SAARC Workshop on Climate Change and Disasters: Emerging Trends and Future Strategies

BACKGROUND PAPER

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Climate Change and Disasters:
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Background Paper

CONTEXTS

South Asia, the home for one-fifth of the humanity, has perennially been a disaster-prone region. In 2007 itself, for instance, the CRED reported that out top five countries in the world who were hit hardest by the natural disasters, the first two were Bangladesh and India, while Pakistan occupied the fourth position[1]. This is not an exception of a year but has generally been the trend, which highlights the comparative vulnerability of the region to disasters. Two thirds of the disasters the region experiences are climate related and there have been phenomenal increase in their frequency, severity and unpredictability in the recent times. The severest impacts have been visualized in terms of sea level rise leading to submergence of low-lying coastal areas and depletion of Himalayan glaciers threatening the perennial rivers that sustained food, water, energy and environment security of the region. The climate change is surely creating grounds for newer and more severe risks of disasters in the region in the coming years.

1.2. Further, layers of vulnerabilities in the region – poverty, illiteracy, mal-nutrition and social inequities - are aggravating the risks from stresses on water, agriculture and environment and creating recipes of more disasters. With climate sensitive agrarian economies, all the countries of the region would be facing serious crisis unless the rising temperature of the globe and the region are checked and new technologies, practices and life styles are developed and adapted according to the changing climate scenarios. Therefore, climate change mitigation and adaptation have emerged as important tools for disaster risk reduction for all the countries in the region.

1.3. So far climate change and disaster management communities of the region have been working in relative isolation, with the former focusing

[1] CRED CRUNCH, Issue No 12, April 12, 2008 (www.cred.be)

more on long term modeling and projections of climate scenarios and their possible impacts and the later concentrating on short term preparedness and response to disaster events. The time has come when the implications of future climate projections for the current risks and vulnerabilities are understood and accordingly these are factored into the policies and programmes developed for reducing the risks of disasters. Surely there should be greater dialogue and interaction between the two communities so that the limited efforts for climate change analysis and adaptation and disaster risk reduction in the region can be integrated to the extent this possible and new innovative tools and methodologies developed for such integration in development projects and practices. Although, efforts to bring together stakeholders in climate change and disaster management have begun to create an opportunity for integration, challenges would lie not only in harmonizing diverse institutional structures and distinct sectoral planning and policies etc but also in translating the common grounds into projects on the grounds. The *SAARC Workshop on Climate Change and Disasters: Emerging Trends and Future Strategies* makes a modest beginning in this direction to develop a road map for the future.

CLIMATE CHANGE AND DISASTERS

2.1. The fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC)[2] has collected good evidences to warn that extreme weather events and climate variability will increase the risks of natural disasters such as floods, flash floods and GLOFs, cyclones, drought, sea level rise, coastal erosion, landslides etc and their impacts would be felt more severely in the South Asia.

Floods

2.2. Erratic rainfall behaviours characterized by lesser number of rainy days but heavy precipitation events would become more frequent. Heavily populated urban areas, river basins and mega-deltas will be at risks of flooding. Increased flooding events, exceeding historical parameters, would affect areas without developed early warning, preparedness and response systems, resulting in displacement and deaths

[2] Intergovernmental Panel on Climate Change, Climate Change 2007 (www.ipcc.ch)

of a large population, damages of housing and infrastructure, dislocation of communication systems and loss of economic production in and outside farming systems.

2.3. The 2005 floods in Mumbai demonstrated how a single day rain could exceed the collective rainfall of the season and offset every projection. More recently in 2007, Nepal, India, and Bangladesh were hit by the worst flooding in living memory, affecting more than 50 million people. Incidence of floods in the newer areas like arid-region of western India and drought in flood-prone basins of eastern India reflect the changing face of the disaster risks expanding its areas of influences in those regions that were not vulnerable ever before.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) 2007 indicates that climate change is likely to alter risk patterns in several ways:

- **Increase the frequency and intensity, reduce the predictability and change the spatial distribution of extreme climatic hazards, such as temperature extremes, storms, floods and droughts. As the water cycle becomes more intense, many climate-related hazards will become more severe, including floods, droughts, heat waves, wildland fires and storms with a range of effects in different regions. Some impacts will occur in regions with no history of a given hazard.**

- **Increase the vulnerability of particular social groups and economic sectors, as existing vulnerabilities are compounded by climate change-related processes, such as sea level rise, glacier melt and ecosystem stress. The increase in vulnerability in regions dependent on subsistence agriculture may be particularly drastic, due to food and water shortages, in Small Island developing states and coastal zones due to sea level rise and in regions depending on water from glacier melt for agriculture and human consumption.**

- **Climate change will alter patterns of climatic hazard as well as increase physical, social and economic vulnerability in many regions. At the same time, other processes that drive disaster risk, such as urbanization and environmental degradation, will contribute to an increased exposure and vulnerability to climate hazard. The increasing concentration of population and economic activities in flood and cyclone-prone coastal areas is such an example, which, when combined with stronger and more frequent floods and cyclones, will magnify the risk associated with climate change.**

GLOF

2.4. South Asia has the largest glacial reserves outside the Polar Regions. There are concluding evidences that many of the glaciers in the Himalayas are melting fast resulting in increased incidence of flash floods and landslides in hilly settlements. Significant increase in the size and volume of glacial lakes and formation of new lakes have made many regions in the Himalayas particularly in Nepal and Bhutan more prone to

Himalayan Glaciers Retreat Documented in various Scientific Publications

India

- **The Siachan and Pindari Glaciers retreated at the rate of 31.5 and 23.5m per year respectively.**
- **The Gangotri retreated 23 m per year between 1985 to 2001. The total of 2 km retreat of Gangotri Glacier is shown.**
- **Retreat of Chhota Shigri glacier in India is 800 m between 1988 and 2003. Areal extent of 466 glaciers in Himachal Pradesh, covering three highly glaciarized basins of Chenab, Parbati and Baspa from 2077 sq. km in 1962 and 1628 sq. km in 2001–04, gives rapid glacial retreat of about 21% deglaciation.**
- **Amount of retreat varies from glacier to glacier and from basin to basin, depending on parameters such as maximum thickness, mass balance and rate of melting at the terminus.**

