DIPLOMATIC CHALLENGES OF CLIMATE CHANGE:

A STUDY OF CONTEMPORARY SOUTH ASIA

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CERTIFICATE

This is to certify that the dissertation entitled "Diplomatic Challenges of Climate Change: A Study of Contemporary South Asia", submitted by Rajiv Kumar Jena in partial fulfilment of the award of the degree of Master of Philosophy is his own work and has not been submitted so far in part or in full, for any other degree or diploma of other university.

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We recommend that this dissertation may be placed before the examiners for evaluation.

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ABBREVIATIONS

ADB	Asian Development Bank
AOSIS	Association of Small Island States
ASEAN	Association of South East Asian Nations
BPOA	Barbados Programme of Action
BSAP	Biodiversity Strategy and Action Plan
CARICOM	Caribbean Community
CCA	Climate Change Adaptation
CDM	Clean Development Mechanism
CFCs	Chlorofluorocarbons
CO2	Carbon Dioxide
COP	Conference of the Parties
CPP	Country Programme Partnership
DRR	Disaster Risk Reduction
EPZ	Environmental Protection Zone
EU	European Union
GARP	Global Atmospheric Research Programme
GEF	Global Environment Facility
GEF	Global Environment Fund
GHGs	Greenhouse Gases
GLOF	Glacial Lake Outburst Floods
HOS	Head of States
ICSU	International Council of Scientific Union
IGY	International Geophysical year
IMO	International Meteorological Organization
IPA	Integrated Programme of Action
IPCC	Intergovernmental Panel on Climate Change
LDFC	Least Developed Countries Fund

MPHRE	Ministry of Planning, Human Resources and Environment
MPND	Ministry of Planning and National Development
NAPA	National Adaptation Plan of Action
NDMC	National Disaster Management Centre
OECD	Organization for Economic Cooperation and Development
PPMV	Parts Per Million Volume
PSAC	President's Science Advisory Committee
PVC	Photovoltaic Cells
REDD	Reducing Emission from Deforestation and forest Degradation
SAARC	South Asian Association for Regional Cooperation
SAC	South Asian Countries
SACEP	South Asia Cooperative Environment Programme
SAR	South Asian Region
SCCF	Special Climate Change Fund
SCEP	Study for Critical Environmental Problems
SCZMC	SAARC Coastal Zone Management Centre
SIDS	Small Island Developing States
SMIC	Study of Man's Impact on Climate
SMRC	SAARC Meteorological Research Centre
SPOCC	South Pacific Organisations Coordinating Committee
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
WMO	World Meteorological Organization
WWW	World Weather Watch

CHAPTER – I

Introduction: Background of Climate Change

BACKGROUND OF CLIMATE CHANGE AND DIPLOMATIC CHALLENGES

Climate change has emerged as an important environmental issue, ever to confront humanity. This concern arises from the fact that our everyday activities may be leading to changes in the Earth's atmosphere, that have potential to significantly alter the planet's heat and radiation balance. The nature of the problem is such that no country can take unilateral decision to protect their environment. It has brought both the developing and developed countries to the negotiating table. Cooperation is required between developing and developed countries to minimize the impact. 'Pressure politics', which was earlier used by the developed countries, has lost relevance. Instead parity with equity has gained importance, and consequently spectacular transformation has taken place in the international politics.

Due to environmental problems in general and climate change in particular in international politics, the concept of security has undergone a radical shift. Until recently the notion of security was exclusively oriented to power and emphasized the military security as its main component. Under the definition, state was the primary actor and the dominant interpretation was that if state security can be ensured individual security was of little consequence. Under the transformation there is a shift away from the zero sum dichotomous thinking of traditional national security discourse towards a more comprehensive, less state – centric orientation. This means that primacy of state as an actor has become diluted and the state per se has become less effective and relevant with the emergence of the climate change issue.

With the diminishing state's role the politics of climate change has led to growing participation and importance of non-state actors in global environmental politics. International governmental organizations, advocacy groups have all become vital players in the process of international environmental regime formation. Moreover, the complexity of climate change problem has provided a bigger role to 'Epistemic Community' (coalition of actors including scientists, government and other public sector officials, who come to share a common interpretation of the science behind environmental problems and the broad policy and political requirements in response). It has given rise to the collective action plan, i.e. it raises questions such as who takes initiatives, coordinate cooperation and shoulders costs. A central aspect of the collective action problem is that it cannot ever be solved by confrontation, which means that

"welfare not warfare" will shape the rules, and a global threat like climate change will dictate the agenda.

Scientific Milieu

The earth's climate is driven by solar – radiation. Solar radiation reaches the earth's atmosphere in the amount of 1370 W.m-² (watts per square meter of energy). Approximately 30% of this energy is immediately reflected back into space, primarily by clouds. The remaining energy reaching the Earth's surface (whose area is four times its cross section) amounts to 240 W.m-² and is absorbed and re-emitted (Dornbusc 1992: 8). The warming effect of greenhouses in the atmosphere was first recognized in 1827 by the French scientist Jean Baptiste Fourier, best known for his contribution to mathematics. He also pointed out the similarity between what happens in the atmosphere and in the glass of a greenhouse, which led to the name 'greenhouse effect' (Houghton 1997:12). During the course of the nineteenth century experiments and observations were undertaken to calculate the effect of the gases involved, and carbon dioxide (CO2) and water vapour became recognised as the most important gases involved in the greenhouse effect. Subsequently, John Tyndall in England actually measured the absorption of infrared radiation by Carbon dioxide and water vapour and showed that these atmospheric constituents could significantly raise the Earth's surface temperature (Glantz 1988: 12). He also suggested that a cause of the ice ages must be a decrease in the greenhouse effect of carbon dioxide.

Meteorologists had already begun to cooperate across natural boundaries, recognising that their measurements would be far more useful if they were united. Two early attempts to set up networks of atmospheric monitoring stations were made, one by the Academia del Cimento in Florence, between 1645 and 1667, both inside and outside Italy, and one by the Meteorological Society of Mannheim, in 1780. The network of stations based in Mannheim included one in the United States and another in Greenland (Meigham 1968: 110). Both of these projects collapsed, however, the collapse of the one based in Mannheim was due to the French Revolutionary war.

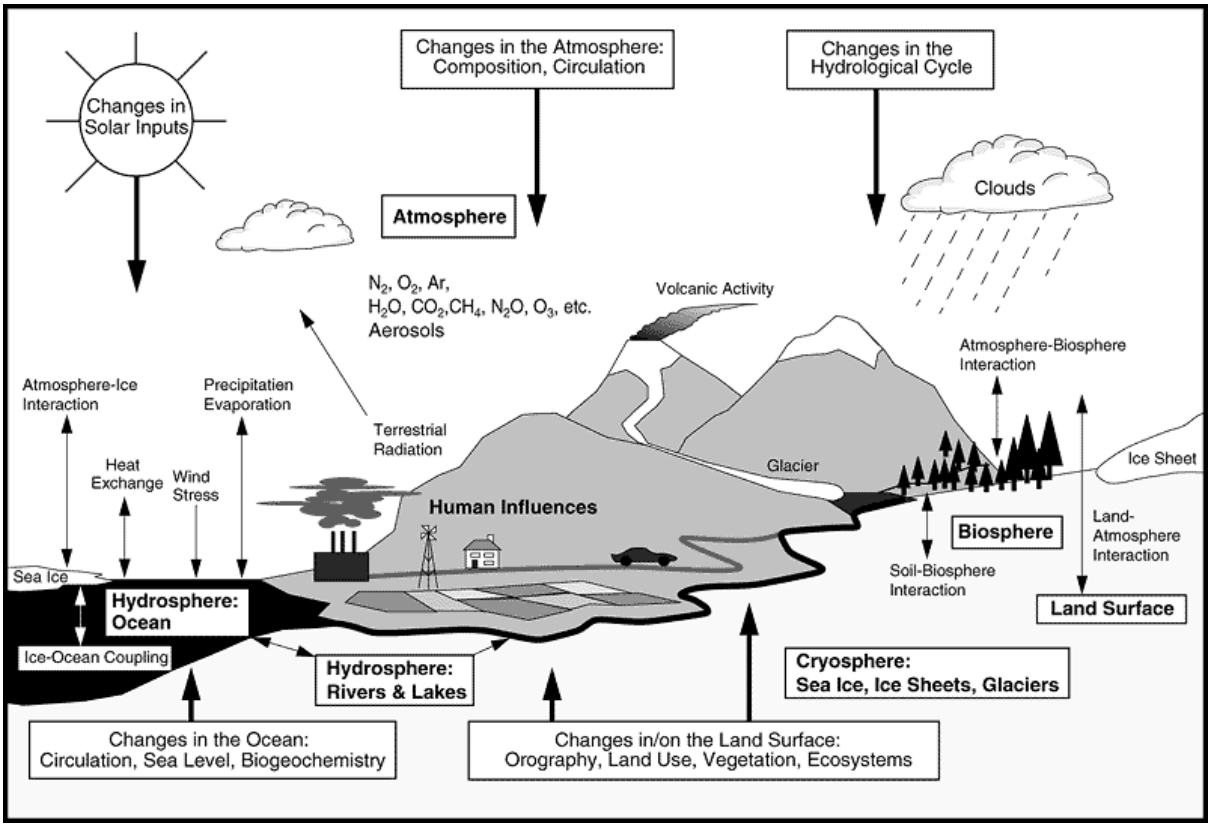


Figure: The components of the Global Climate System: A Schematic View
(Source: IPCC, 2001)

The First International Meteorological Conference was held on 23rd August, 1853 in Brussels. This conference standardised meteorological observations to be taken from ships, by establishing a set of instructions for how to take measurements, and a standard form for recording them (Nadel 1991: 168). This conference was organised at the initiative of a naval officer named M.F Maury of the United States Navy. The conference was attended by people from ten countries and proposed to standardize land based observations (Meigham 1968: 112). But these proposals were not taken up.

Almost twenty years later, at the Leipzig Conference of Meteorologists in 1872, it was proposed that an International Meteorological Organisation (IMO) be established and an official congress be organised to establish the organisation involving government officials (Ibid:112). This conference also standardised land based meteorological observations, following up earlier suggestions. The Leipzig Conference was attended primarily by meteorologists. Fifty two directors of the National Meteorological were present along with other scientists (Ibid). The new developments were due to

‘increasing interests in meteorological research, greater recognition of the economic importance of climate data and the development of the electric telegraph, which facilitated rapid collection and dissemination of observations (Weiss 1975: 805-26). This was due to increasing recognition that meteorologists could not enhance their knowledge satisfactorily within national borders, and needed to cooperate across countries.

The First International Meteorological Congress was held in September 1873, in Vienna. “The Vienna Congress formally established IMO, which was then set up as an organisation over the following six years, through a series of meetings of the permanent committee established at Vienna. These meetings drew up a charter for the organisation, which was finalised at Utrecht in 1878, when the IMO was formally founded” (Meigham 1968: 113). “Van Meigham outlines five main stages of the IMO’s existence. The first of these included the ‘preliminary’ conferences of Brussels and Leipzig. The second was the ‘preparatory phase’, from 1873-78, when the organization was set up. The last three periodic lasted from 1879-1914, 1919-1939, and 1946-1950 respectively” (Ibid: 111-20).

During the third period, the IMO coordinated the standardisation of measurements, and also organized a system of exchanging weather information between countries (Kay and Jacobson 1983: 80).

Just before the turn of the century, it was realised that the concentration of carbon dioxide was probably increasing, as humanity took carbon out of the earth in the form of coal, petroleum or natural gas and burned it. It was a Swedish chemist, Svante Arrhenius, in 1869 who calculated the effect of an increasing concentration of greenhouse gases. He used S. Longley’s measurements of infrared radiation from the moon as it passed through the atmosphere at different angles above the horizon and at different humidity’s for his estimates of the atmospheric absorption due to both carbon dioxide and water vapour, and he combined these with independent measures of carbon dioxide to estimate its current optical depth. He estimated that doubling the concentration of carbon dioxide would increase the global average temperature by 5 to 6°C, an estimate not too far from our present understanding (Houghton 1997: 12). In the year 1940, G.S Callender working in England, recognised that the consumption of fossil

fuels contributes substantial quantities of CO2 to the atmosphere, which might lead to global warming through an enhancement of the greenhouse effect (Dornbusc 1992: 7).

Nevertheless, the intriguing idea that humanity could raise the earth's temperature seems at first to have attracted surprisingly little attention in the scientific community and even less in the public media. It was treated in several papers and books in the 1920s and 1930s notably by biologists or ecologists who were more interested in the global carbon cycle and a squandering of a virtually irreplaceable natural resource of fossil fuels. The implication that climate could be impacted seems to have been of less interests or else utterly ignored. Meanwhile, technological advances such as the development of radio and aviation had made gathering meteorological data much easier, and had made governments more aware of the importance of such data for their economies (Weiss 1975: 810). As a result of this, the IMO became once more an intergovernmental body. "The Conference of Directors of the IMO decided in 1935 that future meetings of the IMO would involve governmental representatives from national meteorological offices" (Ibid: 810).

After the Second World War, the process became more formalised when IMO was turned into World Meteorological Organisation (WMO). The newly formed United Nations had the effect of providing a new framework for international cooperation in various scientific and technical fields. In 1947, the World Meteorological Convention was adopted, which established the WMO. The WMO began operating in 1951, and officially replaced the IMO.

The importance of the CO2 climate was beginning to be recognised and addressed by a larger community by the 1950s and John Von Neumann wrote about the possibility of "Climate Control" (Neumann 1955: 106-8). The first expression of concern of climate change which might be brought about by increasing greenhouse gases was in 1957, when Roger Revelle and Hans Suess, two scientists at the Scripps Institution of Oceanography, made a statement in an article in Tellus that "Human beings are now carrying out a large scale geophysical experiment; namely, testing the greenhouse effect of CO2 by actually changing its atmospheric testing concentration. They also pointed out that newly added carbon dioxide would probably remain in the atmosphere for many centuries because of the slowness with which the oceans could absorb it (Revelle and Suess 1957: 18-27).

In 1963 the Conservation Foundation sponsored a meeting on this topic, and its report stated the situation more clearly than ever before: “It is estimated that a doubling of the carbon dioxide content of the atmosphere would produce a temperature size of 3.8° Celsius though the time scale involved is left unspecified” (The Conservation Foundation, 1962). It was during International Geophysical Year (IGY), Charles David Keeling, started monitoring of carbon dioxide at the Mauna Kea Observatory in Hawaii and at the South Pole. These two stations have given best picture available of the rise of carbon dioxide from 1958 onwards (Keeling and Carker 1984: 4615-28).

Although the greenhouse effect has been known for more than a century, it was not until late 1960 are that concern was voiced about the implications of global warming. The President’s Science Advisory Committee (PSAC) published under the White House Seal a report of its Environmental Pollution Panel entitled “Restoring the Quality of Our Environment” in 1965. It had called the attention of the world to the distinct possibility that the earth could become warmer as a result of human activities, and handful of scientists on both sides of the Atlantic were beginning to develop a physical theory to explain the behaviour of the complex system that determines climate (President’s Science Advisory Committee, The White House,1965).

Thus it was once thought that carbon dioxide is the only green house gas whose atmospheric concentration is increasing as a result of human activities. Research over the past decades has, however, identified other gases, which are long lasting in the atmosphere and are also good absorbers of infrared radiation.

They are often referred to collectively as “greenhouse gases”, since the presence of all of them tend to warm the lower atmosphere. Some of the other gases in question are the chlorofluorocarbons (CFCs) used as propellants in spray cans and also in refrigerators and air conditioners, methane, nitrous oxide, water vapour and ozone. Since their concentration in the atmosphere is increasing even more rapidly than carbon dioxide, it is expected that early in the next century the contributions of all those other gases to a global warming could nearly match that of carbon dioxide alone (Ramanathan and Singh 1985: 5547-66).

The climate system itself consists of five components:

- The Atmosphere

- The Ocean
- The Cryosphere (ice and snow)
- The Biosphere
- The Goesphere

Each of these components plays an important role in determining the earth's climate. Thus most of the incoming solar radiation is absorbed at the surface and heat is transferred to the atmosphere, which transfers the heat meridionally. The behaviour of the atmosphere is governed by a number of factors, including turbulent transfer of heat, moisture, and momentum at the surface; latent heating associated with the condensation of hydrology (H20); the reflective and radiative properties of clouds; the greenhouse effect and many other factors, including atmospheric dust and aerosols, orbital parameters, and surface topography.

Contributions to Global Warming by greenhouse gases and human activities (percentage of global warming.)

Sector	Carbon Dioxide	Methane	Ozone	Nitrous Oxide	Chlorofluorocarbons	Percentage (%) warming by sector
Energy:						
1.Direct	35	3	X	4	X	49
2.Indirect	X	1	6	X	X	
Deforestation	10	4	X	X	X	14
Agriculture	3	8	X	2	X	13
Industry	2	X	2	X	20	24
Percentage (%) warming by gas	50	16	8	6	20	100

Source: S.K Agarwal, 2004.

Causes and Effects of Anthropogenic Global Warming:

Direct Causes	Indirect Causes
Excessive concentration of CO2 and other greenhouse gases in the atmosphere through: 1. Burning of fossil fuels (automobiles and industrial emissions and power sector etc.) 2. Massive urbanization, construction and other developmental activities which involve large scale operation.	1. Excessive consumerism of western industrialized nations. 2. Development trust even at the cost of environment. 3. Massive growth of population, exerting pressure on the earth's carrying capacity. 4. Scientific manipulation and nasty environmental politics. 5. Lack of ethical basis.

Physical effects	Ecological effects	Socio economic effects	Legal and Institutional effects
1. Melting of glaciers and mountain ice caps 2. sea level rise 3.Flood damage 4. Storm surge 5. Shoreline retreat 6. Land subsidence 7. Change in river flow rates and sedimentation 8. High evaporation but low rain in tropics 9. Increase in high latitude precipitation 10.wide spread drought in tropics 11. Frequent severe floods in urban latitudes	1. Loss of coastal wetlands 2. Salt water intrusion 3. Loss of coastal habitat and biomass 4. Loss of cultivable land 5. Decrease in ecosystem productivity 6. Extinction of species and loss of biodiversity	1.Loss of human settlement and property 2. Loss of life from increase in calamities like storm, surges, floods etc... 3. Changes in economic activities 4. Economic migration and environmental refugees 5. Drop in agricultural production in lower latitudes causing hunger and starvation 6. Health problems	1.New Organizations to handle the problem of Climate Change 2. Impact on taxes and laws 3. Change in coastal zone management 4. Delimitation of maritime boundaries 5. New protocols and conventions

The above figure seeks to explain the causes and probable consequences of the warming up of earth and its atmosphere.

The most important anthropogenic gas is CO2, with an atmospheric concentration of around 0.04 percent. Approximately 3% of the annual flux of carbon to the atmosphere is due to human activities; the result is due to natural exchange with the oceans, soils and planets. Historically, anthropogenic sources of greenhouse gases have been closely related to population growth and economic development primarily the consumption of fossil fuels and the development of agriculture. As these activities have expanded, so have the levels of greenhouse gases. Thus when Keeling started his measurements during the International Geophysical Year (IGY), the concentration at the South Pole and Mauna Loa were between
312 and 313 parts per million by volume (PPMV), and now it has reached more than 345 PPMV (Trabalka 1985: 25-62).

Before the industrial revolution and the widespread burning of fossil fuels, and before we had embarked on large scale clearing of forests for agriculture in the nineteenth century, it is estimated from air samples trapped in ice cores that the concentration of carbon dioxide was 250 to 270 PPMV – that is an increase of 20 to 30 % in less than 200 years (Ibid). Hence there is no doubt at all that we have been raising the level of carbon dioxide in the atmosphere by our activities, both industrial and agricultural.

The success of the IGY led to much greater cooperation on meteorology. This led World Meteorological Organisation (WMO) and International Council of Scientific Union (ICSU) to follow up a suggestion by the United Nations General Assembly (UNGA) to develop the World Weather Watch (WWW) and the Global Atmospheric Research Programme (GARP). The WWW was established in 1968, and was an extension and expansion of existing cooperative arrangements between countries to collect and distribute weather information. The WWW organises the systematic observation, processing and transmission of meteorological data between countries, thus making modern weather forecasting possible.

GAPR was created in 1967 by the WMO and the ICSU. It is a coordinated research effort to understand the global weather system as a whole and to develop the underlying

scientific knowledge as a base for improving the services to be provided by WWW and the scientific understanding of climate (Kay and Jacobson 1983: 81). It has conducted several large scale experiments, the most prominent of which has been the first GARP Global Experiment, which became known as the Global Weather Experiment (Ibid).

The developments in greenhouse science by the beginning of 1970s were such that sufficient information was being gathered to make rigorous assessments of the state of knowledge about climate and any potential climate change possible. Simultaneously, the institutional developments, in particular within WMO and ICSU, laid the foundations for the organisation and coordination of further research in the development of a scientific consensus on global warming.

However, from the late 1960's as the first wave of modern environmentalism emerged, this technocratic image of climate as something to be controlled by human fades towards as an image where humans are dependent on climate for their welfare, and are unable to manipulate it for their ends (Hart and Victor 1993: 666-69). The 'turning point' in relation to awareness of climate issues and to the development of greenhouse science was two studies undertaken in 1970 and 1971, the Study of Critical Environmental Problems (SCEP) and the Study of Man's Impact on Climate (SMIC) (Kay and Jacobson 1983: 91).

