity based on traditional knowledge and approaches and reinforces local knowledge
- Implementation of adaptation measures identified in National Communications and National Adaptation Programmes of Action

Future Need

- Enhancement of technical capacity to assess, plan and integrate adaptation needs into sectoral development plans
- The development of educational and public awareness programmes on climate change
- Support mainstreaming of adaptation into sectoral policy, particularly water, agriculture, coastal zones and managing natural ecosystems;
- Enhance effectiveness of mechanisms and increase funds for adaptation to climate change