Bhutan

- **Study based on selected debris covered glacier, retreat rate is 30-35 m/year.**
- **From 1967 to 1988, retreat of 35 m/year was found in Tarina glacier of Bhutan.**
- **The retreat rate is later confirmed by several related studies by examining 103 debris free glaciers in the Bhutan Himalaya. They found more than 26 m/year retreat of glaciers from the period of 1963 to 1993.**

Nepal

- **Most of the Nepalese river systems are snow-fed originating from higher Himalayan regions. There are numerous active glaciers in the High Himalayas, which are retreating in most part at present and contributing to discharge downstream. Glacier lakes are predominantly created by the action of surging glaciers.**
- **Almost all of the glacier lakes in the Nepal are formed on the glacier terminus dammed by moraine. The most active glaciers of Nepal are located in the eastern part of the Nepal. There are numerous occurrences of glacier lakes in this region and one of the big flood disasters in Nepal is due to GLOF.**
- **Further, almost all of the glaciers in Nepal are retreating. The Imja Glacier in Nepal retreated 74 m/year ("between"2001-2006), whereas, the rate was 41m/year "between" 1962-2001. Seven unnamed clean type of glacier in Kumbhu region of Nepal retreated by 30-60m/year.**

Glacier Lake Outburst Flooding (GLOF). The Hindu Kush-Himalayan region has suffered several GLOF events some of which have trans-

national impacts[3]. This phenomenon is likely to lead to increased flooding in many river systems in South Asia, including rock avalanches from destabilized slopes, overflow floods and natural dam rupture.

Cyclone

2.5. In the past 270 years, 20 out of 23 major cyclone disasters with loss of life 10,000 or more have occurred over the India and Bangladesh in the sub -continent. Warmer sea (temperature in excess of 26^{o}–27^{o}C) to a depth of 60 meter with abundant water vapour in the overlying air (by evaporation) is likely to increase the frequency and intensity of tropical and extra-tropical cyclones. As depicted in Table -1 during the past three decades the number of tropical cyclones of Category 4 and above has increased sharply from 8% to 25% in North Indian Ocean and 18% to 34% in South Indian Ocean basins – the largest among the ocean basins of the world.

2.6. This is going to intensify hazard exposure in existing cyclone hotspots which are already densely populated with a range of economic activities that would face the risks of damages. At the same time, higher sea temperatures may alter cyclone tracks, exposing new areas and population to risks and creating newer hotspots of tropical storms[4].

2.7. Storm surge is the catastrophic feature of cyclones. The degree of disaster potential depends on the storm surge amplitude at the time of landfall, characteristics of coast, phases of tides and the vulnerability of the area and community. The tropical cyclones of specified intensity in the Bay of Bengal striking the east coast of India and Bangladesh usually produce higher storm surge compared to elsewhere in the world because of the special nature of the coastline, shallow coastal ocean bottom topography and characteristics of tide. Their coastal impact is very large in the region because of low and flat coastal terrain, high density of population, low awareness of community, inadequate response and preparedness and absence of hedging mechanism. With expected increase in intensity as well as frequency of tropical cyclones in the Indian Ocean, the devastating potentials from storm surge are likely be on the rise.

[3] Impact of Climate Change on Himalayan Glaciers and Glacial Lakes, ICIMOD-UNEP Report 2007
[4] Disaster Risk Reduction – Global Overview 2007, United Nations www.unisdr.org

Table 1: Change in Number and Percentage of Hurricane/Cyclone
[category 4 (wind speed – 210 to 250 km/hr) to 5 (wind speed 250 km/hr and above)]

	1975-1989		**1990-2004**	
Basin	Number	Percentage	Number	Percentage
East Pacific Ocean	36	25%	49	36%
West Pacific Ocean	85	25%	118	41%
North Atlantic	16	20%	25	25%
South West Pacific	10	12%	22	28%
North Indian	1	8%	7	25%
South Indian	23	18%	50	34%

Source: PJ Webster et al (2005), Science, 16 Septembre 2005, Vol 309.

Drought

2.9. The IPCC report highlights that the average temperature would continue increasing thus resulting in over drier conditions in the region. Total rainfall amounts may increase in some parts of the regions, but variability is likely to increase further. As a result, drought will become more frequent and intense, while rainfall will be concentrated in shorter and more intense duration. In arid, dry semi-arid and moist semi-arid regions, delayed and reduced precipitation owing to El Nino and South Oscillation (ENSO), climate change and other local conditions are expected to exacerbate the growing water shortage faced by the poor inhabitants of the region.

2.10. Further, with the climate change, the areas suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease, leading to drought like conditions in larger areas particularly in Afghanistan and parts of Pakistan and India.

IMPACTS OF CLIMATE CHANGE

3.1 It has been projected, in the fourth assessment of IPCC report, that the natural resource base especially water resources, agriculture, biodiversity and other ecosystems would be affected adversely because of anticipated changes in precipitation, temperature and monsoon patterns.

There is a broad consensus among experts that wet areas will get wetter and dry areas drier. A rise in sea level will submerge inland territories and coastal areas. In fact, water, food and energy security in the region are closely linked to the climate change and some of the likely impacts are summarized below:

Water Famine

3.2 The climate change impact is likely to lead water famine in South Asia. Growing populations and the concentration of the population in urban and semi-urban areas are already exerting increasing pressures on the scarce water resources, the climate change may aggravate the water crisis further. Water management would witness more challenges in the scenario of lesser rainy days with high intensity combined with extreme summer and winter. Surface runoff is projected to decrease drastically in arid and semi-arid Asia under climate change scenarios and would significantly affect the volume of water available for irrigation, power and other purposes.

3.3 The perennial rivers originating in the high Himalayas receive water from snow and glaciers. Because the melting season of snow coincides with the summer monsoon season, any intensification of the monsoon is likely to contribute to flood disasters in Himalayan catchments. Such impacts will be observed more in the western Himalayas compared to the eastern Himalayas because of the higher contribution of snowmelt runoff in the west. An increase in surface runoff during autumn and a decrease in springtime surface runoff are projected in highland regions of south Asia. In addition, the increase in surface temperature will contribute to a rise in the snowline, which, in effect, reduces the capacity of the natural reservoir. This situation will increase the risk of flood in Nepal, Bangladesh, Pakistan, and north India during the wet season[5]. The impacts will be greater on irrigation for agriculture and water supply for the industrial, power and domestic purposes[6].