The SCEP held a month - long workshop in Massachusetts, Williamstown, in July 1970 and the SCEP report pointed out several possible implications of the rise of the CO2 levels which had occurred since the Industrial Revolution. SMIC was organised as a conference by MIT and Swedish Scientific bodies in July 1971 in Wijkn near Stockholm, at which thirty leading scientists from fourteen countries attended (Lunde 1991: 65)

The report from SMIC stated bluntly on the question of whether CO2 rises would lead to climate changes: 'We do not know yet' (Ibid. p.67). The 300 page report from this conference went into greater detail about the possible climatic effects, and was used as the major background paper on climate change issues at the 1972 UN Conference on Human Environment (Kellogg 1987: 121). Yet the question of global warming did not reach international headlines until the 1980's. Instead, during much of the post World War Two period, the international community, if interested in climate change at all, was concerned with global cooling. Average global temperatures had decreased from 1945

to 1970, and this has initiated a spell of investigations into the prospects of coming ice-age.

Prior to this, in an address at Glassboro (New Jersey) state college on 4 June 1968, President Lyndon B. Johnson called for Soviet-American cooperation in the formation, with other nation, of an international council on the Human Environment (Keith 1990: 47). On 22 July 1968, in an essay entitled "Thoughts on Progress Peaceful Coexistence and Intellectual Freedom" Russian academician A.D. Sakharov entered a strong and widely circulated plea for cooperation between the Soviet Union and the United States in coping with the global effects of environmental pollution and deterioration. The primary significance of these proposals was that they were made so that they could assume a comprehending and sympathetic audience of sufficient size and influence to justify the risk and effort involved.

The environmental concern was strongest amongst the most developed nations; suspicions arose among the Third World or developing countries that the movement concealed a neo-imperialist scheme to retard their economic growth and to keep them subservient suppliers of underpriced raw materials and consumers of the industrial output of North-America, Western Europe, and Japan. Social ideologists did not resist the temptation to encourage this apprehension, or to blame capitalism and imperialism for the environmental degradation of the world. These differences became explicit at the Stockholm Conference. Yet, even in the socialist and the Third World countries there were individuals and groups, particularly among scientists, who were concerned that the issue was important to all mankind and that countries had an important stake in the preservation of the biosphere.

There is emulation among nations as among people. Rhetoric of resentment among the Third World nations coexisted with conspicuous and, too often, uncritical emulation of the Industrialized First World. Not all third world leaders favoured replicating the west, and for some of them the harsh impact of western industrialism on the environment was something to be avoided. For example, Julius Nyerere of Tanzania rejected both western and Soviet-style industrialisation, favouring an indigenous, essentially rural economy. But during the years immediately preceding the Stockholm Conference- the example of new Environmental Laws and agencies established in France, Sweden, the United Kingdom and the United States (among other countries) and the requests of the

United Nations Preparatory Commission for status report from all countries on environmental policy- made possession of an environmental policy a status symbol-evidence that a nation belonged to the more advanced or advancing states of the world and not to the backward nations.

Review of literature

In this article "*The Strategic Implications Of Climate Change",* the author Alan Dupolt stresses that how climate change has suddenly changed completely from a boutique environmental concern to a first-order foreign-policy and national-security problem that is being ranked alongside terrorism and the proliferation of weapons of mass destruction. Thus policymakers around the world now accept there is sufficient scientific data to conclude that the speed and magnitude of climate change in the twenty-first century will be unprecedented in human experience, posing frightening challenges of adaptation and mitigation for all life forms on the planet. Here climate scientists overwhelmingly agree that the world's glaciers and northern ice cap are melting at accelerating rates and that sea-level rise will threaten many coastal and low-lying areas of South Asian regions. The scientists regard as almost certain that there will be a doubling of carbon dioxide (CO^2) over pre-industrial levels this century regardless of what we do to contain or reduce greenhouse-gas emissions.

Compressed within the space of a single century global warming will present alarming problems of human and biological adaptation especially for natural ecosystems which typically evolve over hundreds of thousands to millions of years. Without effective mitigation and adaptation strategies, a rapidly warming planet presents palpable geopolitical risks for all countries, increasing national vulnerabilities, exacerbating inter-state tensions and threatening the very survival of some societies.

Further the author says that how per capita water availability has already declined between 40% and 65% since 1950 and by 2025 some five billion people globally could be suffering from serious water shortages, half a billion them due to climate change. It is not yet possible to accurately forecast detailed precipitation changes at the national and sub-national level. However, it is clear that countries which are already water deficient will be most at risk as rainfall pattern shifts and become more variable. Within a few decades, however, water levels are expected to decline, putting at risk food

production and causing water and power shortages with potentially adverse consequences for India, Bangladesh, Sri Lanka, China, Cambodia, Myanmar and Thailand. Mr. Alan Dupont also points out how due to climate change various forms of conflicts take place in Asia. Pakistan, India and China skirmish on their borders over refugees and access to shared rivers and arable land. How these states suffering from famine, plague, water and energy shortfalls strike out with 'offensive aggression in order to reclaim balance', their by jeopardizing their neighbors security in pursuit of their own?

Jon Barnett, in this article "Climate Change, Human Security and Violent Conflict", has analyzed that climate change will increase the risk of violent conflict. He raises questions that how climate change would affect on vulnerability of local places and social groups, on livelihoods and the role of the state in development and peacemaking? He says climate change may undermine human security by reducing access to, and the quality of natural resources that are important to sustain livelihoods. Second, he suggests that the kind of human insecurity that climate change may affect can in turn increase the risk of violent conflict. He also argues that climate change may undermine the capacity of states to act in ways that promote human security and peace. The impacts on livelihoods will be more significant in sectors of population with high resource-dependency and in more environmentally and marginalized areas like Bangladesh and India. Climate change may directly increase absolute, relative and transient poverty by undermining access to natural capital. It may indirectly affect poverty through its effects on resource sectors and the inability of governments to provide social safety nets.

The author also stresses how the impacts of climate change are likely to increase the cost of providing public infrastructure such as water resources and services such as education by the government and in turn decreases its revenues. So climate change may decrease the ability of states to create opportunities and provide important freedom for citizen as well as decrease the capacity of government agencies to adapt and respond to climate change itself. Thus it requires understanding the ways in which people may respond if climate change undermines livelihoods, as one outcome might be an increased propensity for people to engage in violence as an alternative strategy. So enhanced understanding of climate insecurity also involves understanding the ways in

which climate change challenges states, including their capacity to protect livelihoods and maintain peace, if it exists.

John Houghton in his book "*Global Warming: The Complete Briefing"*, has attempted to describe the science of global warming, its impacts and what action might be taken in a way in which the intelligent non-scientist can understand. In the chapter 'The Impacts of Sea- Level Rise', the author explains that how a rise in sea level of 12 cm by 2030 and about half a metre by the end of the next century will have great impact on low lying places of South Asia like Bangladesh, Sri Lanka and Maldives. These places are most fertile and densely populated and to people living in these areas, even a fraction of a metre increase in sea level can add enormously to their problems.

Here with the example of Bangladesh, the author tried to stress implications of climate change in South Asia. Bangladesh is a densely populated country of about 120 million people located in the complex delta regions of the Ganges, Brahmaputra, and Meghna Rivers. About 7% of the country's habitable land (with about 6 million population) is less than 1 metre above sea level and about 25% (with about 30 million population) is below the three metre contour. Estimates of the sea-level rise next century are of about 1 metre by 2050 (compounded of 70 cm due to subsidence because of land movements and removal of ground water and 30 cm from the effects of global warming) and nearly 2 metre by 2100 (1.2 metre due to subsidence and 70 cm from global warming) – although there remains a large uncertainty in these estimates.

Therefore the effect will be in the form of substantial amounts of good agricultural land will be lost. This is serious as half the country's economy comes from agriculture and 85% of the nation's population depends on agriculture for its livelihoods. Many of these people are at the very edge of subsistence. Apart from that, Bangladesh is extremely prone to damage from storm surges. Every year, on average, at least one major cyclone attacks Bangladesh. So what possible responses can Bangladesh make to these likely future problems? No significant areas of agricultural land are available elsewhere in Bangladesh to replace that lost area to the sea nor is there anywhere else in Bangladesh where the population of the delta region can easily be located. Therefore it is clear that very careful study and management of all aspects of the problem is required. Ground

water as well as sea defenses must also be managed carefully if some alleviation of the effects of sea-level rise to be achieved.

Pratap Bhanu Mehta in the article “Climate Change: India’s Options”, states how climate change poses difficult challenges for India. On the one hand India doesn’t want any constraints on its development prospects. On the other it also wants itself to be seen as an emerging global power. While the former may be best served by its current position, the latter will, however, require it to take a leadership role on key global issues – climate change being a critical one. And it can either approach climate change as a “stand alone” global negotiation, or weave these negotiations into a “grand bargain” involving linkages with other international negotiations that also involve key Indian interests, be it reforms of the Security Council, World Trade Organization negotiations, etc...

Mehta also raises question that what if developing states like India, Pakistan, Sri Lanka, etc… are unwilling or unable to make steep emission cuts in GHGs?. Should the global community have a plan B, in case this reality comes to pass? Here he emphasizes a technically strong analysis to understand the feasibility and opportunities of low and continued high carbon growth paths and the effects of mitigation mechanisms. Moreover he stresses that we need to put resources in universities in the physical, biological and social sciences for climate related research. The author further put emphasis on a more participatory debate involving political representatives, civil society actors and the bureaucracy, both at the national and sub-national level in order to build a national consensus. The seriousness of climate change impacts, necessity, and options for adaptation and mitigation policies need to be discussed with all stakeholders.

So a better knowledge base and a more inclusive debate will allow India to take more informed view on climate change both domestically and internationally and build broader support for implementing what are bound to be difficult options. It also presents an opportunity for India to rethink its development strategy to one which is more inclusive and less resource-intensive.

Here in the Human Development Report 2007 titled: *"South Asian Regional Study on Climate Change Impacts and Adaptation: Implications for Human Development"*,both the authors Ulka Kelkar and Suruchi Bhadwal summarized that how climate change is a grave and immediate issue for South Asia. The impacts of climate change on food security, access to water, human health, eco systems, urban areas and frequency of disasters will have severe implications for the achievement of sustainable development. These conditions exacerbate and skew water availability across regions is getting stressed. Rapid depletion of water resource is already a cause for concern in many countries within the region. Agriculture is the mainstay of several economies of South Asia and also the largest source of employment. The sector continues to be the single largest contributor to the GDP in the region. As three-fifth of the cropped area is rain fed, the economy of South Asia hinges critically on the annual success of the monsoons, indicative of the well being of millions.

The report highlights how the present coping capacity is very limited particularly for small farmers and rural communities eking out precarious livelihoods and dependent on natural resources for sustenance which make them living in marginalized conditions. In order to address some of these issues there are forums like South Asian Association for Regional Cooperation (SAARC) and South Asia cooperative Environment Programme (SACEP) which promote regional cooperation. A sustained movement at a localized scale is required to facilitate meeting the basics needs of many who are deprived of access to food, safe drinking water and sanitation and shelter requirements. Here a holistic approach which addresses issues of natural resource management, sustainable livelihoods, and climate change adaptation requires development of a stronger knowledge base at various levels (local, national and global) for enhanced understanding of ecosystems and capacity, valuation and internalization of value of ecosystem services, and stakeholder engagement in ecosystems management.

The Diplomatic Challenges

Stockholm Conference was the first high profile political attempt to draw the developing countries into international discussions of environmental issues. It has put on display for the first time the central tension which has dogged global environmental discussion ever since. The major developing countries approached the conference with caution bordering on hostility. The communist bloc took the position that pollution was

the product of capitalism, and consequently a problem from which they did not suffer. Indira Gandhi, for example, emphasized at Stockholm that poverty, not pollution, was the principal problem confronting India. Maurice Strong, the conference Secretary General, had to put the bulk of his effort in the early months into persuading the developing countries to attend by assuring them that the conference agenda would extend beyond the environmental problems of the industrialized countries to embrace developing countries concerns too (Brenton 1994: 37).

As part of this preparatory process the key developing countries rapidly evolved their own distinctive approach to the Stockholm Agenda. This was most coherently summed up in the "Founex Report" (Ibid:37), which was produced by a group of developing countries scientists and experts for the Stockholm Conference as was echoed, with remarkable solidarity, in political statements by developing countries into the run – up to, and through, Stockholm. The central argument of Founex Report can be summarized as follows:

- Current environmental concern stem from the pollution and disruption of natural systems caused by high levels of industrialization.
- It was thus caused by and principally affected the industrialized countries.
- The developing countries also have a stake in these issues to the extent that they impinge on the global environment or on their own economic relations with the industrialized world, and to the extent that the developing countries themselves confront them in the course of their own economic development.
- However, the central environmental problems facing developing countries are different. They stem not from pollution but from poverty, disease, hunger and exposure to natural disasters.
- The solution to these problems was to be found through the process of economic development itself. In the rich countries industries might be the problem, but in the poor countries it was the solution.

The report and subsequent statements made clear a profound underlying worry in the developing countries that western concern about the environmental damage brought by industrialization could create pressure to slow industrial growth worldwide including

the developing countries. They were particularly concerned about the possibility of environmentally motivated restrictions on aid, investment or trade policies. In reaction they placed a heavy emphasis on sovereignty, on the rights of countries to choose their own path of economic development, and on freedom from international interference for environmental or any other reasons. These ideas thus loom largely in the conference conclusions. The Brazilian ambassador to the United States set out the developing country view well when he wrote in 1971:

Environmental deterioration as it is currently understood in some developing countries is a minor localized problem in the developing world. Nobody should expect to find an environment devastated by industrial activity where industries are so few and, more often than not, primitive. Evidently, no country wants any pollution at all. But each country must evolve its own development plans, exploit its own resources as it thinks suitable, and define its own environmental standards. The idea of having such priorities and standards imposed on individual countries or groups of countries, on either a multilateral or bilateral basis, is very hard to accept (Kay and Skolnikoff: 1972).

All the signs are that this developmental twist given by the South to the environmental issue took the North by surprise. The Northern aim is calling for Stockholm to stage an international event focused on the problems of concern of their public such as marine pollution, over consumption of natural resources and global population growth. At Southern insistence they now found the agenda broadened to include such issues as global poverty etc... The fundamental divergence of approach meant that Stockholm, unexpectedly from the North's point of view, became a forum for the rehearsal of well established North – South disagreements, garbed in green for this occasion about the fairness of international economic order and the need for the greater flows of western technology. The developing countries held that if they were to achieve economic growth in a non polluting way and make their contribution to protecting the global environment, they would need extra funding from the west as well as the modern technologies which would achieve economic growth while keeping pollution down. This extra western help would be justified by the need to compensate them for the cost of meeting higher environmental standards, and should be in addition to existing aid flows (Rowland : 1973).

Specific aspects of the environment had been the objects of international negotiations and arrangements but the concept of the collective responsibility of nations for the quality and protection of the earth as a whole did not gain political recognition until the years immediately preceding the Stockholm Conference. In effect, nation-states joined together their sovereignty and jurisdiction to resolve collectively issues that previously would have been definable only within the limits of particular national jurisdiction.

The Stockholm Conference avoided foundering on antagonism born due to Third World resentment over First World "injustice". The price of this avoidance was incorporation of environmental protection into the Third World's development priorities. In the main, the predicted confrontation at Stockholm between developing and developed nations over the impact of environmental protection and development was effectively contained. This was largely due to the political skill of Secretary General Maurice Strong, who had formerly headed the international development of the government of Canada, and to the thorough preparatory meetings in which conflicting perspectives on environment and development had been clarified and, in some instances, reconciled.

The development concept was thus enlarged and delegates were exposed to evidence that many social and economic problems had environmental connections. "In general, this experience was technically similar, but perhaps politically superior, to any success and legitimacy that the United Nations can claim in its history of international undertakings" (Campbell 1973: 138-53). In retrospect the primary accomplishment of the United Nations Conference on the Human Environment was the identification and legitimization of the biosphere as an object of national and international policy. Its resolutions provided standards for environment related acts of government, which even regimes indifferent to environmental values felt obliged to acknowledge as evidence for a status of progressive modernity. Thus the infusion of newer international law was not dramatic, but trends in effect before Stockholm relating to marine pollution, trans-boundary air, water pollution and protection of endangered species among others, were reinforced by the Stockholm resolutions.

The UNFCCC requires industrialized countries to achieve quantified targets for decreasing greenhouse gas emissions. In order to strengthen the international response, the land mark Kyoto-protocol was adopted in 1997. Under the Kyoto-protocol, countries agreed to cut in emissions of the three most important gases: carbon dioxide,

methane and nitrous oxide. The convention lists participating countries in two designations: *the Annex II Parties and Non-Annex I Parties. The Annex* I parties include both the 24 relatively wealthy countries that were the members of the Organization for Economic Cooperation for Development (OECD) in 1992, the European Union and the countries with economies in transition, Russian Federation and several other central and eastern European countries. These countries are committed to adopting national policies and measures aimed at reducing their greenhouse gas emission. They also agreed to submit regular reports, known as *National Communications*, detailing their greenhouse gas emissions. *The Annex II* parties, a subset of the annex I parties, include wealthier countries - the 24 OECD countries and the EU, which has a special obligation to help developing countries with financial and technological resources. The remaining 129 developing countries including India, China, Brazil, Mexico and South Korea were designated as Non–Annex Parties.

The Kyoto protocol laid down a target of a 5% reduction in greenhouse gases by 38 developed countries by the year 2010. More than 80 countries have signed the Kyoto pact at that time. As of May 2000, 184 countries have ratified the UNFCCC. Since 1994, when the UNFCCC entered into force, the Conference Of Parties (COP) and the decision making bodies have met five times. In addition, the UNFCCC's subsidiary bodies have met twelve times. Various workshops have been held to implement climate change goals in area such as agriculture, energy and resources.

However, the United States has abandoned the Kyoto Protocol in March 2001 as it was required to reduce its emissions of greenhouse gases to 7% below the total amount that it emitted in 1990. Therefore the participation of the other G8 nations has become crucial to get the accord into force. The cynical view of the UN Summit on Global Warming was becoming evident since November 2000, at the Hague Summit in Holland, which attracted more businessmen than bonafied environmentalists. The two week UN conference in Germany (Bonn) in July 2001, has not been able to bridge the divide between other developed nations and the US over the accord of Global Warming.

Further, the COP 15 Summit held on 7-18 December, 2009 at Copenhagen to thrash out on rising Global Climate Change and related issues in order to negotiate with the international community for equitable and sustainable results of flow across geo-political boundaries of the world. The purpose of the summit was intended to decide the

future route of the Kyoto Protocol which ends in 2012 in order to outline the character of the potential debates on Climate Change and Sustainable Development relationships so that the international community can provide way to new initiatives at large for its mitigation and adaptation. Delegations from 192 nations gathered at the Bela Centre in Copenhagen, Denmark for the UNFCCC in order to discuss the emerging issues of Climate Change so that it can be tackled through long lasting solutions. The main agenda of this Copenhagen Summit 2009 was clearly aimed at emission targets of industrialized countries, emission cuts of major developed and developing countries and financing of reduced emissions.

So after eight draft texts and all day talks between 115 world leaders, it was left to Barack Obama and Wen Jiabao to broker a political agreement. They said that the Copenhagen Accord will 'recognize' the scientific case for keeping temperature rises to not more than 2°C but it will not have any assurances to emission reductions to achieve that goal. So this deal made uncertain whether it will be accepted by all the 192 nations that participated. On the other hand, China, India, South Africa and Brazil along with the US negotiated a deal among themselves that would provide 30 billion dollars a year for poor countries in order to adapt to climate change from 2012, and 100 billion dollars a year by 2020.

But there was disappointment among African and other vulnerable countries like Bangladesh, Maldives, Kiribati, etc. which had been stressing out for deeper emission cuts to hold the global temperature rise to 1.5°C this century. This led to confrontation among the US, India, China, South Africa along with Brazil and vulnerable nations. So as expected, all reference to 1.5°C in past drafts were removed at the last minute and more shockingly, the earlier 2050 goal of reducing global CO2 emissions by 80% was also dropped by the strong and influential negotiators. Thus in a press conference, Mr. Barack Obama said that developing countries should be "getting out of that mindset, and moving towards the position where everybody recognizes that well all need to move together". Developing nations took this statement as an effort by the rich countries to move about of its liability for climate change. Lumumba Di-Aping, chief negotiator for the G77 group of 130 developing countries, said the deal had "the lowest level of ambition you can imagine. It is nothing sort of climate change skepticism in

action. It locks countries into a cycle of poverty forever. Obama has eliminated any difference between him and Bush".

The Copenhagen Accord was a failure in order to have an equitable and sustainable path of development for the entire international community. The COP 15 Summit was just a formality for rich countries to do some kind of favourism for poor countries in the form of charity and aids. Nothing concrete and no legally binding agreement could come out of the summit. This shows the one sided approach by the developed world at the cost of poor countries who will be at the receiving end forever.

The adaptability of a country in adverse situation depends largely on its socio-economic conditions. The poorer the country, the more vulnerable it is. In South Asia all of the nations fall into low income and low human development category which makes them most vulnerable to climate change. Therefore in negotiating in any international protocol like the Kyoto they could hardly play any effective role. On the other hand, these South Asian nations, East-Asia Pacific and Caribbean regions have just put a leap on the growth escalator. At this moment pressurizing poorer countries cut by imposing several expensive controls in the name of environment would be injudicious. It would mean like restraining millions of people from having food just served in front of them. For them green technology may be a possible solution but not at the cost of their maturing economy.

Besides, many of the Asian and African leaders generally believe that the West is pursuing environmental actions only to stifle the economic aspirations of the poor. The developing countries maintain that the industrialized world is chiefly to blame for the build-up of carbon dioxide and therefore should be held responsible for emission cuts. They point out that cheap and abundant energy from fossil fuels is a primary reason why industrialized countries have become so rich. At the same time, however, the effects of global warming will likely harm the developing world the most. Their economies are heavily dependent on agriculture, which would be severely impacted by climate shifts. In addition global warming presents the greatest threat to Small Island Nations, such as Maldives, Malawi, and populous coastal nation such as Bangladesh. Since water expands as it is warmed, a global temperature increase could cause sea

levels to rise. Millions of people could be displaced as low-lying areas are inundated. However, many US critics of the Kyoto Protocol Treaty say that the accord will be ineffective unless the developing world also agrees to bind reductions in greenhouse gases. Lash and other observers note that developing nations will likely become the largest emitters of carbon dioxide within a few decades. Binding commitments from the developing nations such as India, China and Mexico, the three most populous and fast growing countries, are especially important since levels of greenhouse emissions from those countries are rising faster than levels in the industrialized world.

According to the estimates of the US Energy Department, carbon dioxide emissions from China, already the second-largest emitter of greenhouse gases will surpass US emissions within a few decades.

Many of the developing nations still have to confront the politics of mass poverty, are single- minded in the pursuit of wealth, which demonstrates that a lack of political will is not the main problem; will is often strong but propelled in a wrong direction. Asia's challenge is to give its people the experience of economic success without the lethal side effect of the western industrial model.

Thus, international cooperation is essential to achieve a globally coherent response strategy and could both significantly reduce the costs and increase the effectiveness of greenhouse gas mitigation measures. Efficient policies that provide correct economic signals through such policy instruments as carbon taxes, specific subsidies, quota schemes, tradable emission permits as well as international incentive programmes like joint implementation schemes should be introduced to have required responses.

However, unless the issue of mistrust, legal requirements and financial guarantees are resolved, the most carefully constructed environmental treaties and action plans may collapse. A new system of priorities based on global partnership must be established, involving full participation in decision-making by every country on an equal footing in which everyone should pay a fare share to combat environmental danger. These arrangements do not depend on technical and financial feasibility but on political good will.

The objective of the study is to analyze diplomatic challenges of climate change in South Asia and its responses. Challenges in the form of negotiations that took place such as South Asian Association for Regional Cooperation (SAARC); South Asia Cooperative Environment Programme (SACEP); negotiations at the United Nations level with developed countries etc... will be considered. Further, it will provide special and detailed focus on Maldives as it is a small island nation in the region which is extremely vulnerable to climate change and what mechanisms it has adopted for its mitigation will be discussed at length.

Mechanisms in the form of adaptation and mitigation by the South Asian region as a whole and the response of international community will also be analysed.

The study attempts to test the hypothesis whether climate change presents palpable geopolitical risks among South Asian countries which will increase national vulnerabilities and exacerbate inter-state tensions. Lack of shared vision at the international level makes regional approaches on climate change important among South Asian nations.

The methodology for the proposed study would utilize both primary and secondary sources along with a proper analysis by using historical, descriptive and analytical methods. The primary sources would include documents of the government agencies, press release, organizational reports, etc.. The secondary source of data will include books, news reports, journal and articles and various academic papers. Therefore submerged habitat area and population would be estimated for global climate change for the next century. Policy and plan formulation for adaptation and mitigation would be done on the basis of ecological, social-economic-political structure of the region. The study will also use information and data collected through various seminars, think tank analysis of world organizations, interviews and internet sources etc... for better understanding of the topic.

To make the study detailed, analytical and comprehensive, the study is divided into four chapters and conclusion. The First chapter deals with the scientific background of climate change, its contemporary scenario through review of literature and diplomatic challenges among developed and developing states.

The Second chapter deals with mapping of South Asia: What are the geopolitical features in terms of units? Implications of climate change on agriculture, rural economy, ecosystems, livelihoods, glaciers, health systems, natural disasters etc… will be assessed.

The Third chapter would provide a detailed and analytical focus on Maldives as it is a Small Island Developing State (SIDS) in the region which is extremely vulnerable to climate change. What institutional mechanisms and diplomatic responses it has adopted at the regional as well as at the international level for its adaptation and mitigation will be discussed at length.

The Fourth chapter would delve into various regional approaches adopted to tackle the menace of climate change. The role and responsibilities of SAARC, South Asia Cooperative Environment Programme (SACEP) and other policies formulated so far for its adaptation mitigation would be examined.

The Fifth chapter will be closed with a conclusion wherein an effort will be put towards summarizing the various findings done during the course of the study. It will test the hypotheses and will try to answer the research questions.

CHAPTER – II

Mapping South Asia: Implications of Climate Change

MAPPING SOUTH ASIA: IMPLICATIONS OF CLIMATE CHANGE

Geographical Features

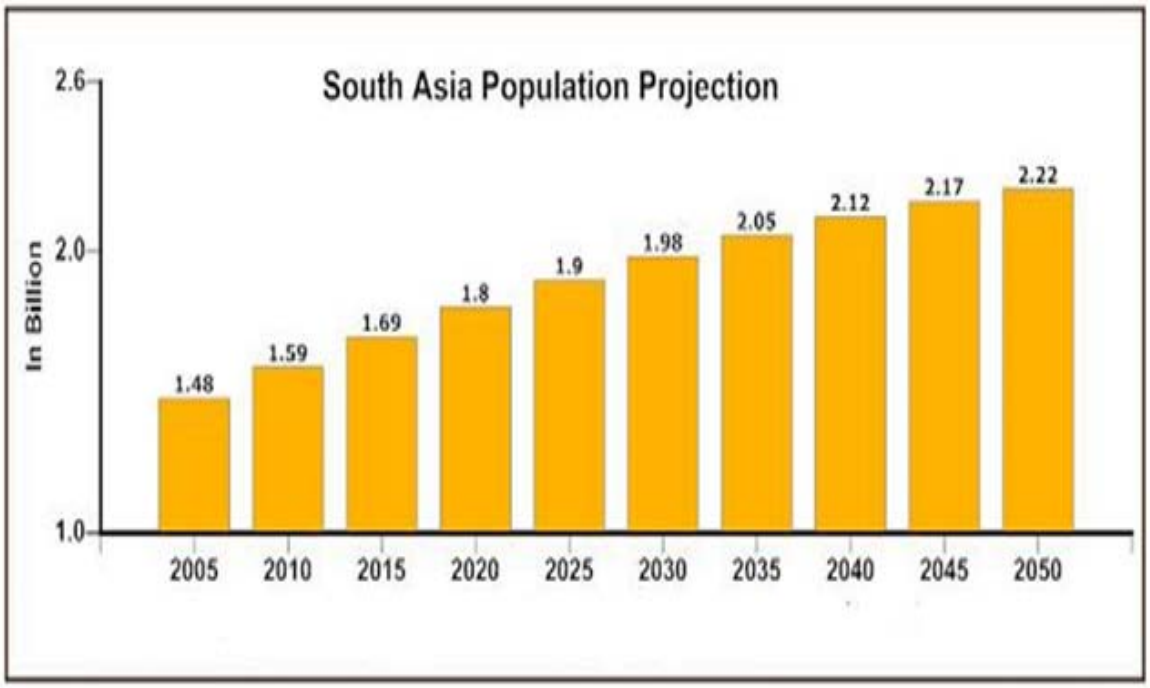
South Asia, also known as Southern Asia, comprises the countries of Afghanistan, India, Bangladesh, Pakistan, Nepal and Bhutan as well as Island nations of Sri Lanka and the Maldives. “It covers approximately 4.48 million Km² in area which makes only 4.8 percent of the world’s total area. It is surrounded by (from West to East) Western Asia, Central Asia, Eastern Asia and South East Asia. It has a 1.5 billion strong population growing at the rate of 1.8% per annum” (South Asia Environment Outlook 2009). South Asia’s geography includes an incredible range of mountains, plateaus, dry regions, main structural basins and beaches. It differs from the World’s highest point, Mount Everest to the World’s lowest, the sea beach and the whole coastline runs to about 10,000 km from Pakistan to Bangladesh with wetlands having an area of 1,34,161 sq km. The Himalayas have a significant influence on the climate and economy of the region. Other mountain ranges are the Vindhyan ranges; the Aravalli ranges and the western edge of the plateau formed by the Western Ghats and the Eastern Ghats.

“The Himalayan system shapes the critical and often unpredictable monsoon dynamics. It acts as a natural reservoir for sustaining crops and providing ground water recharge. The Himalayan ecosystem sustains some 1.5 billion people who live directly in the flood plains of its many rivers (Brahmaputra, Ganges, Indus and Meghna)” (IDSA 2010). “The receding glaciers of the Himalayas could present the more far reaching challenge to the region. Some glaciers are receding more rapidly than the global average leading to increased threats of glacial lake outburst floods in Bhutan and Nepal” (UNEP Report 2010). This poses an unprecedented threat to water supplies, lives and the economy of the region. With melting glaciers flood risks would increase in the near future. In the long term, there can be no replacement for the water provided by glaciers and this could result in water shortages at an unparalleled scale. Glacier retreat in Nepal for instance can flood farms in distant Bangladesh. Addressing these problems call for considerable cooperation.

The entire area is characterized by a tropical monsoon climate in which two monsoon structure function in the region: the summer or southwest monsoon ranging from June-September and winter or northeast monsoon ranging from December-April. The rainfall, particularly in the summer monsoon accounts for the maximum in the entire

South Asian region except Sri Lanka where winter monsoon is dominant; and form a chief source of water for agriculture and other activities. The region also characterizes massive year-to-year differences in the rainfall often causing severe floods/droughts over the large area.

"South Asia has some of the world's biggest river systems which start off partly in Bhutan, China and Nepal and Flow to Bangladesh and India. The Indus is one of the world's utmost river systems measuring 3180 km from its source to the sea and similarly the Ganga extends for about 2525 km and the Brahmaputra which is considered to be the third greater Himalayan river, extends to about 2900 km flowing through Tibet, India and Bangladesh" (Ibid). The Ganges river basin alone is home to about 600 million people.



Source: World Bank Human Development Network 2005.

The region has a long and densely populated coastline with low-lying islands of Maldives that is vulnerable to sea level rise. Salt water intrusion in low- lying agricultural plains and water resources could lead to localized food insecurity, spread of water related diseases and the contamination of fresh water reserves. Parts of east coast (Bangladesh and the Indian state of Orissa), are particularly vulnerable to cyclones and storm surges and these are expected to become more devastating in the future. Low-lying Islands (The Maldives, coastal areas of Sri Lanka and the chars and Islands of

Bangladesh) stand most to lose from sea level rise and the threat of coastal storms. The natural mangroves (Sunder bans) and coral reefs that have helped buffer some of these impacts would vanish, if there is a significant climate change.

Cropping Pattern in South Asia

Of the five sub-regions of Asia and the Pacific, South Asia has the maximum area under cultivation wherein 60 percent poorer segment of its population depend on agriculture for livelihoods which demonstrates the pressure in the form of low output resulting in massive poverty among the region. The sector adds 25 percent of the GDP in the region which makes it a primary sector for the economic development. With the rural economies closely interlinked to the natural resource base and climate sensitive sector such as agriculture, the poor in South Asian region are likely to be excessively affected by climate change. Thus the four most essential agricultural systems used in the region are shown in Table below:

Table: Major Cropping Systems in South Asia

Farming Systems	**Land area (% of the region)**	**Agricultural Population (% of the region)**	**Principal Livelihoods**
Rice	7	17	Wetland rice (both seasons), vegetables, legumes, off-farm activities
Rice-Wheat	19	33	Integrated rice, wheat, vegetables, livestock including dairy, off-farm activities
Highland Mixed	12	7	Cereals, livestock, horticulture, seasonal migration
Rainfed Mixed	29	30	Cereals, legumes, fodder crops, livestock, off farming activities

Source: Food and Agriculture Organization (FAO), World Bank 2001

Thus geography coupled with high levels of poverty and population density has rendered South Asia especially vulnerable to the impacts of climate change. Climate risks in the region reflect varying conditions in the form of regular droughts, floods, wind storms and tropical cyclones. The region is highly susceptible to natural disasters wherein about half of the region's population have been affected by it. Due to common geological formations and river basins, natural hazards frequently go beyond national boundaries. Hence the region faces frightening climate related development challenges.

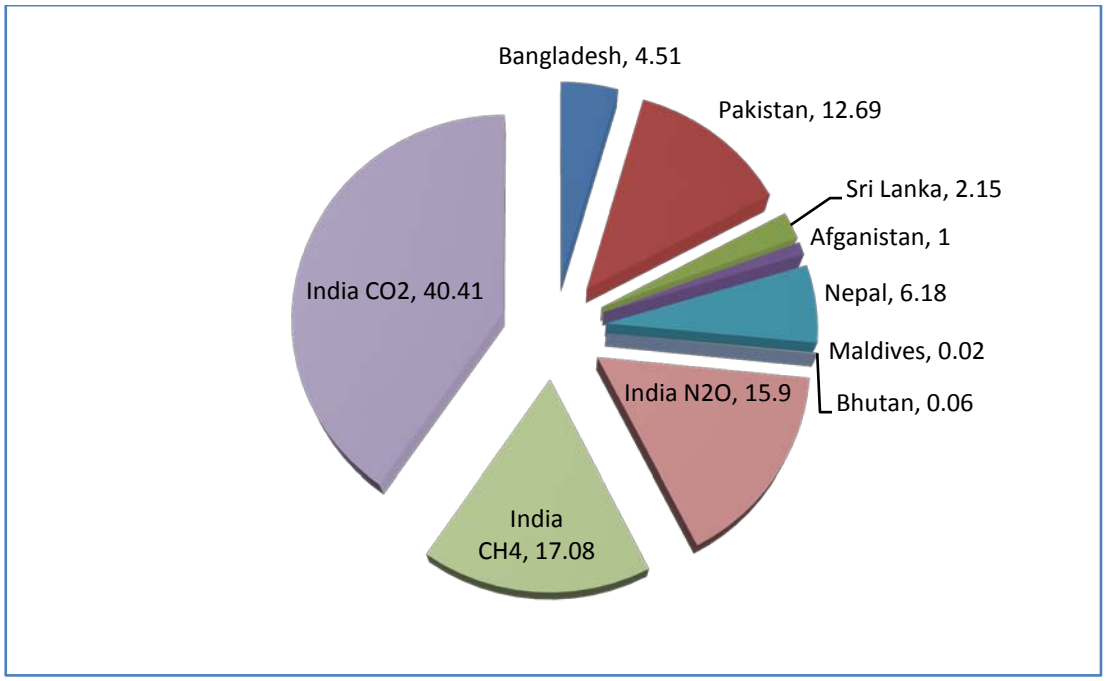
The impact of climate change in the form of high temperatures, more variable precipitation, and more extreme weather events are already felt in South Asia and it has been projected that this will intensify. High population level translates into increased resource demands on an already stressed natural resource base. By 2050, the South Asia's population is likely to exceed 2.2 billion from the current level of 1.5 billion.

According to the Intergovernmental Panel on Climate Change (IPCC), South Asia is seeing a "significant acceleration of warming over that observed in 20th century. Warming is stronger over South Asia and East Asia and greatest in the Continental interior of Asia (Central, West and North Asia)". In the coastal areas of Asia, the current rate of sea level rise is reported to be between 1 to 3 mm/year which is marginally greater than the global average. A rate of sea level rise of 3.1 mm/year has been reported over the past decades compared to 1.7 to 2.4 mm/year over the 20th century as a whole which suggests that the rate of sea level rise has accelerated relative to the long term average.

"The IPCC observed that temperatures are increasing in every sub-region of Asia. The observed increases in some parts of Asia during recent decades ranged between less than 1°C to 3°C degree Celsius per century. This warming at rate greater than the global mean is projected for South Asia at 3.3 degree Celsius" (IPCC 2007:496). According to the IPCC, South Asia is the only sub-region in Asia to record the status of 'highly vulnerable' for all of the following sectors: food and fiber; biodiversity; water resources; coastal ecosystems; human health; and land degradation. South Asia is therefore among the most vulnerable sub-regions in Asia.

"Thus to make climate change theory simple it means that the atmospheric concentration of greenhouse gases (GHGs) in the air should be kept limited to 350 parts per million (ppm) so that temperature would not rise up to an acceptable degree

Celsius" (Ibid: 496). "There are various recommendations by the IPCC but the most important is the one for setting temperature increase far below two degree Celsius and even to limit it to 1.5 degree Celsius" (Climate Change Report 2007). The complication arises when links are made with economic, social, ecological, lives and livelihood options and development path with these changes. The most negative change will be observed in Least Developed Countries (LDCs) and Small Island Developing States (SIDS).



Greenhouse Gas Contributions by Country in South Asia, 2000

Source: World Resources Institute Climate Analysis Indicators Tool

For South Asia the change in climate will include more dangerous weather events. "Even under the most conservative scenario, sea level will be about 40 cm higher than today by the end of 21st century and this is projected to increase the annual number of people flooded in coastal populations from 13 million to 94 million. Almost, 60% of this increase will occur in South Asia (along coasts from Pakistan, through India, Sri Lanka and Bangladesh to Burma)" (IPCC 2007:484).

Country profile showing summary of key observed past and present climate trends and variability in the region:

Country	Change in temperature	Change in precipitation
India	0.68 degree Celsius increase per century, increasing trends in annual mean temperature, warming more pronounced during post monsoon and winter	Increase in extreme rains in north-west during summer monsoon on recent decades, lower number of rainy days along east coast
Nepal	0.09 degree Celsius per year in Himalayas and 0.04 degree Celsius in Terrain region, more in winter	No distinct long-term trends in precipitation records for 1948 to 1994
Pakistan	0.6 degree Celsius to 1.0 degree Celsius rise in mean temperature in coastal areas since early 1990s	10 to 15% decrease in coastal belt and hyper and plains, in case in summer and winter precipitation over the last 40 years in northern Pakistan
Bangladesh	An increasing trend of about 1 degree Celsius in May and 0.5 degree Celsius in November during the 14 year period from 1985 to 1988	Decadal rain anomalies above long term averages since 1960s
Sri Lanka	0.016 degree Celsius increase per year between 1961 to 1990 over entire country, 2 degree increase per year in central highlands	Increased trend in February and decrease trend in June
Afghanistan	An increase in temperature and frequency of hot days and nights since 1960. Average	Rainfall has become scarcer particularly during the months of March to May, declining by 6.6 percent per decade since

	temperature has been recorded to increase by 0.6 degree Celsius	1960
Bhutan	Average temperature has increased by 7 percent in 1990-2000 from their levels in the 1960-70	Precipitation has increased by 7 percent in 1990-2000 from their levels in 1960-1970
Maldives	An increase in sea surface temperature has been observed in the Maldives coasts at S. Gan and Male which are about 0.2 degree Celsius and 1.1 degree Celsius to 1.6 degree per decade	Increased trends during all seasons

Sources: World Bank Climate Change portal; UNDP climate change country profiles

Fundamental threats to South Asia (Sector wise):

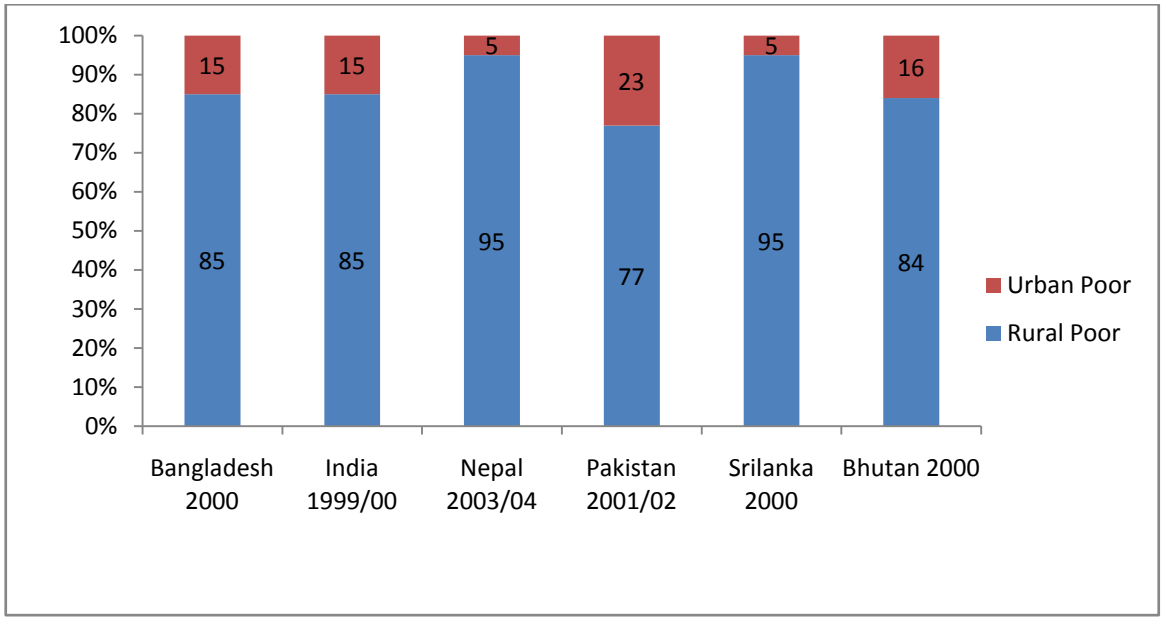
1. ***Agriculture and Rural sector:***

One sixth of humanity is undernourished, more than ever before. Changing climatic conditions are projected to affect food security throughout their impact on local food systems. More frequent and intense extreme weather and climate are increasing uncertainties in rainy season patterns and rising sea levels are already having significant impacts on food production, food distribution infrastructures, food emergencies, livelihood assets and human health, in both rural and urban areas.