[5] P Singh 1998: Effect of global warming on the streamflow of high-altitude Spiti River. In: Ecohydrology of High Mountain Areas [Chalise, S.R., A. Herrmann, N.R. Khanal, H. Lang, L. Molnar, and A.P. Pokhrel (ed.)]. International Centre for Integrated Mountain Development, Kathmandu, Nepal, pp. 103–114.

[6] Lal, M., 2003: Global Climate Change: India's monsoon and its variability, Journal of Environmental Studies and Policy, 6 (1), 1-34

Food Scarcity

3.4 In the past few decades, production of major cereals rice, corn and wheat has declined in many parts of the region due to increasing water stress arising partly from increasing temperature during the critical stages of the crop growth, reduction in the number of rainy days etc[7]. In a study by the International Rice Research Institute, the yield of rice was observed to decrease by 10% for every 1°C rise in growing-season minimum temperature[8]. Further, crop simulation modeling studies based on future climate change scenarios indicate that substantial losses are likely in rainfed wheat and the drop in yields in non-irrigated wheat and rice will be significant for a temperature increase greater than 2.5 ^{o}C, incurring a loss in farm level net revenue of between 9% and 25%. The net cereal production in South Asian countries is projected to decline at least between 4 to 10% by the end of this century under the most conservative climate change scenario[9]. The rainfed crops could face water-related challenges in coming decades due to increases in water demands and soil-moisture deficit associated with projected decline in precipitation. Climate change could make it more difficult to enhance agricultural production to meet growing food demands in the region.

3.5 Further, the impact of climate change on marine fisheries depends on the complicated food chains in the surrounding oceans, which are likely to be disturbed by climate change. Future changes in ocean currents, sea level, sea water temperature, salinity, wind speed and direction, strength of upwelling, mixing layer thickness and predator response to climate change have the potential to substantially alter fish breeding habitats and food supply for fish and ultimately the abundance of fish populations in the coastal regions of South Asia[10]. Potential decline as well as uncertainty in climate sensitive agricultural and fishery production would have profound impact in the region, which has already

7 Agarwal, P. K., S.K. Bandyopadhyay, H. Pathak, N. Kalra, S. Chander and S. Kumar, 2000: Analysis of yield trends of the rice-wheat system in north-western India, Outlook on Agriculture, 29(4), 259-268 [Asia, agriculture]

8 Peng, S., J. Huang, J.E.Sheehy, R.E. Laza, R.M. Visperas, X.Zhong, G.S. Centeno, G.S. Khush and K.G. Cassman, 2004: Rice yields decline with higher night temperature from global warming, Proc. Nat'l Acad. Sci. (PNAS), Vol. 101, No. 27, 9971-9975

9 Kumar, K.S. and J. Parikh, 1998: Climate Change Impacts on Indian Agriculture: Results from a Crop Modeling Approach, In Dinar and others, eds. Measuring the Impacts of Climate Change on Indian agriculture, World Bank Technical Paper No. 402. Washington, DC: World Bank.

10 FAO (Food and Agriculture Organization), 2003: "World agriculture: towards 2015/2030 – An FAO Perspective", Bruinsma (ed.), FAO, Rome and Earthscan, London

been a home to the largest number poor, food insured and malnourished population.

Sea Level Rise

3.6. South Asia with a long coastline of 12,000 km and high population density along most of the coast is highly prone to oceanogenic disasters. Climate change may turn many of these coastal areas extremely vulnerable to disasters. Over the past 100 years or so, the rise in sea level has been around 2 mm per year. Over the next 100 years, IPCC estimates that rise rate could increase significantly up to around 10 mm per year. The deltaic regions of Bangladesh and India and low lying coasts of Sri Lanka, Maldives, Pakistan and India are going to be the most vulnerable to sea-level rise, affecting the lives of millions of people who are already affected by storm surges, tsunami, water logging etc. Sea level rise would further enhance the risk of flooding and storm damage, precipitate salination of surface and ground waters and affect coastal tourism etc.

Migration

3.7. The socio-economic impacts of water and food scarcity and sea level rise would be far reaching as people from the low lying coastal areas, and areas affected by acute water scarcity would be forced to migrate in large numbers in search of new habitats and livelihood which would create new social tensions in already dense settlements of the region. It is apprehended that Bangladesh, Maldives and parts of east coast of India would face large scale displacement of population. As a result, large numbers of people are likely to likely to migrate from these regions and upset established social, ethnic and political balances among affected groups and states, which may lead to a potential source of conflict in the future.

Health

3.8. Climate change is likely to have wide ranging but mostly adverse effects on human health. Increases in mortality from heat waves compounded by more severe urban air pollution are indicated in IPCC assessment. Increases in infectious diseases, such as malaria and

schistosomiasis, are expected to be driven by the geographical spread of conducive climactic conditions and changes in the lifecycle of disease vectors and infectious organisms. Vector-borne diseases are a major cause of illness and death in South Asian countries. Rather than being transmitted directly from human to human, these diseases are transmitted by insects or other vectors. Climate is an important determinant of the spread of vector-borne diseases, affecting the distribution of the disease-carrying insects as well as the infectiousness of the disease itself. The IPCC concluded that increased warmth and moisture would enhance transmission of these diseases. The increased prevalence of disease vectors will also contribute to greater human vulnerability, compounding the above causes. All these increases in vulnerability may result in a reversal of the trend towards reducing mortality risks for climatic hazards.

Bio Diversity

3.9 With the climate impact, the present distribution of species in high-elevation ecosystems is projected to shift to higher elevations. There is growing concern that climate change may accelerate the damage to freshwater ecosystems such as lakes, marshes, and rivers, besides altering the boundaries of forest types and areas, primary productivity, species populations and migration, the occurrence of pests and diseases, and forest regeneration.

3.10 Further, there are complex interrelationships and feedbacks between human driving forces and impacts, on the one hand, and climate- and sea level-induced changes and effects on the other. At the interface between ocean and terrestrial resources, coastal ecosystems undergo stress from competing multi-usage demands, while having to retain their functional diversity and resilience in the face of global environmental change. Temperature increases could also adversely affect local flora and fauna of coastal areas, coral reefs, mangroves, as well as the biological equilibrium of marine life[11].