Agriculture is critical to South Asia's development. Rural areas in the region are home to over 70 percent of its population and agriculture is the region's principal occupation, employing over 60 percent of the labour force. Agricultural and rural nonfarm growth

will be critical to reaching the Millennium Development Goal of halving the number of poor people by 2015. “Long term changes in temperatures and precipitation have direct implications on evaporative demands and agricultural yields. The changing hydrological characteristics of these extreme events, in relation to the onset, duration, and magnitude of the yearly monsoon season, will affect agricultural production significantly. The combined effects could be devastating for tropical agriculture” (World Bank Report 2009: 74-75).

“In Bangladesh alone, between 1991 and 2000, 93 major natural disasters were recorded, with the agricultural sector suffering the bulk of the losses. The sea level rise could have important implications for the availability of land for agriculture. Inundation and changes in the sediment balance and salinity profile of coastal areas could affect large areas of fertile arable land across much of the region”(State of the Environment and policy Retrospective 2002).



Source: World Bank Calculations. Data for Afghanistan and Maldives were not available.

“The fragile ecosystems vulnerable to climate change impacts are: mountain/Himalayan ecosystems (e.g. Nepal, India, and Bhutan), mangroves, salt marshes and coral reefs (e.g. India, Bangladesh, and Sri Lanka), semi-arid and arid resource poor dry lands (e.g. India and Pakistan). The low lying coastal regions would be affected due to Sea-Level Rise (SLR) and increase in extreme climate events (e.g. Maldives and Bangladesh)” (Lal 2010:220). Semi-arid tropics are vulnerable due to reduced rainfall and increased

evapo-transpiration and drought (e.g. central and peninsular India; Sindh and Balochistan of Pakistan; North West Bangladesh), while small islands are extremely vulnerable due to high exposure of population and agricultural infrastructure to sea level rise (e.g. Maldives) and increased storm surge. The Magna basin and north-eastern hoar regions of Bangladesh is vulnerable to flash floods.

Fresh water availability in South Asia is projected to decrease and temporal and spatial changes in precipitation and associated droughts have major implications for agriculture. “Temperatures are projected to increase by as much as 3–4°C towards the end of the twenty-first century. In India, climate change may aggravate the current problems of sustainability and profitability of agriculture in many regions. Studies on socio-economic impact of climate change indicate that the loss in frame level net revenue may range between 9% and 25% for a temperature rise between 2.0°C and 3.5°C” (Ibid. 223).

“In Pakistan, studies indicate that fourteen crops (eight field crops, three vegetables and three fruits) have shown some degree of vulnerability to heat stress under a climate change scenario of a rise in temperature of 0.3°C per decade. Under the scenario where rainfall decreases by 6%, net irrigation water requirements could increase by 29%. Over 1.3 million households (30% of the total), cultivated cotton and 27% of reporting households had paddy fields which will expose to negative climate change impacts” (Lal 2010: 225).

Glacier melting in the Himalayas is projected to increase flooding and affect water resources within the next two or three decades. Glacial Lake Outburst Floods (GLOF), landslides, flash flood and droughts are key hazards affecting Bhutan. Decreased water availability for crop production, increased risk of extinction of already threatened crop species (traditional crop varieties), loss of soil fertility due to erosion of top soil and runoff, loss of fields due to flash floods, landslides, crop yield loss due to hailstorms and forest are the key vulnerabilities. There are an estimated 2,674 glacial lakes in Bhutan of which 562 are associated with glaciers and 24 glacial lakes are potentially dangerous.

Agriculture remains Nepal's principal economic activity, employing 80% of the population. The Terrai plains constitute 43% of the total cultivated land. Recurring natural disasters undermine agricultural productivity causing poverty and food insecurity. In Nepal, the potential yield of Terrai rice is estimated to increase by about 18-21% when CO^2 increases to 580 ppm. However, with an increase of temperature beyond 4°C, the yield is projected to decrease. Similarly, temperature changes will affect the availability of forages and alter the movement of Yaks in the mountains between 3,000 and 5,000 m elevation.

It is projected that Sri Lanka's rice output would be reduced by 5.91% with a temperature increase of 0.5°C. Approximately 740,000 hectares are cultivated with paddy in Sri Lanka and of this 44% is irrigated under major irrigation schemes and another 24% under minor irrigation schemes. The major part of this land is in the dry and intermediate zones and is vulnerable to instability in rainfall pattern. The increase in temperature will negatively impact high value crops such as vegetables and potatoes. The impact of salt water disturbance on low lying agriculture would be noteworthy and loss and degradation of arable lands will gradually lower the agricultural output in coastal areas. An increase in temperature rise of about 2°C may have substantial impacts on the distribution, growth and reproduction of fish stocks.

"Over 80% of the land area of the Maldives is less than 1m above mean sea level and is extremely vulnerable to sea level rise and beach erosion. The share of agriculture is small in the Maldivian economy with a GDP share of about 3.5%. Nevertheless, the sector is considered important because of its potential on generating employment, income opportunities and attaining local food security."(Lal 2010:221). A wide range of crops are grown, with a heavier concentration of root crops in the south and more field and grain crops in the north. The Maldives tuna fishery is affected by the seasonal monsoon and their associated currents. The hydrological cycle is predicted to be more intense with increased intensity of daily rainfall during monsoon season which may lead to intensifying flooding and inundation of agricultural areas. The most intense cyclones crossing the East coast of India and Bangladesh are associated with storm surges, strong winds, coral bleaching, ocean spray and inundation of land and erosion.

In South Asia, there is a trend towards an overall increase in precipitation, with prolonged dry spells having occurred over the last few decades. Climate change

projections show marked increase in both rainfall and temperature over the region. Temporal and spatial changes in glacier melting and precipitation patterns; associated droughts, floods and more intense of frequent cyclones are likely to negatively affect all agricultural sub-sectors. “The crop yields could decrease up to 30% in the region by the mid twenty- first century and considering the population growth, the risk of hunger is projected to be very high. The surge in global commodity prices of the past few years has presented a tremendous development challenge to South Asian countries. On a net basis South Asia is estimated to have suffered an income loss equivalent to some 9.6 percent of GDP between January 2003 and April 2008” (Sapkota 2010). The surge in food prices between January 2007 and April 2008, especially of staple food –wheat and rice has created tremendous adverse social impact in South Asia. All countries have witnessed unprecedented surge in food prices. Net food importing countries like Afghanistan, Sri Lanka and Bangladesh have suffered the most form the food price crisis. South Asian countries have seen a sharp increase in fiscal deficits and a worsening in the balance of payments. Inflation has been hit badly.

Impact analysis based on statistical crop models and climate projections for 2030 from 20 general circulation models revealed that South Asia, without sufficient adaptation measures, will likely suffer negative impacts on several crops that are important to large food- insecure human populations. Other projected impacts of climate change include inundation of arable land, salinity intrusion, reduced fresh water availability and persistence of transboundary pest and diseases. Irrigation demand for agriculture in arid/semi- arid regions is expected to increase by 10% for temperature increase by 1°C; and increased dryness during pre-summer season may accelerate the rate of forest fire incidence and threaten rural livelihoods.

2. Ecosystems and Biodiversity:

Up to 50% of the Asia’s total biodiversity is at risk due to climate change. “The changes in precipitation, sea level, sea water chemistry, incidence of extreme events, and rate of de- glaciations will modify the conditions that shape ecosystems and biodiversity. These climatic changes can disrupt ecosystems functions and distort the growth, size, composition and roles of species” (IPCC 2007: 485-486). The most vulnerable ecosystems are the mountain biota, rangelands and coastal and marine

ecosystems. Endemic mountain species, biota restricted to island or coastal areas, and species with small population, limited climatic ranges and restricted habitat requirements are most in danger of extinction. There are more subtle impacts too such as the reduced capacity of ecosystems to perform sequestration that could aggravate the impacts of climate change. In the high altitude Himalayan Hindu Kush, climate change will transform vegetation and reduce biodiversity of the mountain ranges. Climate change is expected to lead to a northward shift of vegetation and to the reduction and loss of alpine tundra cover in the dry temperate and temperate mountains of the region. The changes in precipitation in the dry temperate mountains of Pakistan are expected to expand conifer coverage at the expense of alpine vegetation even before the mid-century.

The biodiverse forests, rangelands, and deserts of South Asia support basic human needs and livelihoods. Forests account for about 20-30% of the land area of India, Nepal and Sri Lanka and about 68% in Bhutan. These are important to energy, housing, and the livelihoods of many people in rural South Asia. Savannas and dry forests are gazing areas for the region's large population of livestock, which is essential to food security and agricultural draught. Climate change will affect the vegetation, productivity, and biodiversity of ecosystems. Forests and rangelands that receive increased precipitation relative to evapo-transpiration will experience primary productivity gains. The critical impacts on South Asia's terrestrial ecosystems include transformation in the areas supporting large habitats, such as the savanna of India, the highly endemic areas of the Hindu Kush and the dry lands at threat of desertification. "The IPCC projects that carbon fertilization will lead to net primary productivity gains in the medium term, with gains experienced in some forest types outweighing the losses in others. Vegetation types will shift to higher elevations as a result of global warming, and some vegetation types may disappear in the process, together with dependent species and ecosystems with strict climate niches" (IPCC 2007).

In India, climate change is projected to lead to loss of savanna cover. Vegetation is expected to shift towards wetter types in the northeast and to drier types in the northwest of India by 2085. This will transform the currently dominated land cover into tropical dry forest. Wildlife adapted only to the savanna landscape could be threatened by loss of habitat. The highly endemic areas of the Western Ghats and central Himalayas are projected to experience forest dieback and loss of biodiversity in the

long run. In the high altitude Himalayan Hindu Kush, climate change will transform vegetation and reduce biodiversity of the mountain ranges. Climate change is expected to lead to a northward shift of vegetation and the reduction and loss of alpine tundra cover in the dry temperate and temperate mountains of the region. The changes in precipitation in the dry temperate mountains of Pakistan are expected to expand conifer coverage at the expense of alpine vegetation even before the mid-century. The upward migration of plants in the Himalayas could lead to similar reduction in alpine meadows, thus impacting the habitats of several high altitude mammals including wild sheep, goat, antelope and cattle.

Coastal ecosystems are vulnerable to the multiple impacts of sea level rise. The expanding sea level has numerous effects and includes outpouring of wetlands and lowlands; coastal flooding; changes in tidal ranges in rivers and bays; erosion of shorelines and increase in height of waves. High levels of global warming are expected to lead to an average sea level rise of up to 88 centimetres over the next century. This will pollute surface and ground water resources and could increase the damage caused by storms, tsunamis and flooding. The low lying small island state of Maldives, the mangroves of the Sunderbans, and the coastal ecosystems of Sri Lanka are particularly vulnerable to these impacts. Sea level rise could also dislocate low-lying flood plains and swamps, submerge intertidal areas such as mudflats and eliminate the wetland plants and animals sensitive to salinity.

Sea Level Rise and the Biodiversity of the Bangladesh Coastal Area

Bangladesh is majorly at risk from sea level rise, given that its coastal zone, comprising intertidal mudflats, mangroves, and tidal creeks covers about 30% of its area. These coastal ecosystems are habitat for many species, source of livelihood for many communities and a natural defense against storms and floods. The Sunderbans coastline mangroves will be threatened by the increase in inundated areas and salinity of water.

The Sunderbans gives life to a diversity of wildlife: Bengal tigers, spotted deer, wild boars, endangered turtles and some of the largest estuarine reptiles. Sea level rise with a moderate increase could disturb it’s out of the ordinary wildlife and prompt conflict between human and animals. An increase in 1 meter of sea level, which is likely to occur by the end of the century, will lead to the disappearance of the Sunderbans and its biodiversity.

Climate change poses a threat of desertification in dry lands expected to undergo increased aridity. “South Asia’s arid and semi-arid range lands provide livelihoods for millions of herders and pastoralists in Afghanistan, India and Pakistan. The deserts of the Indus valley and Thar support population densities of about 150- per square kilometre- almost five times the global average for desert areas” (World Bank Report 2009). In most deserts and range lands, the combined effects of higher evapotranspiration, lower precipitation, and more intense and extended droughts will reduce soil moisture and promote desertification.

Fresh water and inland wetlands will be affected by the likely impacts of sea level rise, glacial melt, and extreme weather events. Of all ecosystems, fresh water aquatic resources appear to have the highest proportion of species threatened with extinction by climate changes. Fresh water resources and species in low lying plains can be affected by sea level rise through salt water intrusion and by flood through inundation. In semi-arid areas, lower seasonal stream flow and drying up of lakes can have profound effects upon biodiversity and ecosystem services. The drying of stream beds and lakes for extended periods could reduce ecosystem productivity due to the impacts of lower oxygen levels on aquatic habitats and water quality. The lakes in arid and semi-arid areas such as those in the deserts of Afghanistan could disappear as a result of climate changes.

3. Natural Disasters:

South Asia is extremely vulnerable to natural disasters with over 900 events reported since 1970 alone. “Between the 1990 and 2008, over 750 million people – 50 percent of the population in the region – were affected by a natural disaster, leaving almost 230,000 deaths and about US$45 billion in damages. With a coastline of 12,000 kilometres as well as low-lying lands and many islands, the region is highly vulnerable to cyclones, storm surges, and sea level rise” (Coastal Systems and Low Lying Areas 2007).

“Global warming has been correlated with an upward trend in the destructive potential of hurricanes. The eastern coast cyclones originate in the Bay of Bengal, the Andaman Sea, and the South China Sea and move towards the coasts of West Bengal, Orissa, and

Andhra Pradesh, eastern and north central parts of Bangladesh. Recently, observed trends in the intensity of tropical cyclones have raised the probability that the region may face an even stormier future"(UNDP, Human Development Report 2007). This prospect might be partially shaped by an increase in sea surface temperature resulting from climate change.

Countries at Relatively High Mortality Risk from Multiple Hazards

Global Rank	Country	Total area at risk (%)	Population in risk area (%)
1	Bangladesh	97.1	97.7
2	Nepal	80.2	97.4
31	Bhutan	31.3	60.8
48	Pakistan	22.8	49.6
50	Afghanistan	7.2	46.0
71	India	21.9	27.2

Source: World Bank 2005

Hazards include Earthquakes.

The damages caused by natural disasters are exerting more and more pressure on development opportunities. In India for instance, the direct losses from natural disasters amount to up to 2 percent of India's GDP and up to 12 percent of central government revenues. In the state of Maharashtra, a single drought in 2003 and a flood in 2005 consumed more of the budget (Rs. 175 billion) than the entire planned expenditure of (Rs. 152 billion) on irrigation, agriculture and rural development for the 2002-2007 period.

"Due to both limited fiscal resources and a lack of economic incentives to engage in disaster mitigation strategies, governments usually respond only in their aftermath. Many countries depend on emergency aid and on easily available reconstruction funds from international development organizations to alleviate the impacts of disasters. This dependence can adversely affect the need for proactive disaster management" (World Bank Report 2009: 87-92). Many development programs already experience a reduction

in their effectiveness. Though relief programs can be strengthened and will continue to remain a key source of aid to countries suffering from extreme natural disaster events, in the long term there is a clear fiscal and development need to strengthen climate resilience by addressing the root causes of vulnerability.

The Health Sector:

Climate change will affect the basic determinants of health: clean air and water, disease vectors, and the availability of food. "A warmer and more variable climate threatens to increase air pollutants, which in turn is expected to lead to an increase in respiratory and airborne diseases. As hazards from extreme events such as floods and cyclones become more frequent and devastating, transmission of disease through unclear water and contaminated food is also likely to proliferate." (World Bank Report 2009:95-97). Climate change threatens to slow the considerable progress that has been made in combating climate sensitive diseases.

In South Asia many of the leading causes of mortality, such as diarrhoeal diseases and respiratory infections, reflect the poverty that remains endemic to much of the region. With increased rainfall during the monsoon season, these outbreaks will become more frequent. In urban areas, an increase in air pollutants associated with rising ozone levels will exacerbate chronic illness such as cardiovascular disease and asthma. Of all deaths resulting from the world's 35 most deadly cyclones (from the years 1584 to 1991), India and Bangladesh accounted for 76 percent. Two of the world's three deadliest cyclones occurred in Bangladesh, causing 300,000 deaths in the 1970 cyclone and 138,000 deaths in the 1991 cyclone. Rising sea- surface temperatures are expected to increase tropical cyclone intensity and the height of storm surges in the region.

Several tropical vector- borne diseases are highly sensitive to climate change. Not only does temperature and precipitation influence pathogen development within vectors, but vectors themselves are also subject to climatic variability. Given the complexity of the interactions, the relationship between climate change and human illness caused by vector-borne pathogens is difficult to assess. "However, studies suggest that climate variability and extreme weather events, projected to occur in South Asia may increase the occurrence of outbreaks and the spread of vector-borne diseases in some areas. Climate changes that include changes in human behaviour can also alter the patterns of vector-borne diseases; for example, changes in population density, water storage,

irrigation practices, land use, construction techniques, and the use of air conditioning can all vary the way in which vectors and humans interact" (WHO 2003).

Air quality is significantly affected by weather conditions, including amounts of ground-level ozone, fine particulate matter, smoke and aeroallergens. In urban areas, warmer temperatures may result in the production of more ground-level ozone through conversion of carbon dioxide emissions. Ozone is known to have negative respiratory effects, particularly affecting individuals with asthma. Being home to five of the world's mega cities, South Asia will continue to be affected considerably by urban air pollution. Rising carbon dioxide levels and warmer temperatures have the potential to increase the amount of aeroallergens, such as pollen or spores in the air. These airborne substances are characterized by their ability to cause an allergic response in humans which can in turn lead to an increase in the incidence of respiratory allergies.

Rising temperatures are also expected to exacerbate the existing urban heat island effect, thus increasing the vulnerability of some urban environments to some heart related mortality. The air temperatures in cities can be up to 12°C warmer than that in surrounding suburban and rural areas due to absorption of heat by dark- paved surfaces and buildings, lack of vegetation and trees, heat emitted from buildings, vehicles and air conditioners, and reduced airflow around buildings. With five of the world's megacities and many other urban areas situated in South Asia, rising city temperatures have the potential to impact the health of city dwellers and, particularly, of those residing in slums, who usually lack access to air conditioning and adaptive strategies.

"Great intensity of rainfall events in South Asia is projected to increase the frequency of floods. In 2007, floods resulting from monsoon rain killed over 20000 people and displaced more than 20 million people in Bangladesh, India, and Nepal. In the Himalayas the frequency of glacier lake outburst floods rose during the second half of the 20th century" (Sahni 2003). Flooding has been associated with direct and induced health risks. Direct risks include death due to drowning and trauma from being hit by objects moving rapidly in the flood stream. Flooding creates an environment conducive to the transmission of disease.

If flood water gets contaminated with human or animal waste, the rate of fecal- oral disease transmission may increase, allowing diarrheal disease and other bacterial and viral illness to grow. For example, flooding in West Bengal caused an outbreak of

cholera induced diarrhoea that resulted in 276 deaths. Flooding can also contribute to increased vector and rodent borne diseases. Stagnant water provided breeding grounds for mosquitoes, potentially helping the spread of malaria.

Due to the impact of climate change on environment, major concerns will be the health implications of social and economic dislocation. Importantly, the major health impacts connected to environmental decline in South Asia will be population dislocation and displacement. The impact of population displacement will create “climate refugees”. Most of the cities in South Asia are situated along the coasts; the coastal impacts of climate change could result in mass displacement of vast urban populations. People displaced internally or displaced across the borders are vulnerable to disease. These displaced populations often end up living in refugee camps or urban slums; these are environments in which health suffers dramatically, as they are regarded by poor sanitation, and insufficient food supply or livelihood opportunities. Mental health impacts of extreme climate events and disasters present another public health challenge. The most common consequences of severe weather events, such as floods and cyclones, include anxiety, depression and post traumatic stress disorder.

Impact on Unique and Threatened Systems

“Unique systems are restricted to a relatively narrow geographical range but can affect other entities beyond their range. Many unique systems have global significance. These unique systems are restricted geographically points to their sensitivity to environmental variables, including climate, and therefore they are potentially vulnerable to climate change and variability. Unique systems can be divided into physical and human systems” (Sahni 2003). “In South Asia, three such unique systems pertinent to hydrology and water resources have been identified. Himalayan glaciers and ground water system of Pakistan are two unique physical systems” (Pacific Network for Global Change Research 2002: 18-20). The Himalayan glaciers are the source of water of many large rivers in South Asia. Agriculture and domestic water supply sector are highly dependent on ground water system in Pakistan. Both systems are found to be sensitive and vulnerable to climate variability and will likely to be more vulnerable to future change in climate and variability. Mountain communities in South Asia have

been found to be especially vulnerable to natural disasters and may be susceptible to higher vulnerability due to climate change in future.

Himalayan Glaciers: The Himalayan glaciers lie across the boundary zone between monsoonal and westerly atmospheric influences strongly affecting precipitation in the form of rain and snow and hydrological (runoff) conditions in the region. "The Himalayan glaciers cover around 100,000 km² and the maximum seasonal snow cover could be as high as 1.5 x 106 km². The amount of water in the glaciers and snow cover has been estimated to be 12,000 km³" (Ibid: 20). Snow covers, glaciers and permafrost contributes significant amount of melt water to the Himalayan perennial river systems through a network of mountain streams. The Himalayan Rivers supply an estimated 8500 km³ of water annually. Roughly about 10 % of this volume of water comes from the melt water contribution. The remaining amount is generated from rainfall. The glaciers act as buffers and regulate the runoff water supply from high mountains to the plains during both dry and wet spells.

Recession of the Glaciers: Himalayan glaciers that feed the Ganges River appear to be receding at a fast rate (Table below). "The estimated retreat of the Dokriani glacier in 1998 was 20 metres compared to an annual average of 16.5 metres over 1993-1998. Dokriani is just one of the several hundred glaciers that feeds the Ganges" (UNEP 2009). The 26 kilometer long Gangotri glacier has also been retreating. From observations dating back to 1842, the rate of recession of the snout (the point at which the glacier end) has been found to be have increased more than two-and-a-half fold per year. "Between 1842 and 1935, the glacier was receding at an average rate of 7.3 m every year, whereas between 1935-1990, the rate of recession had gone up to 18 m a year" (Ibid).

Implications of recession: "Glaciers in the Himalayas are receding faster than in any other part of the world and if the present rate continues, the likelihood of many of them disappearing by the year 2035 is very high (with less than 1°C increase in temperature). The world may be 0.3-1°C warmer by the year 2035" (Pacific Network for Global Research Change 2002:18). Global warming and glacier retreat in the Himalayas will have four broader implications. First, in the short-run, in the process of continued retreat more water will be supplied to the glacier dependent perennial rivers in the Himalayas. This may generate positive effects on dry season water availability. Second,

chances of glacier lake outburst flood (GLOF) may increase. Third, in the long-run, dry season flow in the upstream of the Himalayan rivers could be greatly reduced posing serious eco-environmental problems. So with increase in population water demand will likely be higher in the long run. Therefore, the gap between demand and supply will likely to be higher in the long run. Fourth, in the short run, with increase in dry season release deposit supply in the rivers may increase. This may pose a threat to the existing dams and reservoirs in the region. More melting means higher silt loads which reduce the life of dams and reservoirs.

Table: Record of retreat of some glaciers in the Himalayas

Glacier	**Period**	**Retreat of Snout(metre)**	**Average retreat of glacier (metre/yr)**
Triloknath Glacier (Himachal Pradesh)	1969 – 1995	400	15.4
Pindari Glacier (Uttar Pradesh)	1845 – 1966	2,840	135.2
Milam Glacier (Uttar Pradesh)	1909 – 1984	990	13.2
Ponting Glacier (Uttar Pradesh)	1906 – 1957	262	5.1
Chota Shigri Glacier (Himachal Pradesh)	1986 - 1995	60	6.7
Bara Shigri Glacier (Himachal Pradesh)	1977 – 1995	650	36.1
Gangotri Glacier (Uttar Pradesh)	1977 – 1990	364	28
Zemu Glacier (Sikkim)	1977 – 1984	194	27.7

Source: IPCC, 2007.

About 10% of the Earth's population live in mountain areas with higher slopes, while about 40% survive in the adjoining medium and lower-watershed areas. There are

serious problems of ecological deterioration in these watershed areas. The mountain and upland areas of the Himalayas are threatened by cultivation of marginal lands due to expanding population. In many areas this goes along with excessive livestock grazing, deforestation and loss of biomass cover. Soil erosion is also a growing problem which can cause a devastating impact on the vast numbers of rural people who depend on rainfed agriculture in the mountain and hillside areas. Poverty, unemployment, poor health and bad sanitation are widespread. A significant number of the population residing in the Himalayas faces a problem of availability of water throughout the year. This is mainly due to sharp contrast in seasonal availability of water. They receive either abundant water during the monsoon (June-September) or too little for the rest of the year.

Despite inter-annual unevenness and uncertainty; and insufficient water, mountain communities have developed diverse strategies and systems for the management of water to satisfy their needs with the aid of local skills. In the last four decades, mountain areas of the Himalayas experienced a huge influx of people as well as high population growth. Most of the settlements in the mountains usually located at the lower altitudes which facilitates access to surface and air transport. Usually these settlements are highly prone to flooding and vulnerable to landslides and debris flow. Usually the inhabitants and infrastructure of small watersheds are more vulnerable and due to limited coping capacity these watersheds are unable to manage the disasters caused by extreme weather events. The frequency of such events is increasing especially in the Hindu Kush Himalayas.

CHAPTER – III

Climate Change and Diplomatic Responses: A Study of Maldives

CLIMATE CHANGE AND DIPLOMATIC RESPONSES: A STUDY OF MALDIVES

Background

The modern era has increasingly demonstrated the problems of distance that have restricted contemporary development in small island developing states. Sea-level rise is of particular concern to small states as over half the countries classified as small states are islands like Maldives, Kiribati, Fiji, etc. Island states are more vulnerable to the projected sea-level rise. Many large countries are also vulnerable, particularly when there are large population areas near the coast (globally 65 percent of the world population is living along the coast lines). However, the problem is especially acute for many small states as most population and infrastructure of Small Island Developing States (SIDS) exist in the coastal zone and for many the effect will also be felt on the marine environment with possible damages to coral reefs and fisheries. There is also the danger of inundation of outlying islands and damage to vegetation and freshwater resources through saline intrusion as predicted by the IPCC. Including Maldives, a far greater proportion of the population of small states suffers from the potential effects of sea-level rise than in larger states, which is 66 percent against 9 percent.

The case of Atoll nations is much more complicated with regard to the global warming and the rising sea levels. Atolls are rings of coral reefs that enclose a lagoon. Around the rim of the reef there are islets with a mean height above sea – levels of approximately two meters. Worldwide there are five countries comprised entirely of low – lying atolls: The Maldives (population. 298,968), Kiribati (population. 78,000), The Marshall Islands (Population. 58,000), and Tokelau (population. 9000) (Secretariat of the Pacific Community, 2000). With the exception of Tokelau (a dependent territory of Newzealand), these are all sovereign states. The Maldives, Kiribati, and Tuvalu are official 'Least Developed Countries' (LDCs are countries that exhibit the lowest indicators of socio-economic development, with the lowest Human Development Index ratings of all countries of the world) in the United Nations system.

Maldives is one of the small island states which face several environmental problems with regard to climate change and also the ill effects of tsunami. It has a problem of environmental degradation due to its huge tourism industry. Being so vulnerable to the nature's course of action, Maldives faces the imminent threat of being inundated in the

next 50 years because of the menace of climate change and rising sea level rise. Its vulnerability has been witnessed glaringly in the wake of the Indian Ocean Tsunami of 2004, which caused several damages to the ecology and economy.

"Maldives with its low flat topography faces the perennial possibility of submergence due to the sea-level rise. In addition, lack of enough land to accommodate the people and to build necessary infrastructure is another problem in Maldives" (Khan, 1997:471). "Adding to all these problems the people of Maldives are also alarmed because of their past experience, where the long distance gets in association with swells generated by storms have resulted in flooding with coastal erosion and alteration of beaches" (Ministry of Fisheries and Marine resources 2006). Further, "the coastal settlement, particularly in the lowlands is likely to expose residents to seaward hazards such as sea-level rise and tropical storms" (UNEP: 2006).

The Small Island States chapter of the Third Assessment Report of the IPCC implicitly concludes that climate change - induced sea level rise, sea – surface warming, and increased frequency and intensity of extreme weather events puts at risk the long term ability of humans to inhabit low – lying atolls (IPCC Report, 2001). For the island countries, the response to sea level rise and climate change focuses on adaptation rather than on reducing of green house gas emissions, that is mitigation (Mimura, 1999:137).

Some of the important findings of the Inter Governmental Panel on Climate Change (IPCC) report and its consequences for Maldives:

1. Most of the observed increase in globally average temperatures since the mid 20^{th} century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. As a result, since, 1961, the oceans have warmed to a depth of at least 3000 metres and have been absorbing more than 80% of the heat added to the climate system. Such warning causes water to expand, resulting in a rise in sea level (IPCC, 2007). This finding is of greater significance in case of Maldives, where the mean height of land is just one metre above the sea level. Rising sea level could drastically affect the existence of Maldives. An increase in precipitation in higher latitudes and the increased retreat of mountain glaciers and snow cover in hemispheres since the 1990's could also fasten the process of sea level rise.

2. Maldives could be a victim of scare water resource by the decrease in precipitation by the lower latitudes, as predicted by the IPCC Report. The report adds that, while mid-and-high latitude ocean waters have freshened, low-latitude waters have become more saline, leading to changes in evaporation and precipitation, and a decrease in fresh water availability.
3. Cold days, cold nights and frost have become less frequent, while hot days, hot nights and heat waves have become more frequent. This could affect corals and also the biodiversity of Maldives. The report also predicts intense tropical cyclones, which could be devastating for the Maldives with its vulnerable coastal structures.

Institutional Structures of Maldives

Under the existing government institutional framework of Maldives, the key authorities involved in the protection of the environment are the National Commission for the Protection of the Environment, The Ministry of Planning, Human Resources and Environment, The Ministry of Fisheries and Agriculture, The Ministry of Tourism, The Ministry of Construction and Public Works and The Ministry of Atolls Administration.

The environment sector was formally recognised as an entity within the Government in 1984, with the creation of an Environmental Affairs Division in the Ministry of Home Affairs and Social Services. In the late 1980's, environment was given an elevated status, being combined with the then ministry of planning and development to form a new "Ministry of Planning and Environment". The rationale for this move is that environmental considerations needed to be efficiently integrated into development planning within the country. In the government reorganisation of 1993, the ministry was given the additional responsibility of human resource development, and was renamed the Ministry of Planning, Human Resources and Environment (MPHRE), reflecting increasing attention towards environmental issues (UNDP, Country Report, 2005:19).

Climate Change and Environmental Policies

The world scenario of "global warming" has creates a lot of problem for this tiny island nation. The Maldivian government is trying to alleviate the worst effects of climate change, where it is predicted to be inundated within the end of this century. To mitigate

or at least to postpone this threat, the Government had embarked on general programmes where it has started to formulate policies in an integrated approach which includes prevention of marine and water resources, security of the livelihood of the people and putting in place a sustainable development.

The government is encouraging forestation to prevent beach erosion and is backing a plan to clean litter and debris from the country's coral reefs – a natural barrier against tidal surges which changes to the fragile eco - system have placed in peril. Environmental science is taught in every school, and given the same importance as writing and arithmetic. All new resorts are subject to a rigorous environmental impact study and developers are allowed to build on only 20 % of islands. But the efforts are aimed at mitigation rather than prevention.

The ecological formation of Maldives makes resource management extremely difficult. Further, as inhabited coral islands are relatively few globally, literature on the subject is also limited. Understanding in – depth technical studies to determine the carrying capacity and impact of construction and development is extremely costly and difficult due to absence of site – specific historical data (UNDP 2006). Acknowledging these difficulties, the government is optimistically cautious. The Government of Maldives has taken a precautionary approach to island development. For example, tourism development is currently confined to certain atolls and its expansion is limited to selected islands. In 1996, only 74 or 10% of the country's 1190 islands were developed as resorts. Although there has not been a "cap" on island resort development, islands developed for resorts during the past ten years have not been exceeded 10% of the country's total islands. This stable trend may not last long, it is expected that within 20 years, resort islands will grow to about 20% of the total islands. However, as per guidelines, for each island developed into resort, one island must be left as a reserve (Ministry of Planning and National Development, 2005).

Preserving the Ecology

In the management of the environment, an important aspect that the government envisions is preservation of the original processes by effective environmental controls. To meet this end, removal of indigenous vegetation, disruption of marine ecology, redirection of original current patterns, and distortion of the wave patterns within the

lagoon by constructions of structures is discouraged. Some of the environmental standards and controls in this area include (UNEP – RRCAP, 2002):

1. Control and mandatory replacement for each tree that is cut down (certain rare and large trees have to be avoided when constructing a building). All buildings have to be located well away from the peripheral vegetation – at least five metres away from the shore line to ensure that the peripheral vegetation most important for coastal protection is preserved;
2. Allocating space for vegetation between each building. This is to ensure that substantial areas of indigenous vegetation are left untouched;
3. All coastal works and larger projects have to be commenced after a thorough environmental impact assessment. Hard engineering solutions for dynamic coastlines are discouraged;
4. Constructions of rock filled jetties are controlled. Design of boat piers and jetties should be in such a way that they do not obstruct the original flow of currents or distort the wave climate within the lagoon;
5. Construction of sea walls, detached and submerged breakwaters are restricted. Instead, promotion of greater coral colonization on the peripheral reefs and another natural methods to protect shorelines are encouraged (Ministry of Planning and National Development,2006);
6. Coral and sand mining form resorts and inhabited islands and from their house reefs are strictly prohibited. More recently, certain specific locations have been allocated for sand and coral mining. Construction of structures with coral is now being controlled;
7. Spear, poison and dynamite fishing are strictly prohibited. Net and trap fishing are controlled to certain areas. Removal of shells, fishing of turtles and tortoise, juvenile and gravid lobsters are strictly prohibited;
8. Other environmental regulations include architectural controls. To preserve the aesthetic integrity of resort islands, height to buildings is restricted to the height of the foliage of the vegetation. They to be well integrated to the island.

   In response to the tsunami, the government of Maldives with the assistance of the UNDP initiated a programme for disaster risk reduction for sustainable development in the Maldives.

The objectives of the programme are to:

1. Establish an institutional framework and policy for disaster management.
2. Develop multi – hazard preparedness and response plans at the national, atoll and island levels.
3. Awareness, training and capacity building activities (UNDP, 2006).

Key components of the program and outcomes

- Support for setting up national level early warning systems process was accelerated with the active participation of the South Asian Association for Regional Cooperation (SAARC) and other international donors like Australia, US, Japan, etc. An experimental system was put in place in the Indian Ocean at the end of 2006. In addition, disaster risk reduction program was mainstreamed into the development processes, where all the new projects will be evaluated with a component of disaster reduction and mitigation (Ministry of Planning and National Development, 2006).
- Develop a multi – hazard disaster risk profile with vulnerability ranking for each island to facilitate better planning and judicious use of resource for development activities in the country. In conformity with this, the resort developers prepare their own safety measures with the consultation and guidance of the government. To support the ministry of tourism in a vision to make a “disaster risk free tourism environment” in the Maldives, a consultant facilitated the process of developing a framework for the disaster response plan within the ministry.
- Facilitate setting up of national and regional level emergency operations centre with better communication facilities. This would compliment for the efficient and effective functioning of disaster risk systems set up in the country. Local communities were trained on how to respond and rescue in an eventual scene of disasters.
- Provide safe shelters to ten most vulnerable communities. The development of early warning system is being complemented by the community shelter for protection of the most vulnerable families in the event of a disaster. UNDP has through a consultation with the Ministry of Planning and National Development

has prioritized ten islands for the construction of safe shelters. The first shelters were constructed in March 2007 in Felidhoo island of Vaavu Atoll. This was now integrated with the safe islands programme of the government and the project is jointly funded by the European Union.

- Enhancing skills and capacities for management of natural disasters at the National, Atoll and Island levels and supporting the formulation of community preparedness plans in each vulnerable island. These tasks were effectively accomplished with the training provided by the international organizations in removing the hazardous waste, the emergency relief operation, etc (SAARC Secretariat, 2005). These programmes and policies have resulted in developing a relatively safer environment for most of the vulnerable communities.

The Safe Islands Programme

To mitigate the future sea level rise, to resort the island and create a safer and larger islands for the local population, a reconstruction plan has been developed by the National Disaster Management Centre (NDMC). Even before the tsunami struck, the Ministry of Planning and National Development has developed a plan to construct the so – called safe islands in each of the 20 atolls under the "Safe Islands Program". These safe islands will have a much higher protection from natural and other disasters, through sea walls, vegetation enclosure surrounding the island, and drains to clear away floods should there be high waves.

In order to cater for future population growth the new safe islands will be generally (much) larger than the present islands; this would lead to more efficient use of social – economic infrastructure such as health and education infrastructure and provision of energy. After the tsunami debacle, this project has been given high priority.

Project Features

The present plan for post tsunami reconstruction of the island of Vilufushi (first of its kind) is in line with the safe island program. The design includes a(higher) land level of 1.4 metre above sea level and a protecting bund wall on the east side of the island of 2.4 metre above sea level and areas of high ground. The bund wall is part of the EPZ (Environmental Protection Zone) which has palm trees on the island side. The island

would be enlarged from 16 hectare at present to 60 hectares. Due to the enlargement of the island, a new and larger port areas need to be created, as fishing is one of the main activities of the island's population and also facilitate general transport.

The main land – use categories areas follow:

- Existing island - housing social infrastructure - 11 hectares
- Existing island - green zones - 5 hectares
- Reclamation - housing social infrastructure - 36 hectares
- Existing island - environmental protection zones - 9 hectares

Total **61 hectares**

The island will provide in future space for housing and social infrastructure for up to 500 inhabitants. It is noted that the pre – tsunami number of inhabitants was approximately 1800. Most of the houses, under the tsunami recovery and reconstruction programme would be built in these newly created safe islands, where the first phase of this project would be completed at the end of 2007. Total costs of the project, excluding cost of financing, would be between 15 and 16 million Euros.

The project would also include the following construction activities;

- Debris removal from old Vilufushi and surrounding sea bed.
- Dredging and reclamation of coral sand
- Finish original island to new safe levels
- Construction of revetments
- Dredging of new harbours
- Construction of quay wall
- Construction of harbour breakwaters
- Mitigating measures fir environment.

The Maldives' survival as a sovereign nation is seemingly at stake. It is because of the environmental insecurity, mainly of global warming. Since environmental security is a global phenomenon, steps taken for its adaptation and mitigation should also be coordinated at the international level. Maldives is one among the first three countries

predicted to be inundated by sea in the next fifty years, because of global warming and sea level rise. It has also its repercussions for its corals, flora and fauna which attracts tourists and forms its economic backbone. To be sure of its survival, Maldives has to be actively involved in the International Environmental Programmes and Negotiations, which they have done with their utmost capacity in the past. Here it will analyse how the Small Island Developing States (SIDS) acts as a pressure group to put their concern at the international stage and try to avert their problems of environmental insecurity by actively participating in the environmental negotiations and policies formulated for the betterment of the humanity.

Maldives was the first country to sign the Kyoto Protocol, which sets target for cuts in industrialised countries green house gas emissions. Male, the capital, is surrounded by a 3 metre high (9.8 feet) wall, which took fourteen years to construct at a cost of dollar 63 million. Unable to foot the bill themselves, the government happily accepted aid from Japan, which paid for 99% of the cost (UNDP, 2005). But the wall offers protection for just one of the Maldives' 200 inhabited islands and then only against tidal surges rather than the rising sea level, the long term threat. In Kandholhudhoo, a densely populated island in the north of the Maldives, 60% of the residents have volunteered to evacuate their island. Over the next fifteen years those remaining behind will eventually be compelled to do the same.

Maldives does not have sufficient financial and personnel resources to address the predicted impacts of global climate change. Much of the economy and prospects of the Maldives has come to focus on a forecast of certain future flooding. This forecast has even been used as forceful argument for economic assistance for those countries emitting carbon dioxide to the atmosphere (Morner, 2004: 154).

Efforts taken by Maldives at the International Stage

The Maldivian Republic, in global environmental context, has gained unprecedented visibility under President Maumoon Abdul Kayoom, making its present felt in a variety of international forums. It has emerged as the vigorous champion of the rights and interests of small island states, focussing international attention on the damages they face as a result of the rising sea levels and global climate change. President Maumoon Abdul Kayoom has spent much of his 26 years in power warning that his country will disappear if nothing is done to fight for global warming, which is thought to cause sea

level rises. He has been playing a vital role in creating awareness at the apex forums of the world leaders and organisations. His role in alerting many world leaders, such as those of commonwealth, including Mrs. Margaret Thatcher, to the problems associated with global warming and sea level rise is well known (Commonwealth Secretariat, 1997: 5).

President Kayoom argues that sustainable development of developing countries is possible only through the transfer of environmentally sound technologies and provision of new and additional financial assistance to these states by the developed countries (Khan, 1997: 476). The Maldives has taken these concerns to the SAARC, the Commonwealth, the United Nations, UNEP, UNDP, etc.