[11] Church, J., J. M. Gregory, P. Huybrechts, M. Kuhn, K. Lambeck, M. T. Nhuan, D. Qin, and P. L. Woodworth, 2001, Changes in sea level, in Climate Change 2001: The Scientific Basis, Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change, edited by J. T. Houghton et al., pp. 639–693, Cambridge Univ. Press, New York

CLIMATE CHANGE AND DISASTER RISK REDUCTION

4.1 Increasing trends of natural disasters and their threatening impacts on lives and livelihoods have resulted in a paradigm shift in disaster management in all the countries of South Asia - from one post disaster relief and rehabilitation to holistic management of management of disasters covering all phases of disasters. The focus is clearly on Disaster Risk Reduction (DRR) - preparedness, mitigation and prevention. Many of the risk reduction measures particularly those related to hydro-meteorological disasters, such as drought proofing, flood protection, saline embankment and bio-shields, alternative livelihood development etc have similarities with Climate Change Adaptation (CCA) programmes. Therefore synergies between DRR and CCA would be necessary not only to avoid duplicities and derive optimal benefits from scarce resources but also to add value to the projects through lessons learnt from the respective perspectives. Factoring climate change issues in disaster risk mitigation projects would enrich the projects and make

Priorities of Hyogo Framework of Action

The Hyogo Framework of Action has advanced the cause of disaster risk reduction by adopting five Priorities for Action through a five fold processes:

a) **Political process to ensure that disaster risk reduction is a national and a local priority,** which would require countries to develop policies and legislative and institutional frameworks for disaster risk reduction and commit resources for prevention, mitigation and preparedness for disasters;

b) **Technical process for identification, assessment and monitoring of disaster risks,** which would require of application of science and technology for risk identification, risk mapping, risk assessment and risk monitoring and enhancing early warning of disasters;

c) **Socio-educational process of knowledge, education and innovation** for increasing citizen's understanding and skills to build a culture of safety and resilience at all levels;

d) **Development process of reducing underlying risks** through poverty alleviation and urban, environmental and regional land use planning so as to integrate disaster risk in all relevant sectors of development planning and programmes as well as in post-disaster recovery; and

e) **Humanitarian process** of factoring disaster risk reduction in disaster preparedness, response and recovery.

them more relevant to the emerging concerns just as risk management tools would assess climate change from the perspectives of risks and vulnerabilities over time and the cost-benefit of alternative strategies of adaptation.

Global Efforts

4.2. At global level, the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters* adopted at the World Conference on Disaster Reduction in Kobe Japan lays emphasis on scaling up the use of disaster risk reduction tools viz., vulnerability and risk assessments, early warning systems, land-use planning, techno-legal regime for development practices, besides enhancing the institutional and legal capacities. The focus has also been placed on the integration of knowledge on disaster risk reduction and application of such knowledge to bridge the gaps in management of disaster risks. Each of these action areas can have significant bearings in climate sensitive sectors.

4.3 The United Nations Framework Convention on Climate Change (UNFCC) recognized that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention adopted the Kyoto Protocol in the third conference of parties in Kyoto Japan in 1997 which commits the developed countries to stabilize greenhouse gases and provide a tool for such stabilization through the promotion of Clean Development Mechanisms in the developing countries. In the second most important initiative after Kyoto Protocol, the Convention adopted the Bali Action Plan in December 2007 which calls for enhanced action on adaptation, considering in particular risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance and other disaster reduction strategies. For the first time ever disaster risk reduction was included as a tool for climate change adaptation, which will guide the negotiations for a post Kyoto climate change agreement from 2012, This has opened up a range of possibilities for integration of climate change adaptation in disaster risk reduction strategies.

Climate Change Adaptation and Disaster Risk Reduction in Bali Action Plan

The Conference of Parties agrees, inter alia, consideration of:

International cooperation to support urgent implementation of adaptation actions, including through vulnerability assessments, prioritization of actions, financial needs assessments, capacity-building and response strategies, integration of adaptation actions into sectoral and national planning, specific projects and programmes, means to incentivize the implementation of adaptation actions, and other ways to enable climate resilient development and reduce vulnerability of all Parties, taking into account the urgent and immediate needs of developing countries that are particularly vulnerable to the adverse effects of climate change, especially the least developed countries and small island developing States.

Risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance;

Disaster reduction strategies and means to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the effects of climate change.

Regional Efforts

4.4. The need for regional cooperation addressing the concerns for environmental degradation in South Asia was voiced way back in 1987 during the Third SAARC Summit. The trans-boundary linkages of natural disasters with environment in the region were recognized for regional cooperation. The SAARC initiated a 'Regional Study on the Causes and Consequences of Natural Disasters and the Protection and Preservation of Environment' in 1991 and another study on 'Greenhouse Effect and its Impact on the Region' in 1992, which recommended regional measures in sharing experiences, scientific capabilities and information on climate change, sea level rise, technology transfer etc. As a follow-up to these studies, SAARC Plan of Action on Environment was adopted in 1997. The Action Plan provided for the establishment of Regional Centers of Excellence. The SAARC Meteorology Research Centre (SMRC) was established in Dhaka in 1995; the SAARC Coastal Zone Management Centre (SCZMC) was set up in Male in 2004; SAARC Disaster Management Centre (SDMC) came up in New Delhi in 2007 and the SAARC Forestry Center has come into the existence in Bhutan recently. All these SAARC Regional Centres can provide credible institutional

support for taking up climate change and disaster risk reduction issues in the region.

4.5. The Fourteenth SAARC Summit held in New Delhi in 2007 expressed 'deep concern' over the global climate change and called for pursuing a climate resilient development in South Asia. The member countries pledged for immediate collective action and stronger regional co-operation for the conservation and utilization of SAARC shared resources towards addressing the negatives of climate change. Further, the SAARC Council of Ministers, at their Twenty-ninth Session held in New Delhi in December 2007, adopted the SAARC Declaration on Climate Change which reflects the collective vision of South Asia. On behalf of the SAARC H.E. the President of Maldives presented the Declaration in the UNFCC meeting at Bali in December 2007.

SAARC Declaration on Climate Change

We, the Foreign Ministers of member states of SAARC, are deeply concerned that the adverse effects of climate change threaten human lives and livelihoods, sustainable development, and the very existence of many developing countries, particularly in South Asia. We believe that climate change is a phenomenon that impacts on the right to development and human security.

The low-lying regions and long coastlines of SAARC face serious threats from sea-level rise. Our peoples are being adversely impacted, including massive displacement as a consequence of sea-level rise, river bank erosion, drought, severe storms and cyclones, and permanent inundation. The Himalayan regions also face the catastrophic consequences of accelerated glacier melt, including Glacial Lake Outburst Floods (GLOF).

The SAARC member states are determined to contribute to this global effort, in line with the principle of common but differentiated responsibilities. Given our vulnerabilities, inadequate means and limited capacities, we need to ensure rapid social and economic development in our region to make SAARC climate change resilient.

4.6. The SAARC Ministerial Meeting on Climate Change held on July 3, 2008 in Dhaka adopted the SAARC Action Plan on Climate Change. H.E. Dr Sheel Kant Sharma, the SAARC Secretary General, in his inaugural speech laid emphasis on intensifying the regional cooperation on climate

change adaptation. He also highlighted that the emphasis of SAARC is to move from a declaratory to implementation phase and highlighted the roles that SAARC Regional Centres could play therein. He called upon the SAARC Meteorological Research Centre, the SAARC Coastal Zone Management Centre, SAARC Disaster Management Centre and SAARC Forestry Centre to contribute synergistically with their respective mandates in enhancing the SAARC climate change resilience by pursuing SAARC Action Plan on Climate Change.

4.7. SAARC Disaster Management Centre (SDMC) attaches a very high priority on implementing the SAARC Action Plan on Climate Change. In fact, SDMC, in its strategy to evolve the road maps on various themes, has taken into account the integration of disaster risk reduction into climate change adaptation as one of its priority areas of action. The SAARC Workshops on Science & Technology Applications in Disaster Risk Reduction in January 2008 in New Delhi and Coastal and Marine Risks in May 2008 in Goa emphasized on exchange of information and research on the linkages between climate change adaptation and disaster risk reduction in the region.

4.8. In the above contexts and background, the SAARC Workshop on Climate Change and Disasters: Emerging Trends and Future Possibilities during 21-22 August 2008 at Kathmandu, Nepal would be an important step forward for enhanced regional cooperation on :

a. Creation of awareness, scientific understanding and information exchange on the risks of climate change in the region and their impacts;

b. Development of innovative tools and methodologies for integration of disaster risk reduction strategies into climate change adaptation;

c. Implementation of SARC Action Plan on Climate Change for reducing the risks of disasters in the region; and

d. Development of a road map for regional cooperation on the above.

National Initiatives

Afghanistan

4.9 Afghanistan, a mountainous and land-locked country, has been experiencing climate related disasters like, floods, drought, landslide, sandstorms, avalanches and extreme winter events, which cause considerable loss to life and property and damage an already fragile environment. The National Environment Protection Act (NEPA) of Afghanistan provides the legal and institutional framework for management of natural resource, conservation, biodiversity, drinking water, pollution control, and environmental education. The Afghanistan National Development Strategy 2004 has set the goal for a five-year plan for institutional reform and sustainable development strategies, which include disaster and climate risk management as a priority.

4.10 The Afghanistan National Disaster Management Authority (ANDMA) is the nodal agency for formulation and implementation of disaster management policies and plan of action in association with the concerned line ministries and the provincial governments.

Bangladesh

4.11 IPCC reports suggest that Bangladesh might lose as much as one-third of its landmass due to the potential sea level rise, storm surges and anomalies in monsoon circulations. Bangladesh has attached a very priority on addressing climate change and disaster management issues in synergy. The Bangladesh Environment Conservation Act, 1995 provide a framework for climate change adaptations with provisions for conservation of environment, improvement of environmental standards and mitigation of environmental pollution. Water Management Plan of Bangladesh takes into account climate change as a critical factor for future supply and demand. Climate change has been factored in cyclone mitigation and coastal zone management plan. The National Adaptation Programme of Action (NAPA), prepared by six inter-sectoral groups of core development sectors with Ministry of Environment and Forest in the lead, has envisaged integration of climate change adaptation within the development process. The strategic goals and objectives, as outlined in NAPA, are to reduce adverse effects of climate change including variability and extreme events and promote sustainable development.

4.12 The Ministry of Food and Disaster Management (MoFDM) is mandated to co-ordinate all disaster management activities within the country. The MoFDM has designed a Comprehensive Disaster Management Programme which has taken a holistic approach to disaster risk including the risks of climate change.

Bhutan

4.13 Taking note of the fourth IPCC assessment report that the Himalayan glaciers are receding Bhutan has identified 26 glacial lakes that are extremely vulnerable to GLOFs and has put in place risk mitigation as well as climate change adaptation strategies. The NAPA of Bhutan has spelt out both short-term as well as long term strategy for climate change adaptation, vulnerability to the fragile mountain ecosystems, farming and livestock rearing, health, etc. Bhutan has a national forest policy, which emphasizes a minimum of 60% forest cover in order to prevent soil erosion and maintain climate equilibrium. The National Environment Protection Act 2000 takes into account climate change mitigation measures by establishment of an effective system to conserve and protect environment independently by a high-powered National Environment Commission.

4.14 Earthquake, Glaciers Lake Outburst Floods (GLOFs), Floods, Landslides, Forest Fires etc are the major disasters confronting Bhutan. The royal government of Bhutan has endorsed the National Disaster Management Framework under the National Committee on Disaster Management and there is a separate Disaster Management Division within the Ministry of Home and Cultural Affairs as the nodal agency to coordinate disaster risk reduction measures in the country.

India

4.15 The Govt. of India has been an active participant in the climate charge negotiations since the inception of UNFCC in 1992. The Ministry of Environment & Forests is the nodal Ministry for all environment related activities in the country including climate change policy. The National Environment Policy 2006 has laid emphasis on mitigation of climate change. Recently, India unveiled its National Action Plan on Climate Change, which lays down priorities and future actions on addressing climate change. Eight national missions viz., solar mission,

energy efficiency, sustainable habitat, water, Himalayan eco-system, green-India, eco-green agriculture and knowledge have been outlined focusing on both GHG mitigation as well as adaptation. The National Action Plan forms the basis for related sectoral developmental planning efforts to harmonize activities in respective sectors.