Maldives hosted a ministerial level meeting, small state conference on sea level rise in 1989 calling for strong actions incorporated in the Male' Declaration, to ensure the security of small states. Also, the Maldives participated in the Second World Climatic Conference in 1990 and the Earth Summit held in Rio de Janeiro in 1992. In 1994, Maldives participated in the Global Conference on the Sustainable Development of Small Island Developing States and in 1997 participated in Kyoto Conference. Also in 1997, the thirteenth Inter Governmental Panel on Climate Change (IPCC) was held in the Maldives. Maldives approach to environmental issues as with many other small states stays in harmony with the concept "think globally and act locally" (Ministry of Environment, 2005). Apart from these conferences, the government has also actively attended most of the international summits on environment and sustainable development and also a party to many conventions like; the Montreal Protocol, the Basel Convention, the Biodiversity Convention, etc. Maldives is also an active member of the Commonwealth Expert Group on Climate Change.

Small States Conference on Sea Level Rise

To discuss the issue of sea level rise among the small states of the world who are the most vulnerable to climate change, Small States Conference on Sea Level Rise was held in Male, in 1989. The outcome of the conference was the "Male Declaration on Global Warming and Seal Level Rise". This declaration paved the way for the establishment of an Action Group among small island states, to coordinate a joint approach on the issue of climate change, global warming and sea level rise, and to pressure and follow up on global and regional response strategies.

The Male Declaration was use for early negotiations for a Framework Convention on Climate Change. The United Nation Convention on Climate Change was adopted in 1992 and the small island states jointly played a very important role in the sessions of the Intergovernmental Negotiating Committee set up to formulate the convention. Among the main achievements of the Male Declaration, the increased awareness it created among the international community about vulnerability of small island states is noteworthy (Ministry of Environment, 2006). That was the first time the small island started speaking together to draw the attention of the global community to this important issue and it and a very good effect.

In addition to all these things, in 1991, an Association of Small Island States (AOSIS) was launched at the United Nations by delegations in Newyork. Essentially, AOSIS was a pressure group of small island states which collaborated in advancing environmental issues at the United Nations. AOSIS is a useful example of how small states might work in every international organisation to secure better conditions (Sanders, 1997: 372).

The Alliance of Small Island States

The environmental problems of the small island states had long been marginalised at the international level till the formation of AOSIS. Maldives was instrumental in the formation the small island action group in 1989 that eventually, at the end of the Second World Climate Conference in Geneva, became the Alliance of Small Island States (AOSIS). AOSIS, formed in 1990, is a coalition of Small Island and low–lying coastal countries that share similar development challenges and concerns about the environment, especially their vulnerability to the adverse effects of global climate change. It functions primarily as an ad – hoc lobby and negotiating voice of Small Island Developing Sates (SIDS) within the United Nations System. AOSIS has a membership of 51 states (initially 43) and observers drawn from all oceans and regions of the world: Africa, Caribbean, Indian Ocean, Mediterranean, Pacific and South China Sea. Most of them were also the members of the United Nations, close 25% of the United Nation's total membership. Together, SIDS communities constitute some 5% of the global population (UN, 2007:2).

Member states of AOSIS work together primarily through their Newyork Diplomatic missions to the United Nations. AOSIS functions to the basis of consultation and consensus. Major policy decisions are taken at ambassadorial level plenary sessions.

The alliance does not have a formal charter. There is no regular budget, nor a secretariat. AOSIS operates out of the chairman's mission to the United Nations (SIDS, 2006). The alliance of small island states was born of global warming. It is in deepest interest of the rest of the world to ensure that it does not die of the same cause (Davis, 1996: 18).

Barbados Programme of Action

One of the early documents produced by the Small Island Developing States (SIDS) was the Barbados Programme of Action (BPOA), which formed the basis of its association at the United Nations. BPOA of 1994, for the sustainable development of small island states, puts emphasis on the need for development and management programmes to achieve the ecologically and economically sustainable utilisation of coastal and marine resources. Even after 13 years this continues to be a major challenge for the small island developing states. The lack of an integrated approach has limited the effectiveness of past and present management measures, resulting in coastal habitats being degraded through pollution and over exploitation of natural resources; this is a significant constraint for small island developing states.

SIDS has basically identified five main reasons for the poor implementation of the BPOA. They are:

1. Absence of an integrated and holistic approach at national level to devise appropriate sustainable developing strategies.
2. Lack of institutional and other capacities in many important areas.
3. Inadequate access to appropriate science and technology
4. Lack of resources and their poor trading ability (SIDS, Oct. 2004).

For these problems to be solved, SIDS need to ensure that all relevant parts of the government structures are cooperating in an integrated and holistic manner. There are some examples of best practices (like CARICOM and SPOCC) in this regard in many SIDS, where national sustainable development councils and commissions have been set up and where team approaches are used under certain international conventions. This integration must be driven by and respond to a national sustainable development strategy (UN, 2004).

The success of National Development Planning for SIDS is substantially dependent, and in many specific cases would be wholly dependent, on the continued health of the oceanic and coastal systems. The Small Island Developing States (SIDS) has committed themselves to a set of actions based on new approach for pursuing the protection and sustainable development of the marine and coastal environment and its resources. Governments of the Caribbean Community (CARICOM) for instance, have moved to have the Caribbean Sea internationally recognised as a specific area in the context of sustainable development.

Both the BPOA and strategy document have strongly reaffirmed the need for partnerships at all levels in order to increase their institutional capacity. In the current global warming scenario, regional and inter – regional linkages among SIDS, as well as stronger linkages with the international development partners or organisations are crucial for SIDS. Regionalism is already has a strong influence on SIDS, but is expressed with some variations across the regions.

In the areas of science and technology; there is clearly a deficit in the SIDS. With their small economies and low resources, SIDS finds it extremely difficult to access SIDS appropriate technologies which they require in the various areas such as waste management, water and energy. They need partners to facilitate the access to such technologies. And in this regard, the idea of creating a science and technology fund is being proposed by SIDS. SIDS also organised a science and technology workshop in Singapore during which many technologies which are being developed in SIDS were highlighted. The technology covers important area such as waste water recycling, fuel production from coconuts and scavenging wells. They will need to be disseminated and other SIDS may be able to benefit from them (Pacific Islands Climate Change Conference, 2000).

Sustainable development of SIDS can only be achieved through partnership with development partners. In view of their size and finite resources, SIDS can indeed be a microcosm for other countries in the global quest for development that can be sustained bearing in mind the need to prevent global environmental degradation. That is why ; there is the need for the international partners and SIDS to work together when it comes to sustainable development, conservation and sustainable use of the oceans and sea and marine resources is critical in support of regional fisheries regimes, as well as initiatives

aimed at reducing land and sea - based pollution. AOSIS is fully aware to seek international support to build capacity, to access and manage the vast oceanic resources of small island developing states, and to establish or strengthen specific coordination mechanisms.

To the extent possible, AOSIS member states have sought to be closely involved in a number of negotiations that have explicit legal remits pertaining to oceans and fisheries, as well as those relating to associated issues such as climate change and biological diversity. It is essential that they endeavour to contribute to the development of international legal principles and regimes in all these areas because ultimately, the most effective protection of small states is an agreed international order. Given the linkages, and the complexities, there cannot be any doubt about the critical need for a fully integrated and coordinated treatment of the issues pertaining to global warming and environmental protection (Salde, 1999). Throughout the climate change negotiations, the AOSIS countries have insisted that the principles that must inform the development of the global regime to control climate change and the responses to its consequences must be science driven. But, equally, they have maintained that the precautionary approach provides a sensible and essential basis for policies related to complex systems that are not yet fully understood and whose consequences of disturbances cannot yet be predicted.

United Nations Special Session on Small Island States

The international statement on climate change, with respect to Small Island Developing States (SIDS) was the outcome of the 22nd UN General Assembly special session held in Newyork in September 1999. In that session, the well established fact that SIDS are among the most at risk from the adverse effects of climate change was acknowledged. It was accepted that the capacities and means to adapt to this phenomenon are an absolute necessity for SIDS. Furthermore, the committed support of the international community was recognised as a critical complement to the SIDS own effort in any response and long – term planning. International support was seen as particularly required for identifying adaptation options and linking efforts to reduce vulnerability with the best available information. In the context of actions to address these issues, it was agreed that the international community and SIDS should pursue specific objectives and activities for the implementation of SIDS capacity to respond and adapt to climate

change, and to make the necessary linkages to other international activities, such as the study of climate variability and climate prediction (UN, 2001: 3).

The General Assembly Special Session also identified other priority areas closely related to climate change and as critical to the sustainable development of SIDS, including:

- Freshwater resources;
- Coastal and marine resources;
- Environmentally sound renewable energy resources;
- Transfer of environmentally sound technologies;
- Vulnerability index of socio – economic and environmental parameters; information systems and technology and
- Natural and environmental disaster and climate variability.

Capacity building is seen as critical to the long term sustainable development of Small Island Developing States, in terms of the need, as well as the emphasis and support required from both national governments and external sources. The strengthening of regional technical training and scientific research centres, including the improvement of data and data collection was highlighted in the UN session (UN, 2001:5). In most of the successive reports to the Commission on Sustainable Development pertaining to small island states, agencies of the United Nations Systems have consistently featured training and the improvement of capacity as requiring the fullest and most urgent attention.

Environment Outlook for SIDS

The outcomes of the UN General Assembly special session (1999) took account of the last information available from the UN system, including the Environment Outlooks for the Caribbean, Western Indian Ocean and South Pacific Prepared by United Nations Environment Programme (UNEP). A common thread runs through the Regional Environment Outlooks, namely, the ecological fragility of island in all regions, and their high vulnerability to natural disasters and the effects of climate change and sea level rise. Climate change is as an urgent problem and one on which close policy – coordination will be needed, both in all regions and with the wider international community. The report also highlighted that all regions are expected to face steady and sometimes serious decline in environmental quality. The driving forces behind this

detoriation include increasing populations and urbanisation and their cumulative impacts on resource use, depletion and disposal, with adverse impact on climate change.

Commitments of AOSIS

In the past, the countries of AOSIS have actively engaged in the international discussions towards development of the Climate Change Convention and the Kyoto Protocol. AOSIS is committed to a number of essential principles and objectives. These have provided the foundation of AOSIS participation in the climate change regime, and have been reflected in its positions and formal submissions over a decade of negotiations. They include:

- The principle of preventive action;
- The precautionary principle;
- The polluter pays principle, and state responsibility in the matter;
- Duty of all countries to cooperate;
- Equity; and
- The principle of common but differentiated responsibility (AOSIS, 1995:3).

Taking an early action is a fundamental element of AOSIS representations, and forms the basis for the demands for international efforts to focus on the mitigation of climate change with precautionary principles. From these principles, AOSIS has developed a number of core medium and long term objectives that have guided its own approach to the implementation of the Convention and the Kyoto Protocol. These include:

- The review of adequacy and strengthening of commitments;
- Reducing scientific and methodological uncertainties associated with the protocol's commitments and the Kyoto mechanisms;
- Commitment to binding energy conservation and efficiency requirements and the development of renewable energy sources;
- Development of strong monitoring, verification and compliance regimes; and
- Development of mechanisms for meeting the costs of adaptation.

AOSIS and the Kyoto Protocol

A major aim of AOSIS is to press for the ongoing review of the adequacy of existing commitments and to propose ways to strengthen commitments. Measured against the science, the SIDS are of the opinion that the targets set under the Kyoto Protocol are demonstrably inadequate, where it is critical about many scientific and methodological uncertainties surrounding the protocol's commitments and mechanisms. SIDS insists that there needs to be a sound compliance regime with binding consequences to ensure the effectiveness of legally binding commitments. They also advocate various forms of "conditionality", such as requiring participation in the protocol's implementation mechanisms to be conditional on the proof of sound domestic regulatory regimes. It is essential to ensure the development of a strong and effective compliance system, especially with the extra - territorial operation of national obligations through emissions trading at the global level and the involvement of corporate entities in the private sector. One of the long term strategies of AOSIS is the eventual replacement of polluting systems with renewable sources (SIDS, 2006).

AOSIS was instrumental in the inclusion of adaptation requirements in the Clean Development Mechanism of the Kyoto Protocol. AOSIS is doing its best, at the climate change negotiations to advance global consensus, and to initiate practical approaches through the Global Environment Facility (GEF). As time goes on, and with the impact of climate change already alarmingly evident, adaptation has become an essential area for policy concentration for all the governments. So action is now necessary , especially for courtiers like Maldives, Kiribati, Marshall Islands, Tuvalu and the Bahamas in the SIDS regions, for the protection and preservation of fresh water reserves and other life support systems – whether or not there is international consensus on all outstanding issues, like the Kyoto Protocol.

Global Environment Fund (GEF) and Small States

In Maldives some of the most important projects dealing with the environment have been undertaken by the Global Environment Fund (GEF) in cooperation with the UNDP and UNEP. An independent financial organisation constituted in 1991, the GEF provides grants to developing countries for projects that benefit the global environment and promote sustainable livelihoods in local communities. GEF projects in climate change help developing countries and economies in transition to contribute to the overall objective of the United Nations Framework Convention on Climate Change

(UNFCCC). This project support measures that minimise climate change damage by reducing the risk, or the adverse effects, of climate change.

The GEF supports projects that reduce or avoid greenhouse gas emissions in the areas of renewable energy, energy efficiency and sustainable transport. As regard the financial mechanism of the Climate Convention, GEF allocates and disburses about 250 million dollars per year in projects in energy efficiency, renewable energies, and sustainable transportation. Moreover, it manages two special funds under the UNFCCC – the Least Developed Countries Fund and the Special Climate Change Fund. Both these funds were established under the Climate Convention in 2001 (GEF, 2006).

The Least Developed Countries Fund (LDCF) of GFE was designed to support projects addressing the urgent and immediate adaptation needs of the least developed countries (LDCs) as identified by the National Adaptation Plans of Action (NAPAs). The fund responds to the unique circumstances of the LDCs, which are highly vulnerable to the adverse impacts of climate change. Climate Convention guidance decided that the LDCF would provide support, as a first step, for the preparation of NAPAs.

The GEF, with the assistance of UNDP, UNEP, and the World Bank, has already supplied funds for preparing NAPAs. The rationale for establishing the LDCF rests on the low capacity and high vulnerability of LDCs, which renders them in need of immediate and urgent support to start adapting to current and projected adverse effects of climate change. NAPAs propose activities whose further delay could increase vulnerability or lead to increased costs at a larger stage. GEF also has a Special Climate Change Fund (SCCF) to finance activities, programmes and measures relating to climate change that are complementary to those funded by the resources allocated to the climate change focal area of the GEF and by bilateral and multilateral funding (GEF, 2006).

To support country focal points, the GEF has launched the Country Support Programme (CSP) – a new comprehensive capacity building programme – in March 2006. The United Nations Development Programme and The United Nations Environment Programme are implementing the CSP, working closely with the GEF secretariat. The

CSP chiefly helps countries fulfil their obligations to the global conventions on biodiversity, climate change, desertification, and persistent organic pollutants.

This is followed by the comprehensive strategy to strengthen capacity for country – level GEF coordination and support, with linkages to such ongoing GEF country support activities as the GEF National Dialogue Initiative, the proposed country capacity building programmes for least – developed countries and small island developing states, and the land degradation Country Programme Partnerships (CPP). The components of the GEF programme will build the capacity of focal points to design, implement, coordinate, and monitor GEF projects. Moreover, it will promote genuine country ownership of GEF – financial activities and will facilitate active involvement of recipient country's government and civil society stakeholders (GEF Secretariat, 2006).

GEF and Maldives

The GEF funds Maldives in two important areas of Biodiversity and Climate Change. Under the National Biodiversity Conservation Strategy and Action Plan, GEF will assist the Ministry of Planning, Human Resources and the Environment to develop a National Biodiversity Strategy and Action Plan (BSAP), as an enabling activity. The BSAP will reflect national aspirations, and will build on existing national strategies and plans. The project will allow Maldives to meet its obligations under the Convention on Biological Diversity and assist in the preparation of its first national report to the conference of the parties. The second project under Biodiversity is the Conservation and Sustainable Management of Coral Reefs in Maldives. The eventual goal of the project is to build the required capacity in the concerned government agency for monitoring and regulating the sustainable use of coral reefs in order to maintain the physical nature and environment biodiversity (Ministry of Environment, 2006).

Under the Climate Change Enabling Activity and the National Greenhouse Gas Inventory and Adaptation and Assessment Projects, GEF assists the government of Maldives to meet its reporting obligations under the UNFCCC.

The project has five major objectives that are targeted at the following major outputs:

1. An inventory of greenhouse gas sources and sinks;
2. Mitigation options;

3. A national vulnerability assessment;
4. Adaptation options and;
5. A national implementation plan and the first National Communication to the Conference of the parties to the UNFCCC.

The government of Maldives and UNDP signed a Global Environment Facility (GEF) funded project that assisted the nation to take preventive measures against the impacts of global climate change. The project prepared a "National Adaptation Plan of Action" (NAPA) for climate change, through a country wide consultation process and further, provides the basis for implementation of adaptation activities in the country in the face of relevant development activities. The Ministry of Environment and Construction is the lead agency that executes the project worth US dollar 200,000. GEF initiated the National Adaptation Programme of Action (NAPA) in Maldives in 2002. GEF provided guidelines on how to go about the project from the initial stages of the project, which was started in 2004.NAPA provides the framework to guide the coordination and implementation of climate change adaptation activities in Maldives. NAPA is also integrated with the Climate Change Strategy Framework.

This project follows the following guiding principles:

1. A participatory, multidisciplinary approach,
2. A country driven approach with cost effectiveness,
3. Sound environmental management and,
4. Flexibility of procedure and gender equality (UNDP, 2005).

Thus, GEF has been playing an important role in all the major climate change and environmental projects in Maldives with the active participation of the UNDP.

CHAPTER – IV

Climate Change and South Asia: Multilateral Responses

CLIMATE CHANGE AND SOUTH ASIA: MULTILATERAL RESPONSES

Regionalism in international politics has become very important component in the post cold war period. It was present during the cold war period but the basic motto of it was vindicated due to the super power rivalry and their global designs. During cold war period, “approaches to the regional conflicts were made not according to the merit of the cases or regional demands, but to super power’s global outlook. As a result, many conflicts instead of being resolved aggravated” (Gaan 1998: 105).The most prominent among it, is the environmental degradation in general and climate change in particular.

Regionalism in totality cannot be a viable option in case of environmental problem. “Climate Change for example is in one sense a global phenomenon, but its impact are very unevenly distributed, and that unevenness does not take regional form”(Buzan 2000: 17). Nevertheless, “regionalizing logic does come into play in the environmental sector if either of the requirements gets fulfilled: (a) A geographically coherent group of actors behave in such a way as to create a common problem in their own environment, or (b) An environmental impact with causes elsewhere happens to encompass a region”(Ibid:18). The both stated conditions apply to South Asian Region (SAR) in case of environmental degradation due to climate change because it is a common problem for all the countries whose impact ranges from high to low magnitude. Therefore regional approaches could be most appropriate for tackling the climate change.

A regional approach becomes important due to the failure of global negotiations. Moreover, all the South Asian countries are and will be experiencing the problems occurring due to change in the climate. It is likely to get aggravated due to number of factors like, poverty, high rate of population growth and the dependence of the population on the environment. Most vulnerable sector would be reduction in agriculture production, decline in economic growth, population displacement, and disruption of regular and legitimized social relation. These in turn would cause specific types of acute conflict, including scarcity disputes and violence both at intra- state and inter- state levels, each with potentially serious repercussions for the security interests of the human and other living beings.

Therefore, “there is a natural need for the SAARC member countries to cooperate with each other and share experiences and resources in their common endeavour to ensure a

safe, sustainable and better future for their people". Though regional approach is imminent, however, the region's countries have also taken measures to ratify the treaty related with climate change, and have established sound policy positions, administrative systems and methods of resource management for a solid environmental base. They are thus in a situation in which cooperation and exchange of skills and experience would constitute mutual support to their national efforts in development and environment.

Before going in details about the regional approaches which are taken and discussed at SAARC level, I would like to give brief description about the pre – SAARC measures adopted by the region's countries to tackle the environmental degradation:

South Asia Cooperative Environment Programme (SACEP)

It was set up by a ministerial plenary meeting at Colombo on 25th February 1981. The 'Colombo Declaration' and 'Articles of Association' were adopted and subsequently ratified by the governments of the countries concerned – Afghanistan, Bangladesh, Bhutan, India, Iran, and Maldives, Nepal, Pakistan and Sri Lanka – with a directorate and Headquarters at Colombo, Sri Lanka. Apart from SACEP, the U.N. Economic and Social Commission for Asia and Pacific has taken an active interest in preventing environmental degradation in the South Asia Region.

The first Governing Council meeting of SACEP in 1983 approved the 15- priority subject areas identified by SACEP with necessary support from UNEP and UNDP. In 1989, SACEP initiated a programme for the establishment of a regional information network in the countries of region with the technical and financial assistance of Asian Development Bank (ADB). In the field of environment a MoU was signed in 2003 between UNEP and SACEP. This was followed by a MoU on cooperation for the protection of environment of the region signed by SACEP and SAARC in 2004.