4.16 Recognizing that India's disaster vulnerability is closely linked to climate change, there are several on-going centrally funded schemes under implementation for mitigation of weather related risks viz., flood control and drought proofing, cyclone warning and shelters, malaria eradiation, developing crop varieties resistant to weather related risks; integrated coastal zone management etc. Cyclone mitigation guidelines, released recently, takes into account the potential sea level rise besides the historical trends of storm surge. National Food Security Mission and National Rainfed Areas Development Authority taken up by two separate Ministries of Government, on a mission mode, have strong climate adaptation elements. Similarly, there are ongoing efforts on conservation of Himalayan glaciers taking into account the climate change issues. In fact, Govt of India is spending over 2 per cent of GDP in development measures with strong adaptation content including those related to disaster preparedness and mitigation. These programmes, in coming days, are likely to be extended and enhanced to cover additional risks of climate change, through provision of financial resources and introduction of innovative technologies. Further, India has taken up several initiatives at national level inherently supportive of sustainability and clean development. Use of CNG for public transport, metro rail in many cities, bio-diesel programme including mandatory blending of ethanol in petrol are some of the initiatives related to mitigation as well as adaptation. Further, India has launched the Green India project, the world's largest afforestation project covering six million hectares of degraded forest land. Overall, the efforts have been targeted to enhance natural endowments, ensure environment protection and ecological fragility, while addressing the fundamental issues such as food security and poverty alleviation.

Maldives

4.17 With the IPCC report on sea level rise and the December 2004 tsunami which exposed the vulnerability, Maldives, by virtue of having its unique geography and topography, is truly a hotspot island in the

region. Low elevation above sea level, perennial beach erosion, and dispersal of population across very small islands, remoteness and inaccessibility of islands, concentration of economic activities on tourism, high dependence on imports and high diseconomies of scale have added layers of coastal vulnerability in the country. Increasing island erosion has become a major threat to nearly half of 194 populated islands of Maldives.

4.18 Maldives has developed 'Safe Islands' programme focusing on the development of larger islands with better economic opportunities, high environmental resilience and incentives for voluntary migration to these islands. To mitigate future risk from disasters, land use plans of the safer islands have been developed incorporating features of high resilience with a wider environmental protection zone, elevated areas for vertical evacuation in case of floods, establishment of alternative modes of communication and energy and detailed disaster management plans. Currently five islands have been identified for the programme and development plans prepared in consultation with people. Challenges for the programme include geographical population dispersion, difficulties of access to islands, a high unit cost of delivery of construction material, inadequate human resource to manage projects and above all unpredictable weather and rough seas.

Nepal

4.19 Recognizing that rise in temperature would cause increased melting of Himalayan glaciers creating negative impact downstream in almost all the sectors of development – water, energy, food etc - Nepal has launched risk reduction programme for the glacier lakes. The Nepal Government, in its five yearly plans, has been putting into the context the climate change adaptation issues by laying emphasis on integrated agriculture and forestry development with focus on poverty alleviation. High priority has been given to natural resources management through community participation. National Action Programme (NAP) places focus on reclamation of degraded land to prevent expansion of desert-like areas due to accelerated land degradation, soil erosion, landslide, alkalinity and salinity in the agricultural land. A number of legislations have been implemented for the conservation and sustainable use of natural resources, particularly the forest, land and water. Nepal has put in place a

system for the development of Clean Development Mechanism (CDM) projects and formed the Climate Change Network to coordinate climate change activities at the national level.

4.20 Nepal has adopted the National Policy Framework for Tenth Plan (2003-2008) and identified disaster management as the core need of sustainable and broad-based economic growth. The Plan focuses on disaster risk reduction by enhancing preparedness activities at national and community levels, by engaging local bodies, NGOs, community organizations and the private sectors. Nepal has further developed a Water Induced Disaster Management Policy, 2006 which seeks to

- Mitigate the loss of lives and property arising from water-induced disasters like flood and landslides;
- Preserve rivers, river basins and water related environment for the sustainable use of natural resources;
- Reclaim riverbanks and flood affected areas for the rehabilitation of landless people and conduct of socio-economic activities; and
- Develop institutions for the control of water induced disasters and management of flood affected areas.

Pakistan

4.21 The National Environment Policy of Pakistan 2005 provides an overarching framework for addressing the environmental issues, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, loss of biodiversity, desertification, natural disasters and climate change. It also gives directions for addressing the cross sectoral issues as well as the underlying causes of environmental degradation and meeting international obligations. Towards climate change mitigation and minimizing ozone layer depletion the Policy has prescribed the following:

- Establish National Clean Development Mechanism Authority
- Develop and implement policy and operational framework for effective management of CDM process.
- Promote the use of ozone friendly technologies.
- Phase out the use of ozone depleting substances in line with the provisions of the Montreal Protocol.

4.22 A Prime Minister's Committee on Climate Change has been reconstituted as a policy review forum, while a Global Change Impact Studies Centre has been established for pursuing related R&D efforts. The country's effort on coastal zone management is yet another initiative to reduce the coastal and marine risks taking into account climate change impacts on these sectors.

Sri Lanka

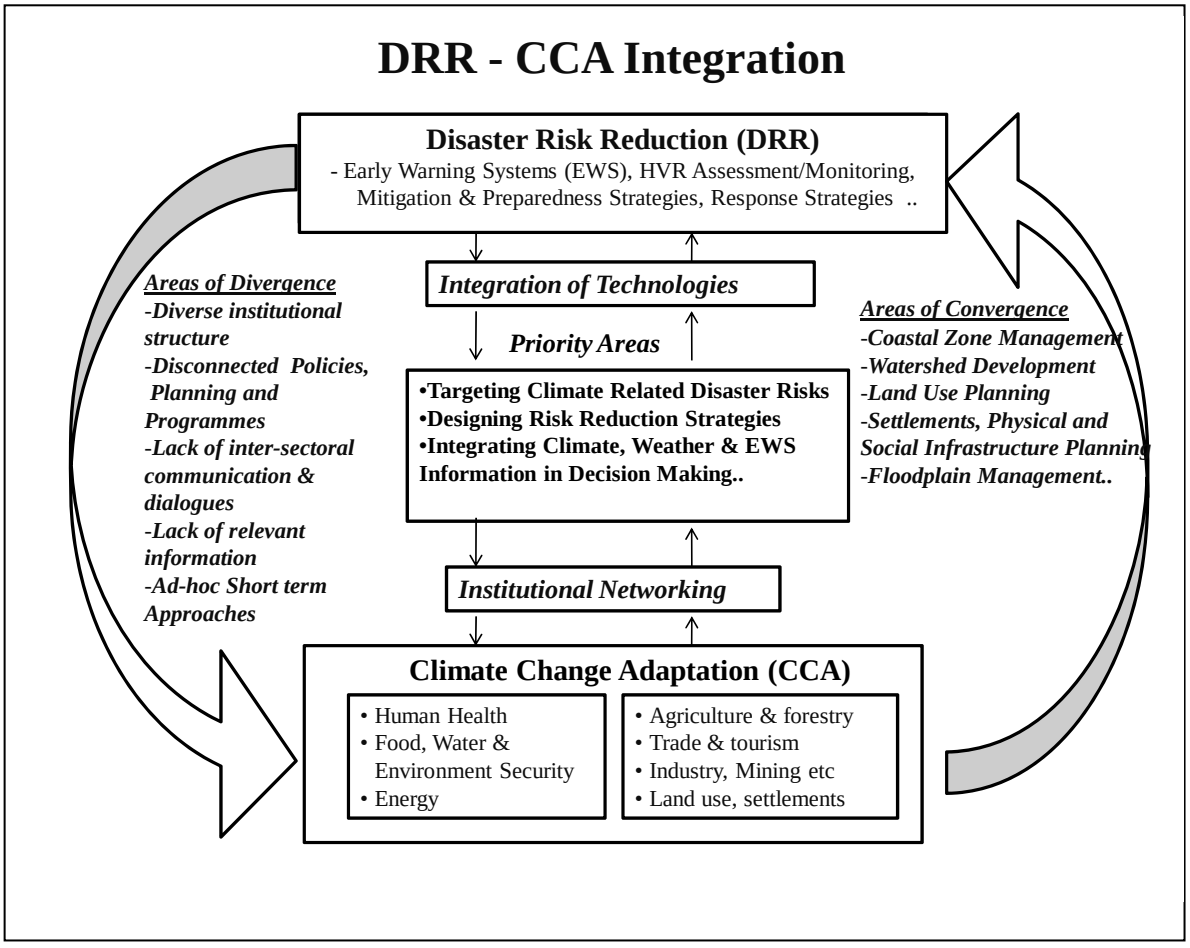
4.23 With its vulnerability to the coastal hazards, Sri Lanka has been at the forefront to implement coastal zone conservation. The first Coastal Zone Management Plan (CZMP) was developed and accepted in 1990. The policy evolved over the next few years has led greater community participation, particularly through the introduction of Special Area Management (SAM). The Policy aims at addressing not only the causes of coastal erosion but also habitat degradation and the wider issue of sustainable coastal livelihoods. The approach includes efforts to decentralize, strengthen local institutions and encourage working with coastal communities towards sustainable resources management. The Govt of Sri Lanka has recently adopted a National Charter on Environmental Protection, which envisages binding citizens to a set of guidelines towards protecting and conserving the environment through individual actions. The country has also put in place effective mechanisms to incorporate climate change concerns into development programme with the Ministry of Environment and Natural Resources as the nodal coordinating agency.

4.24 Sri Lanka has been experiencing natural disasters caused by isolated incidents of flood, cyclone, coastal erosion and landslides until the 2004 tsunami devastated two-thirds of Sri Lanka's coastline. A National Council for Disaster Management and a separate Ministry for Disaster Management and Human Rights have been set up under the Sri Lanka Disaster Management Act No. 13 of 2005 which has provided a holistic framework for disaster risk management in the country, including the climate related risks.

INTEGRATING DISASTER RISK REDUCTION IN CLIMATE CHANGE ADAPTATION

5.1. Integration of Disaster Risk Reduction (DRR) into Climate Change Adaptation (CCA) would be one of the challenges of risk management in South Asia. The task can be addressed by identifying those areas which create divergence between DRR and CCA processes, as also those which create convergence between the two. The forces that create divergence are the following:

a) **Diverse Institutional Structure:** The institutional arrangements that exist in South Asian countries are such that DRR and CCA experts and functionaries are usually different, respond to different needs and to the different constituencies and do not have authority to implement policy decisions in the areas other than their specific responsibilities. In fact, such structural barriers also exist at international and regional levels.



b) **Disconnected Policies, Planning and Programmes:** DRR and CAA policies, planning and programmes often take place in isolation without sharing the respective goals, methodologies and objectives.

c) **Lack of Relevant Information:** Information concerned with DRR and CCA are inherently complex which can not be packaged easily for integration into respective concerns. DRR related info, for example, often does not describe environmental and socio-economic information of underlying risk factors which are required in support of pursuing CCA.

d) Ad-hoc Short-term Approaches: For most of DRR projects, risks to investments are not considered for the full life-time of the project and thus ignores climate change risks, impact and adaptation factors.

5.2. The convergence between DRR and CCA processes have been observed in certain types of projects which need to be recognized for scaling-up and replications in the region, especially through regional cooperation. These are:

a) Integrated Coastal Zone Management

b) Participatory Watershed Development Programme

c) Land Use Planning in areas sensitive to climate and disaster risks

d) River-basin Floodplain Management

e) Integrated Drought Mitigation

5.3. The tools and techniques used for DRR such as early warning systems, hazard, risk and vulnerability analysis, risk assessment and monitoring, risk mitigation as well as response strategies need to be integrated with CCA strategies in the critical sectors like human health, food, water and environmental security, agriculture, forestry, tourism, etc. There are success stories and good practices demonstrating such integration, which should be replicated and further scaled up.

5.4. There are enabling mechanisms for integrating DRR and CCA through integration of appropriate technologies like ICTs, Space,

Automatic Weather Stations (AWS), Doppler Weather Radars (DWR) etc. Similarly, networking of DRR and CCA institutions at national, regional and global levels coupled with multi-stakeholder communication and dialogues as well as exchange of information and expertise may catalyze such integration.