Furthermore, the region has programme to tackle the sea level rise "The South Asian Regional Seas Programme" initiated by UNEP in1983, was adopted on 24th March 1995 in New Delhi. It is operated through the effective implementation of an 'Action Plan'. SACEP is designated as Secretariat of the programme. The objective of the 'Action Plan' is to protect and manage the marine environment and related coastal ecosystems of the region. This includes the promotion of sustainable development and sound management of regional marine and coastal resources by: establishing and enhancing

consultants and technical cooperation among states of the region; establishing a regional cooperative network of activities concerning concrete subjects or projects of mutual interest for the whole region. For the purpose of this Action Plan, the South Asian Seas Region covers the marine and related coastal environment, including international waters adjacent to the following states: Bangladesh, India, Maldives, Pakistan and Sri Lanka.

The Action Plan states:

1. All mechanisms of it are independent and provide an outline for inclusive action which will contribute for both the protection and the continued development of the region. Each activity will assist the government of the region to strengthen the process by which environmental management policies are formulated and to improve the quality of the information on which these policies are based;
2. Protection and management of the marine environment and related coastal ecosystem of the region is the objective. Further, it includes encouragement of sustainable development and sound management of regional marine and coastal resources by the way of establishing and enhancing consultations and technical cooperation among states of the region; emphasising the economic and social importance of the resources of the marine and coastal environment and establishing a regional cooperative network of activities concerning existing subjects of mutual interest of the whole region;
3. To promote policies and management practices for the protection and development of the marine and coastal environment on a national and regional level including appropriate legislation at the national level;
4. To prevent detoriation of the region's marine and coastal environment originating from activities within and outside the states of the region;
5. To provide for protection and realistic development of the marine and coastal resources of the region, which are a natural heritage with important economic and social values and potential, through the preservation of habitats, the protection of species and careful planning and management of human activities that affect them;
6. To strengthen and encourage through increased regional collaboration, the activities of institutions within the region involved in the study of marine and coastal resources and ecosystems;

7. To improve training technical assistance and exchange of scientific and statistical data at all levels and in all fields relating to the protection and development of the marine and coastal environment;
8. To stimulate the growth of public awareness at all levels of society of the value, interest and vulnerability of the region's marine and coastal environment;
9. Assessment and evaluation of the causes, magnitude and consequences of environmental problems in particular the assessment of marine pollution from land and sea based sources, and the study of activities and social and economic factors that may be influenced by environmental degradation;
10. Promotion of methods and practices for the management of social and economic development activities that safeguard environmental quality and utilise resources rationally on a sustainable basis;
11. Promotion of national legislation, if necessary, for the protection and development of the marine and coastal environment which will facilitate mutual collaboration and operational efficiency of the Action Plan, having due regard to the need for and suitability of such a framework;
12. Promotion of research and development and exchange and sharing of their findings among the member states;
13. Strengthening of institutional machinery and adoption of financial agreements required for the successful implementation of the Action Plan; (http: //www.sacep.org/html/sas.htm).

SAARC's Role in Mitigating the Impact of Climate Change

Environment is identified as one of the eleven areas of cooperation within the 'Integrated Programme of Action' (IPA) of the SAARC. The Technical Committee on Environment and Meteorology is responsible for monitoring the implementation of the projects related to environment. The first major initiative on environmental issue was taken during the *Third SAARC Summit*, held from 2 – 4 November, 1987 at Kathmandu. The Heads of States (HOS), expressed concern over the danger posed by the global sea level rise and its impact on South Asian Countries (SACs). In order to tackle the malady of sea level rise they decided to intensify regional cooperation with a view to strengthening their natural disaster management capabilities. The summit decided to commission a study on causes and consequences of "Natural Disasters and Protection and Preservation of the Environment". National studies were undertaken and

subsequently consolidated into a regional study, which was approved by the Sixth SAARC Summit held at Colombo, December, 1991.

The *Fourth SAARC Summit* held at Islamabad from 29 – 31 December 1988. "The Heads of States expressed profound sorrow at the natural disasters suffered by Bangladesh, Nepal, India and Pakistan in1988 urged that the study on the 'Causes and Consequences of Natural Disasters and Protection and Preservation of Environment' be completed in the shortest period of time so as to provide a rational basis for identifying areas keeping in view the potentials and possibilities in evolving a regional plan of action, particularly to strengthen disaster management capabilities and to protect and preserve the environment"(SAARC Secretariat, 2001: 44).

The summit decided to undertake a joint study on 'Green house Gas Effect and its Impact on the Region', SAARC Secretariat published the report in 1992. The study suggested number of programmes to tackle the potential danger of green house effect in the region. The Seventh SAARC Summit, held in Dhaka in 1993, formally approved the study. In the same year Technical Committee on the Environment decided on number of modalities to successfully implement the recommendations made by the study, which includes:

- "Improving Climate Monitoring Capability through networking arrangement and through SAARC Metrological Research Centre (SMRC).
- Developing climate change and sea level rise scenario through country specific studies and sharing of data.
- Making available to member states expertise on climate research and monitoring green house gas emissions.
- Identification of training and research institutions and ongoing programmes.
- Exchange of information and data.
- Exchange of experience on strategies for developing, mitigating and adaptive responses to climate change" (RIS, SAARC, 1999: 114-115).

The establishment of 'Technical Committee on the Environment' and the publication of first report by the United Nations in 1990, that confirmed the reality of climate change, stimulated the flurry of seminars and discussion related to climate change and the environmental issues started featuring in the SAARC summit agenda.

During the *Fifth SAARC Summit*, at Male (Maldives) from 21 – 23 November, 1990, the SAARC member countries noted with alarm the unprecedented climate changes predicted by the IPCC report. "They urged the international community to mobilize additional finances and to make available appropriate technologies to enable the developing countries to face the new challenges arising from climate change and sea level rise"(SAARC Secretariat, 2001: 51). In the summit it was agreed that member countries should coordinate their positions at international forum on this issue. They also decided to observe 1992 as the "SAARC Year of Environment".

During the *Sixth SAARC Summit* at (Colombo, December, 1991), South Asia Countries were of the view that regular environmental ministers meeting should be held to formulate a common regional strategy. In the same year a report by the SAARC Secretariat was brought out titled "Green House Effect and its Impact on the Region". The report highlighted possible dangers for the region due to green house effect and suggested certain policy measures. According to the report, the energy sector is the primary contributor of carbon emissions in all the South Asian Countries.

The table given below provide details:

COUNTRY	SECTOR	FUEL
Bangladesh	Industry	Natural gas
Bhutan	Domestic	Fuel wood
India	Industry	Coal
Maldives	Domestic	Oil
Nepal	Domestic	Fuel wood
Pakistan	Industry	Oil gas
Sri Lanka	Domestic	Fuel wood

Source: SAARC Secretariat, Regional Study on green house effect and its impact on the region, Kathmandu, 1992.

During the *Seventh SAARC Summit* held at Dhaka from 10 – 11 April 1993, South Asian Countries expressed their commitment to implement at all levels-national, bilateral, regional and global programme for the protection and preservation of the environment and prevention of its degradation. The Heads of the State (HOS) recognized that the completion of the joint study on the "Green House Effect and its Impact on the Region" was a significant step forward in promoting regional cooperation

in the vital field"(SAARC Secretariat, 2001: 80). "They welcomed the outcome of United Nations Conference on Environment and Development (UNCED), held at Rio in 1992, and urged that all international actions in the area of environment should be based on common but differential responsibilities, collective endeavour and a balanced perspective"(Bhushan 2001: 121). Such actions, they stressed, must consider the protection of environment, economic growth and eradication of poverty as mutually reinforcing. They reiterated their determination to continue in future the practice of intra-SAARC consultations on matters of common concern. SAARC member countries took step beyond the intra-regional level interaction, "SAARC and ASEAN meeting held in 1994 at Bangalore, to address the environmental issues through cooperation among the two regional blocks" (RIS, SAARC, 2002:115).

During *Eighth SAARC Summit* held at New Delhi from 2 – 4 May, 1995, "the member countries recognized that international cooperation is vital for building up national capabilities, transfer of appropriate technology and promotion of multilateral projects and research efforts in natural disaster reduction"(Bhushan 2001: 140). They expressed their commitment to implement at all levels-national, bilateral, regional and global - programmes for the protection and preservation of the environment and prevention of its degradation. They also recognized the tardy progress in implementing the recommendations of 1992 report published by SAARC Secretariat. They stressed the importance of effective and speedy implementation of the recommendations and requested member states to take all necessary steps without further delay in vital areas such as sharing and developing scientific capabilities to protect and manage the environment. "They further directed the technical committee on environment to monitor the progress, and submit a report to the Ninth Summit through the Council of Ministers" (SAARC Summit, 2001: 101). The Heads of the State urged that the Global Environment Facility (GEF) should be of much larger order if the needs of Framework Convention on Climate Change (FCCC) are to be met.

During the *Ninth SAARC Summit*, that held at Male (Maldives) from 12-14 May 1997, the member states pointed out, "unsustainable consumption patterns in the developed countries and widespread poverty in the developing countries are major factors contributing to ecological degradation in different parts of the world"(Bhushan 2001: 158). During the summit, Maldives offered to host a meeting of the SAARC environment ministers to focus more directly on the environment concerns of the region

including the formulation of the plan of action for immediate implementation of recommendation contained in the two studies. The Heads of State observed that the meeting might also consider the feasibility of drawing up a 'Regional Treaty on Environment' in the context of existing international conventions on the subject. "They reiterated their view that member states should take all necessary steps in vital areas such as sharing and developing scientific capabilities to protect and manage the environment"(Declaration of SAARC Summit 2001: 119). Focusing on the global scenario the Heads of State expressed dissatisfaction at the slow progress in the implementation of Agenda 21 of United Nations Conference on Environment and Development (UNCED) 1992 for reduction of green house gas emissions by developed countries.

During *Tenth SAARC Summit* held at Colombo from 29 – 31 July 1998, the member states welcomed the adoption of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) in December, 1997. "The Heads of State urged all industrialized countries to ratify the protocol and to undertake urgent and effective steps to implement the commitments undertaken by them to reduce their emissions of green house gases"(Ibid:182). The Heads of State also emphasised the need for complementary action by organisations and institutions in the region in their effort to protect the environment and achieve sustainable development in the region.

During the *Eleventh SAARC Summit* held at Kathmandu from 4 – 6 January 2002, the Heads of State reiterated their call for the early and effective implementation of the SAARC Environment Plan of Action and devise a mechanism for cooperation in the early warning system. It also stressed on preparedness and management of natural disasters along with programs to promote conservation of land and water resources.

During the *Twelfth SAARC Summit* held at Islamabad from 4 – 6 January2004, the Heads of State stressed the early submission of the state of the environment report to expedite the preparation of SAARC State of Environment report and most importantly the commissioning of the work on drafting a Regional Environment Treaty.

During the *Thirteenth SAARC Summit* held at Dhaka from 12 – 13 November 2005, the member states expressed deep apprehension at the continuing degradation of environment and reaffirmed the importance of determined action in the protection and preservation of environment. Further that they decided to consider the modalities for

having a Regional Environment Treaty in furthering environmental cooperation among SAARC member states. The member states expressed satisfaction at the progress in implementation of the SAARC Environment Action Plan and they also welcomed the decision of the Council of Ministers to set up a SAARC Forestry Centre in Bhutan.

The Heads of State welcomed the declaration of the Special Session of the SAARC Environment Ministers in Male in June 2005 convened in the wake of the tsunami catastrophe. They approved the proposal for elaboration of regional programmes and projects for early warning, preparedness and management of tsunami and other natural disasters. They called for elaboration of a Comprehensive Framework on Early Warning and Disaster Management. The members approved the decision of the special session of the SAARC Environment Ministers to further augment the capacity of the existing SAARC Institutions namely, SSARC Research Centre and SAARC Coastal Zone Management Centre, to carry out their mandated tasks.

During the *Fourteenth SAARC Summit* held at New Delhi from 3 – 4 April 2007, the government expressed satisfaction at the launching of 2007 as the 'Year of Green South Asia'. They reiterated the collaboration in addressing the problem of arsenic contamination of ground water; desertification and melting of glaciers and assistance to affected people should be deepened. They expressed deep concern over global climate change and their subsequent rise in sea level and its impact on the lives and livelihoods in the region. They emphasised the need for assessing and managing its risks and impacts. They called for adaptation of initiatives and programmes; cooperation in early forecasting, warning and monitoring; and sharing of knowledge on consequences of climate change for pursuing a resilient development in South Asia. They agreed to commission a team of regional experts to identify collective actions in this regard.

During the *Fifteenth SAARC Summit* held at Colombo from 2- 3 August2008, the Heads of State reiterated the need to intensify cooperation within an extended regional environmental protection framework, to deal in especially with climate change issues. They were of the view that SAARC should contribute to restoring harmony with nature, drawing on the ancient South Asian cultural values and traditions of environmental responsibility and sustainability.

The Leaders expressed satisfaction at the adoption of SAARC Action Plan and Dhaka Declaration on Climate Change by the SAARC Environment Ministers at the SAARC

Ministerial Meeting on Climate Change held at Dhaka on 3 July 2008. In this perspective they stressed the need for close cooperation for capacity building, development of Clean Development Mechanism (CDM) projects and promotion of programs for advocacy and mass awareness rising on climate change. They also expressed satisfaction at the adoption of SAARC Declaration on Climate Change for the United Nations Framework Convention on Climate Change (UNFCCC) by the Twenty – ninth Session of the Council of Ministers.

The Heads of State expressed deep concern over global climate change and its impact on the lives and livelihoods in the region. They also noted the urgency of the immediate need for dealing with the onslaught of climate change including sea level rise, on meeting food, water and energy needs, and taking measures to ensure the livelihood security of the peoples in the SAARC region. They resolved to work together to prevent and address the threats to the livelihoods of the people and to provide access to remedies when these rights are violated and also to find an equitable distribution of responsibilities and rights among the member states. They also emphasised the need for assessing and managing its risks and impacts. In this regard, they called for an in-depth study on "Climate Justice: The Human Dimension of Climate Change," to come up with a right based approach that would highlight the human impact when responding to the impacts of climate change.

The member states affirmed that every citizen of this planet must have an equal share of the planetary atmospheric space. In this context, they endorsed the convergence of per capita emissions of developing and developed countries on an equitable basis for tackling climate change. They were of the view that any effort at addressing climate change should take into account historical responsibility, per capita emissions and respective country capabilities. The Heads of State expressed concern at the human loss suffered through natural disasters in the region and stressed the need for the timely provision of relief in humanitarian emergencies.

In this regard they directed that a Natural Disaster Rapid Response Mechanism be created to adopt a coordinated and planned approach to meet such emergencies under the aegis of the SAARC Disaster Management Centre.

The *Sixteenth SAARC Summit* held at Thimpu, Bhutan in April 2010 was committed to the theme of Climate Change. The Summit declaration was termed 'Towards a Green

and Happy South Asia'. The Thimpu Statement on Climate Change adopted at the Summit meeting called for a review of the implementation of the Dhaka Declaration and SAARC Action Plan on Climate Change and ensured its timely implementation. There was an agreement to establish an Inter-governmental Expert Group on Climate Change to develop clear policy direction and guidance for regional cooperation as envisaged in the SAARC Plan of Action on Climate Change. It was resolved that the Inter-governmental Expert Group on Climate Change shall meet at least twice a year to regularly monitor and review the implementation of

This Statement and make recommendations to facilitate its implementation and submit its report through the senior officials of SAARC to the SAARC Environment Ministers.

The Thimpu Statement resolved to attempt and carries forward with comprehensive regional self-reliance efforts and adopted the following:

1. "Direct the Secretary General to commission a study for presentation to the Seventeenth SAARC Summit on Climate Risks in the Region: ways to comprehensively address the related social, economic and environmental challenges;
2. Undertake advocacy and awareness programs on climate change, among others, to promote the use of green technology and best practices to promote low-carbon sustainable and inclusive development of the region;
3. Commission a study to explore the feasibility of establishing a SAARC mechanism which would provide capital for projects that promote low-carbon technology and renewable energy; and a Low-carbon Research and Development Institute in South Asian University;
4. Plant ten million trees over the next five years (2010-2015) as part of a regional aforestation and reforestation campaign, in accordance with national priorities and programmes of Member States;
5. Evolve national plans, and where appropriate regional projects, on protecting and safeguarding the archaeological and historical infrastructure of South Asia from the adverse effects of Climate Change;
6. Establish institutional linkages among national institutions in the region to facilitate sharing of knowledge, information and capacity building programmes in climate change related areas;

7. Commission a SAARC Inter-governmental Marine Initiative to strengthen the understanding of shared oceans and water bodies in the region and the critical roles they play in sustainable living to be supported by the SAARC Coastal Zone Management Centre;
8. Stress the necessity of conservation of bio-diversity and natural resources and monitoring of mountain ecology covering the mountains in the region;
9. Commission a SAARC Inter-governmental Mountain Initiative on mountain ecosystems, particularly glaciers and their contribution to sustainable development and livelihoods to be supported by SAARC Forestry Centre;
10. Commission a SAARC Inter-governmental Monsoon Initiative on the evolving pattern of monsoons to assess vulnerability due to climate change to be supported by SAARC Meteorological Research Centre;
11. Commission a SAARC Inter-governmental Climate-related Disasters Initiative on the integration of Climate Change Adaptation (CCA) with Disaster Risk Reduction (DRR) to be supported by SAARC Disaster Management Centre;
12. Complete the ratification process for the SAARC Convention on Cooperation on Environment at an early date to enable its entry into force" (SAARC Thimpu Summit 2010).

The above said deliberation of SAARC Summit shows that the environment has become a very important component of SAARC. Moreover, it also shows that member states are very keen to find mitigation measures for the impact of climate change. By going through the discussion that have taken place at the regional forum, one could also say that from time to time they have kept reminding the developed countries to implement the international declarations.

Thus in order to remind the developed countries to implement the international declaration, the SAARC nations had a common position during the Conference of the Parties (COP) for Climate Change held in Cancun, Mexico from 29 November to 10 December 2010.The member states of SAARC reiterate and emphasized the importance of the principal of equity, and common but differentiated responsibility and respective capabilities in the global negotiations of climate change. They also held the view that it should be equally important to ensure that such negotiations are conducted in an open, transparent and inclusive manner so the outcome enjoys the support and ownership of the international community, particularly those that are most affected by climate

change. Any effort in addressing climate change must take into account historical responsibility and must be in accordance with the principles of the UNFCCC, the Kyoto Protocol and the Bali Action Plan.

SAARC believes that the way forward must include the international community's commitment to:

(1) Provide adequate, new and additional resources easily accessible to address the full incremental cost of tackling climate change, under the authority of the Conference of the Parties (COP) that do not divert funds for development;
(2) Allocate at least 1.5% of the GDP of "Annex -1[1]" countries to meet the adaptation needs of all developing countries;
(3) Urgently adopt operational guidelines for facilitation flows of short-term funds for undertaking climate change activities. Similar guidelines need to be developed for subsequent funds in due course;
(4) Ensure balance and separate financing for both adaptation and mitigation;
(5) Ensure access to adaptation finance for all developing countries that are vulnerable to adverse effects of climate change, with special focus on Least Developed Countries (LDCs) and Small Island Developing States (SIDS);
(6) Ensure effective access to and funding assistance for the transfer of climate-friendly technologies;
(7) Set up technology innovation centres and networking in SAARC region and globally to promote development and transfer of technologies addressing adaptation and mitigation issues;
(8) Establish an International Centre for Adaptation, Research and Training in SAARC region, as the medium for sharing experience for adaptation;
(9) Provide adequate and full support for conservation of forests as an integral part of the Reducing Emissions from Deforestation and Forest Degradation (REDD) Plus mechanism;

Deep and legally binding greenhouse gas emission reduction commitments by all developed countries with effective timeframes as recommended by the IPCC; and immediate action by all nations on the Bali Action Plan has to be incorporated. SAARC

[1] Here Annex-1 countries refer to Parties of the Convention, observer states and United Nations organization attending the sixteenth session of the Conference of the Parties.

expects concrete and action oriented outcomes at COP 16 with a view to enabling the full, effective and sustained implementation of the commitments made under the UNFCCC, including the Kyoto Protocol and the Bali Action Plan and calls upon the international community to honour its commitments.

Adaptation Measures taken by South Asian Countries (SACs):

Apart from SAARC initiatives, the member countries have also undertaken programmes and projects in their respective countries in order to mitigate the impact of climate change. "Bangladesh is emphasizing appropriate watershed and water management technologies. Bhutan is promoting afforesting programmes and developing and developing a national pastures policy to control overgrazing. Sri Lanka is promoting soil conservation programmes, conservation of coastal areas, and development of land use policies and plans. India has major programme for soil conservation and wastelands development and in developing a national land policy. Maldives is trying to identify species appropriate for coastal island ecosystems and has undertaken aforestation program on a large scale. Nepal is emphasizing forest watershed and water management techniques. Pakistan has numerous programmes to control and reclaim water logged and saline lands" (SAARC Secretariat 1992: 199).

Although SAARC Ministerial Conferences have shown enthusiasm in tackling the problem of climate change but little progress has made at the ground level primarily due to lack of resources, research facilities, trained personnel etc. Apart from these bottlenecks it has been observed that intra – South Asian countries politics plays dominant role in demand – supply equation. It could be illustrated by citing some examples: sharing of water and hydel energy between India and Nepal, the problems of exporting natural gas to India from Bangladesh and the proposal to sell electric power by Pakistan to India.