5.5. From the 'conceptual framework' as outlines above to 'actionable strategies', the following steps are suggested:

Step I: Targeting Climate Related Disaster Risks: Most of the Hazard, Vulnerability and Risk (HVR) Assessment efforts are based on the frequency of occurrence of disasters in spatial and temporal domains. Climate risks are not captured well and also the simulated climate change scenarios are not factorized to target the climate related disaster risks especially in the 'hotspots' of South Asian region. While the strategy calls for recasting HVR mapping efforts, such efforts enable closer integration of DRR and CCA in the operational domain of end-to-end project implementation.

Step II: Designing Risk Reduction Strategies: Designing Risk Reduction Strategies for hydro-meteorological risks must essentially be based on using the knowledge of climate risks. For instance, if it is to develop an effective and people's centred EWS to provide 'actionable' information about a climate hazard to a vulnerable population, the assessment of climate risk should form the key inputs. Further, the strategies must be dynamic and in tune with the changing practices and conditions such as depletion of the ecological foundation of the natural resources such as coral reefs and mangrove forests may aggravate risks; further effective insurance and micro-finance initiatives to transfer risks and provide additional resources may reduce risks.

Step III: Integrating Climate, Weather & EWS Information in Decision Making; Besides implanting DRR in CCA projects, it is important to utilize advanced climate forecast information in managing risks from the existing climate variability and also utilize results from climate change models especially where known climate change impacts lead to a certain direction viz., glaciers retreat and GLOF in Himalayan region.

5.6. As climate hazards are growing in number, more and more people in the region are turning vulnerable because of poverty, powerlessness, population growth, and the movement of people to marginal areas. Climate change has the potential to derail the poverty alleviation efforts in the region, punishing first and most, the very people least responsible for greenhouse-gas emissions – and increasing their vulnerability to the natural disasters further. Concerted national efforts are necessary in support of climate change adaptation and disaster risk reduction.

5.7. Uniquely, with the inherited traditional knowledge, South Asia has got the civilizational heritage in terms of indigenous coping and community resilience. These heritages need further empowerment in terms of technology and knowledge to withstand the potential climatic shocks and their extremes. Further, with the growing climate risk, the adaptive capacity in South Asia is to be enhanced by providing the necessary financial resources, access to technology and knowledge, and by enhancing the institutional capacity. For example, the capital-intensive agricultural systems are less sensitive to climate, perhaps because they can control so many more inputs. Agriculture, water management, land use practices etc in South Asia are therefore to harmonize with changing climate regimes.

5.8. While there are efforts in South Asian countries to directly address climate change adaptation issues, through the development of National Adaptation Plans of Action (NAPAs), their integration to disaster risk reduction need specific priority. In order to address adaptation concerns as part of their national development plans, the explicit focus on disaster risk is seen only in few cases. For example, the Safe Island programme of Maldives is an integrated effort on addressing vulnerability through strategic planning for climate change adaptation. Similarly, coastal zone management efforts in India, Pakistan and Sri Lanka are yet another example in this direction.

5.9. Except few cases in the arena of coastal zone management and also in case of integrated watershed development programmes, there is a clear disconnect between the institutional and legislative systems developed to address disaster risk and those developed to address climate change. The emphasis is to be laid on climate-related development outcomes – in areas such as agriculture, water resources, food security, health, the

environment and livelihoods – that are sensitive to both climate variability and change.

5.10 In South Asia where both climate-related hazard and vulnerability levels are likely to be drastically affected by climate change, it is necessary, based on the regional cooperation among South Asian countries, to establish systematic integration between the institutional frameworks, policies and strategies to address disaster risk with those related to adaptation to climate change. A key challenge, in this context, is to strengthen regional capacities to manage and reduce risks associated with existing climate variability. To achieve this, closer linkages need to be forged between the policy arenas of climate change and disaster risk reduction, at national, regional and international levels.

5.11 Further, at global level, the implementation of the Hyogo Framework needs to be more clearly recognized as a primary tool to achieve the adaptation goals of the UN Framework Convention on Climate Change (UNFCCC). The reflection of such integration assumes greater importance and urgency in the climate risk hotspot of South Asia through regional cooperation under the SAARC Framework of Disaster Management.

SAARC WORKSHOP ON CLIMATE CHANGE AND DISASTERS

6.1. With the above background, the SAARC Workshop on Climate Change and Disasters: Emerging Trends and Future Possibilities during 21-22 August 2008 at Kathmandu, Nepal is planned with the following objectives:

- to capture the recent trends of climate change scenarios including scientific & operational issues as well as challenges in South Asian region;
- to highlight the on-going efforts on climate change adaptation and disaster risk reduction as well as their integration at various levels;
- to explore the possibilities of regional cooperation for capacity building in addressing the issues related to climate change adaptation and disaster risk reduction and also to discuss the conceptual DRR-CCA integration framework and the suggested recommendations therein for further follow-ups;

- to prepare a roadmap on strengthening the regional capacity as well discussing the role of SDMC in support of SAARC Action Plan on Climate Change.

6.2. The workshop will discuss the following thematic areas of the Regional Action Plan on Climate Change on which SDMC shall be expected to play its role in promoting action for national action and regional cooperation.

Thematic area one: Adaptation to Climate Change

- Adaptation to climate change impacts and risks in vulnerable communities, locations and ecosystems,
- Adaptation in sectors (e.g. water, agriculture, fisheries, health and biodiversity)
- Adaptation to extreme climate events (e.g. flood, cyclone, glacial lake outburst, droughts and heat and cold waves)
- Adaptation to climate change impact (e.g. sea level rise, salinity intrusion, glacial melt and coastal and soil erosion,)
- Adaptation suited to urban settlements, coastal structures and mountain terrain

Thematic area Six: Management of impacts and risks due to climate Change

- Climate risk modeling and capacity building in the region on impact assessment of climate change.
- Sharing of information and capacity building in the management of climate
- change impacts and risks through cooperation among SAARC member states in
- early forecasting, warning and adaptation measures,
- Cooperation amongst the SAARC member states in exchange of information
- on climate and climate change impacts (e.g. sea level rise, glacial melts, droughts, floods, etc.).
- Cooperation and sharing of good practices in disaster management

Priority Action Plan

• Exchange of information on disaster preparedness and extreme events
• Capacity building and exchange of information on climate change impacts (e.g. Sea level rise, glacial melting, biodiversity and forestry).