In all these counts, "sale or distribution of surplus energy have been viewed in some quarters as a depletion on the part of the countries holding surplus energy and the recipient countries like India have been reluctant to take the offers on the grounds of its perceived vulnerability, should adversarial situations lead to war in future"(George 2001: 162). Therefore there is an underlying urgency for proper integration and cooperation between government and citizens. For this, beginning should be made within the nations with greater degree of linkages horizontally among actors across

political boundaries. One way out is by allowing the rich plurality of institution working on climate change in the region a much wider and positive role than before in the business was done earlier.

Following initiatives could be appropriated in tackling the Hazard of Climate Change

- Regular environmental ministers meeting of the SMC, strengthening the technical committee on 'Environment and Metrology', fund provisions for poor nations like Bangladesh and Maldives, adoption of joint strategy in global level conferences, like the collectiveness show during 'Earth Summit' and 'Kyoto'.
- Concerted efforts should be made for trading and manufacturing on energy products and design capability. An information network should be established for exchanging data on demand-supply gaps, policy changes, market conditions, investment opportunities, energy expertise, and seismic, geological and environmental data.
- "South Asian countries must develop resource - conserving urbanization strategies, otherwise the urban demand for resources will also destroy the resource base in the rural areas"(Gaan 1998: 110). For instance, increasing demands for timber can lead to tremendous deforestation resulting in acute firewood and fodder shortages for the village people. It is very important because many actions and projects in region failed to get translated into action due to lack of an integrated approach to urban management and a proliferation of agencies dealing with different aspects of urban growth and urban life, which has led to confusion and indecision.
- South Asian region is blessed with enormous hydropower potential, "Nepal alone has the potential for 83,000 mw of hydropower, Bangladesh (52,000 mw), Bhutan (21,000), India (75,400 mw), Pakistan (2077 mw), and Sri Lanka (2000 mw)" (Khanna 1997: 225-26). A regional plan should be chalked out to exploit the existing potential as it will help in lessening the burden on fossil fuels. Moreover, it will help in removing constraints to the development of region. The exploitation of hydroelectric power at the regional level could be possible by carrying out studies, exchanging experiences in creating conditions for the inflow of foreign private investment.

- Emphasising the importance of hydro – power resources, The Group of Eminent Persons' established by the 'Ninth SAARC Summit' recommended – "to implement the suggestions made at the trilateral business summit held in Dhaka in January, 1998 for the creation of an 'Energy Grid for South Asian Countries', the group suggested early commissioning by the SAARC Secretariat of a feasibility study on this proposal. This grid in addition to hydroelectricity, also provide a basis for absorbing surplus energy resources, both gas and, from Central and West Asian regions" (SAARC Vision 2000:77).

  Apart from the exploitation of the hydroelectric power, concerted efforts should be made to exploit the enormous sunlight throughout the year. However, solar energy plants like Photovoltaic Cells (PVC) are cost – intensive and require an integrated market to bring down costs through the economies of scale. India could share its experience and technology of solar Photovoltaic Cells with other member countries.
- All the SAARC member countries have plan for the conservation of forest but the progress is dismal due to dependence of the people on the forest for livelihood. As nothing substantial is done in the field for eradication for poverty, population explosion and alternative to fuel wood, the dependence is increasing. "It has been found that during (1990-95) Bangladesh and Pakistan have experienced the highest rate of deforestation, they are 2.9% and 2.96% respectively, which is four times higher than the region's average of 0.68%. While Nepal and Sri Lanka experienced forest loss at the rate of 1.08% and 0.36% respectively, the same for India was 0.52% and in Bhutan it was just 0.36%"(RIS, SAARC 2002:104). The table given below provides a data of forest areas in South Asian Countries, in terms of thousand sq. km and percentage of total land area under forest area in 2000.
- The deforestation data and the table clearly illustrates that the region is undergoing massive deforestation. The pace at which deforestation is going on has potential to aggravate the malady of climate change and could also deprive the South Asian countries from taking the benefit of global development concerning to forestry sector. With the Bonn meeting of July 2001, forest has become very important for the mitigation of climate change impact as it is recognized as sink for carbon dioxide. Apart from sink's role the South Asian

region tropical forests are banks of fabulous genetic heritage and will be one of the strong sources of strength in future bargaining with the advanced world, which needs these resources in their industrial process, such as biotechnology. In order to provide proper integration between the member states, 'SAARC Forestry Program' should be launched.

Sl. No.	Country	Thousand sq.km	% of total land area
1	Bangladesh	13	10.2
2	Bhutan	N A	N A
3	India	641	21.6
4	Maldives	N A	N A
5	Nepal	39	27.3
6	Pakistan	25	3.2
7	Sri Lanka	19	30.0

Source: World Development Indicators, 2000.

- The focus should be on the propagation and use of green technology which include an evolving group of methods and materials for producing non toxic clean products. The term "green technology" refers to comprehensive technology, which allows for prevention of pollution and restoration of the damaged environment and promotes development while preserving the environment.
- "Environmentally sound technology not only refers to each separate technique, but to the entire comprehensive system which includes knowledge, processes, goods and services, facilities and organizations and management processes. Using sustainable ways for meeting the needs of the society without damaging or depleting natural resources; developing alternatives to technologies-whether fossil fuels or chemical intensive agriculture-that have been demonstrated to damage health and the environment; and create a centre of economic activity around technologies and products that benefit the environment have to be incorporated.

- Capacity- building at local, national and regional levels is vital to enable developing countries to adapt to climate change. It is important for stakeholders and funders to recognize the role of universities, tertiary centres and centres of excellence. Enhanced support is needed for institutional capacity-building, including establishing and strengthening centres of excellence and building up hydro metrological networks. Training for stakeholders in all sectors would help the development of specialized tools for planning and implementing adaptation activities.
- Improving public awareness and developing overall communications strategies make climate change science assessable to the average citizen and can reduce their vulnerability. Apart from awareness raising at local levels, it is also important to involve high level policy makers to ensure integration of climate change risks into national development policies. For example, in Cuba, hurricane and disaster reduction is taught in schools and training is carried out for the entire population every year" ((www.sacep.org/html/docs action plan).
- Collaboration and cooperation between South Asian countries and among South Asian and developed countries can directly engage multiple stakeholders in dealing with climate change and coordinate planning and actions.
- "Through improving observation, forecasting and early warning systems; establishing hazard and vulnerability mapping; fostering community involvement and awareness raising; improving operation and maintenance of existing water infrastructure; improving irrigation efficiency; developing varieties of crops and livestock with greater resilience to limited arable land and extreme conditions and creating community-based forest management and aforestation projects will reduce adverse impacts of climate change" (International Environment Development 2005).
- A mechanism should be worked out under the aegis of SAARC for the entire region for baseline research, species recovery efforts and innovative programmes to educate local people about conservation values. Further, "emphasis need to be placed on inspiring in- country conservation expertise and awareness through training, environmental education and public outreach; developing eco – tourism in protected areas to ensure adequate representation to

maintain forests and assessing the status of certain threatened species with a view to ensure their survival"(Mehrotra 1995: 101).

- There is need for the establishment of an integrated environmental education programmes. "Such an integrated environmental course would yield a common environmental perception by people from different disciplines, enabling meaningful and socially acceptable translation of biospheres' knowledge into resource- use patterns and sound development action"(Kumaran 1989: 7). In order to encourage the research and projects related with climate change, "the SAARC scheme of chairs, scholarships and fellowships may specifically make provisions for young students and ex-service personnel to attend training courses in priority areas in the field of environment recommended by their government in other member states where such training facilities are available"(SAARC Report 2002: 205).
- The South Asian Regions have many agro – industries, the residue of these industries could account for an impressive contribution to total energy supply in an overall strategy, harmonizing both economic needs and environmental concern.
- "SAARC should institutionalize its response to environmental matters by setting up a permanent secretariat for 'Environment Affairs'. This secretariat should provide support to various national efforts and help evolve areas for regional cooperation" (Hasan 1989: 49). Moreover, a special cell for climate change should be established.

Thus, climate change requires a global framework for international cooperation. Adaptation action is a vital part of this framework. Actions to enable adaptation to climate change pose opportunities to promote sustainable development. Developing countries require resources in order to promote these actions. "A successful framework must directly involve assistance for adaptation in developing countries, particularly Small Island Developing States and Least Developed Countries, given that they will disproportionately bear the brunt of climate change impacts" (UNFCCC 2007).

CHAPTER – V

Conclusion

CONCLUSION

The diplomatic activity concerning global warming might lead one to believe that it is the major crisis - confronting mankind in recent times. The point is that carbon dioxide is vitally central to industry, transportation, modern life, and life in general. It has been joked that carbon dioxide controls would permit us to inhale as much as we wish; only exhaling would be controlled. Dealing with the threat of warming fits in with a great variety of pre-existing agendas- some legitimate, some less so: energy efficiency, reduced dependence on fossil fuel, dissatisfaction with industrial society, international competition, governmental desires for enhanced revenues (carbon taxes etc), and bureaucratic desires for enhanced power and so on.

Climate change represents one of the most serious and far-reaching challenges facing human kind in the twenty-first century. Public is anxious about climate change because of damages that can be foreseen and because of the risks involved in accomplishing an irreparable experiment with the planet, an experiment whose result is presently is unknown. Climate change could result in the emergence or exacerbation of a large number of potential public health problems, including heat induced mortality and increased geographical ranges of deadly diseases such as malaria and dengue fever. Loss of species biodiversity, changes in weather patterns with increased damages from storms, sea level rise, and infrastructure costs are among the economic ecological harms that have been identified. In addition, climate change could trigger potentially catastrophic changes in certain earth systems. Even if the probability of such disasters is small, taking action now to avert them is justified. Ambiguity about the enormity of risks posed by climate change provides a strong rationale for action rather than passivity.

The international consensus of scientific opinion, led by the Intergovernmental Panel on Climate Change, is agreed that global temperature is increasing and the main cause is the accumulation of carbon dioxide and other greenhouse gases in the atmosphere as a result of human activities. The cost of failing to mobilize in the face of this threat is likely to be extremely high among the South Asian nations. The economies costs alone will be very large here: as extreme weather events such as droughts and floods become more destructive and frequent; communities, cities, and island nations are damaged or inundated as sea level rises; and agricultural output is disrupted.

The social and human costs are likely to be even greater, encircling mass loss of life, the spread or exacerbation of diseases, dislocation of populations, geopolitical instability, and a pronounced decrease in the quality of life. Impacts on ecosystems and biodiversity are also likely to be devastating. Therefore preventing rogue climate change must be seen as a precondition for prosperity and a public good like national security and public health.

On the other hand the issue of Climate Change has all potential to change the course of international relations already discussed in the first chapter. There is growing awareness that transboundary pollution and transfer of Green House Gases is a new source of international tension and may become a potential source of conflict in near future. Several ground breaking agreements have been made to deal with the problem but hardly anything has been materialized due to clash of interests and mis-visioned diplomacy. The end of cold war did not bring about a peaceful era expected by many. Now there is another set of growing crises like terrorism and national security, global economic crisis, illegal migration etc. to be confronted besides the old problems like poverty, hunger, unemployment, discrimination, and more severely the erosion of global resources. The vast amount spent annually on arms and nuclear stockpiles cannot rebuild the economies of Eastern Europe which is severely grappling with the menace of economic crisis. Neither it can usher in development in the developing countries of South Asia where defence, national security is given first priority and basic sustenance for the mankind is grossly neglected. We can bear up huge unproductive defense expenditure in the name of national security but are reluctant to spend on the protection of environment.

While it has been widely recognized that close connections exists between environmental health and security and international cooperation is needed to protect the fragile web of life, rather than additional expenditure on arms. A quote from the UNDP's Human Development Report offers elaboration on this matter – "*The concept of security must change – from an exclusive stress on national security to a much greater stress on people's security, from security through armaments to security through human development, from territorial security to food, employment and, environmental – security.*"

Policy to promote a structural shift in economic activity is fundamental to sharing a common future. The idea of building partnerships for action encompasses the search for new forms of international cooperation in South Asia. The first step in this process is to building on some of the existing regional networks and alliances like SAARC, SACEP, SIDS, etc. Two major institutional changes required are: Firstly, modification of the planning process: A more rational approach for planning which requires an integrated set-up. Secondly, consensual approach to decision making made on political ground should involve community participation. As with all forms of development initiatives will be successful only if they involve the local people.

Balancing growth with conservation is difficult even for the economically powerful nations. It requires not only capital but also farsighted and effective governance – farsighted enough to appreciate emerging problems and effective enough to impose needed regulations. The trouble is that politicians all over the world continue to give greater importance to economy than to ecology. The result is that most of the leaders of the developing countries feel they are being unfairly asked to share the economic burden of conservation even though such problems like climate change and ozone depletion are largely western creation.

Global environmental politics has entered a new stage in which the political stakes for industrialized and developing countries alike have increased. As the costs of environmental degradation to present and future generations become clearer the costs to global environmental and resource conservation are also rising for all states.

Environment is an issue for which every individual on this earth is responsible for. So to allow policy makers to decide and rule the environment keeping in mind their own selfish interests in not part of a healthy scenario. Because their actions will be motivated by lot of things, and whether their decisions are implemented in toto is a thing which has to be waited for. As Mr. Maurice Strong, in an interview said that decision makers should not be allowed to hide behind science in the name of seeking scientific certainty before acting. In science, certainty is impossibility and decision makers are used to making policy decisions under conditions of considerable uncertainty- that is what they are good at.

The South Asian region needs a special treatment when talking of their prospects in the wake of the rising sea level and the climate change. Their economies need to be

developed and then only they can dream of standing on par with the developed world of the North. As for a sustainable and equitable development this is an issue which obviously must take priority with any nation and thus the South Asian nations are no exception. But trying to force their growth to meet the convenience of the North is quite an unreasonable requirement on part of the developed world. South Asia cannot be denied its right to grow nor be denied to choose their pathways to growth. Nor should that right be constrained by new conditions of trade or financial aid imposed in the name of environment because who would know the meaning of the impact of the rise in sea level better than South Asia.

A fact that can't be denied is that the South Asian Region does need financial support from the developed world not only to develop, but to develop in the cleanest possible way. The South Asian countries must be enabled to leap frog the environmentally destructive paths pursued in the West since the Industrial Revolution. To do this, they need financial support, vastly improved professional and institutional capacities and the cleanest and latest technologies.

Although SAARC Ministerial Conferences have shown enthusiasm in tackling the problem of climate change but little progress has made at the ground level primarily due to lack of resources, research facilities, trained personnel etc. Apart from these bottlenecks it has been observed that intra – South Asian countries politics plays dominant role in demand – supply equation. It could be illustrated by citing some examples: sharing of water and hydel energy between India and Nepal, the problems of exporting natural gas to India from Bangladesh and the proposal to sell electric power by Pakistan to India. However, the magnitude of the problem creates a platform on which all the nations irrespective of their differences come together and work towards a sustainable and equitable environment.

Adaptation is by now regarded as an imperative part of any future climate change regime. Within the UNFCCC and the international community, negotiations are building to find an effective means to tackle climate change, which is described by UN Secretary General Ban Ki-moon as the "defining issue of our era". Transfer of knowledge, technology assistance and financial resources will assist South Asian countries to build a path of equitable and sustainable development. Workshops and

conferences assisted by the rich countries who are techno savvy in this regard will boost developing nation's efforts towards environment protection.

This adaptation methods need to be integrated at the community, local, national and international levels. Concerted efforts should be made for trading and manufacturing on energy products and design capability. An information network should be established for exchanging data on demand-supply gaps, policy changes, market conditions, investment opportunities, energy expertise, and seismic, geological and environmental data. The focus should be on the propagation and use of "green technology" which include an evolving group of methods and materials for producing non toxic clean products. Environmentally sound technology not only refers to each separate technique, but to the entire comprehensive system which includes knowledge, processes, goods and services, facilities and organizations and management processes.

Further, by setting up national level early warning systems, disaster risk reduction programme and developing climate change and sea level rise scenario through country specific studies and sharing of data will facilitate better planning and judicious use of resources for development activities in the countries of the South Asian region. Also by making available to member states expertise on climate change research and monitoring green house gas emissions, identification of training and research institutions and ongoing programmes; and exchange of experience on strategies for developing, mitigating and adaptive responses to climate change will lead towards environment friendly growth.

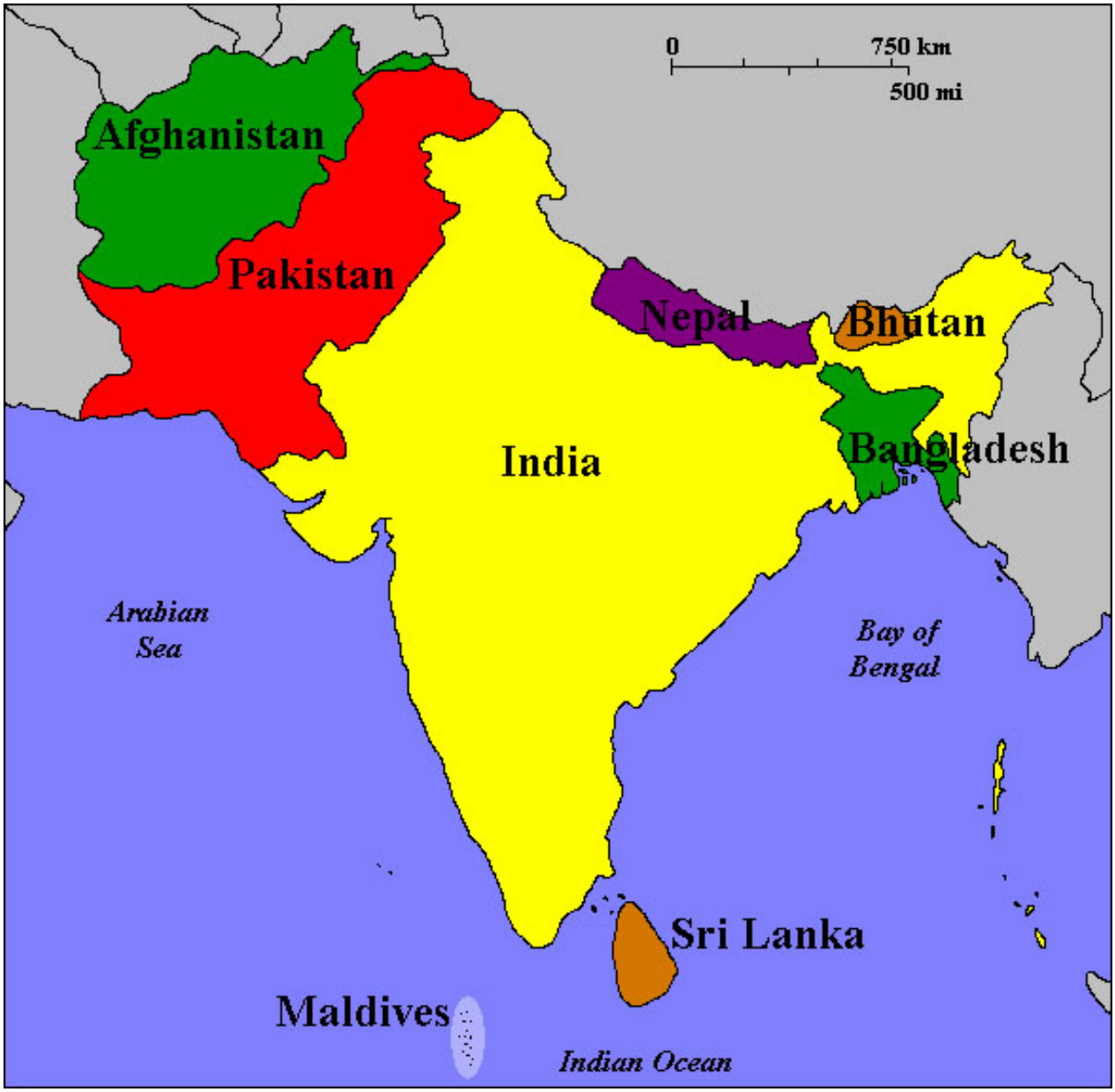
Collaboration and mutual effort among South-South and North-South can directly connect multiple stakeholders in dealing with climate change and synchronize planning and actions. This may possibly be facilitated by international fora with the participation of Parties and relevant stakeholders involved in South-South and North-South association, multilateral environmental agreements and with the disaster risk reduction community. Awareness rising among the key sectors and mass media, including using current events such as economic, weather and health crisis can also help promote adaptation measures with co-benefits.

As South Asia is the most vulnerable region so far as climate change is concerned, concrete efforts has to initiate for its adaptation and mitigation. We have to shed away from the formality for just being a part of negotiation process with regard to climate

change and effortlessly have to work towards a clean environment. Organizations like SAARC, SIDS, SACEP, etc. will function appropriately once they bestow high priority for the environment and work on a single platform for its adaptation and mitigation.

Then only we will be competent to bargain strongly at the international forum which is largely dominated by the rich nations and their decisions regarding climate change mitigation measures which are discriminatory in nature.

APPENDIX



South Asia Political map

Source: www.mapsofworld.com

Physical Map of South Asia

Source: www.mapsofworld.com

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