CHAPTER VI

ENVIRONMENTAL SECURITY AND
INFORMATICS: THE SOUTH
ASIAN PERSPECTIVE
Introduction:

The previous chapter has pointed to the importance of informatics in regional security. It is even more crucial to explore the informatics dimension of the environmental security in South Asia since the ecological implications of the process of development in the SAARC countries are crucial for all who are involved in policy formation and programme implementation. It is through informatics that the ecological challenges created by political development in the SAARC countries can be fully comprehended and full assessment made of their impact on life-support systems. Political forces that hinder the realisation of appropriate corrective measures in the environmental arena in South Asia cannot be defined in a piecemeal fashion. The importance of macro-political analysis has been stressed by several observers. The incorporation of an "ecological framework" into economic and political decision-making is a cumulative process of interdependence and networking in which information and communication technology play a crucial role.

In the words of Maurice Strong, Secy. Gen. of United Nations Environment Programme, "the security of our planets and our species is at risk. Surely this must be seen
as the ultimate security risk, which calls for the ultimate security alliance”. The world’s geopolitical systems may be faring better but its ecological systems are in trouble.

With the decline of East-West tension it seems crucial to improve international relation in the North-South Asia. None of the major environmental challenges we face - atmospheric deterioration, loss of biodiversity and resources degradation in our developing countries can be met without a new era of heightened cooperation and agreement between the Industrial North and us, the developing world. And this improved North-South understanding will have to transcend the traditional environmental agenda and incorporate initiatives in policy areas of international trade and debt, development and assistance, energy, technology transfer and population. If agreed, these arguments will be seen as nothing short of global compact between North and South, for environment protection and economic progress.

The urgent need to protect our atmosphere will necessitate major reductions in global emissions of two leading greenhouse gases, carbon dioxide and methane and elimination of the third chlorofluoro carbons (CFCs) responsible for destruction of the stratospheric ozone.

The industrial North is responsible for most of the greenhouse gases piled up in the atmosphere, nonetheless
the south's contribution to the above phenomenon has been steadily on the increase. They already account for about 30 percent of each year's green house gas toll.\footnote{Annual Report. World Resources Institute, 1990-91, pp. 348-349.} It would become more in the future if these nations continue on the same techno-economic development path. Deforestation and other landuse changes now account for about one-third of the carbon dioxide produced by human activity. We will have to adopt suitable energy, forestry, population and agricultural strategies to contain this trend of global warming both in the North and South.

The North-South cooperation is also vital for the protection and preservation of our biodiversity, what with the fast loss of species and genetic variety of the earth. The world is already losing some 16 million hectare of tropical forest every year, at a rate of 50 percent higher than what was estimated by the UN Food and agriculture Organisation (FAO) and some one hundred species every day. The North will need to work with the developing countries to counter these forces threatening the flora and fauna of our earth leading to biotic impoverishment and also for creating powerful new incentives for favouring the protection of critical ecosystems.
Developing Countries: Key Issues

The task of promoting environmentally sound policies concerning our planet's natural resources has become a top priority in the developing countries as they are least able to afford expensive environmental protection measures so far, who trade the protection of irreplaceable natural resources economic development. The earth's greatest diversity is found in these countries and the destruction of these natural resources, it is being increasingly realized, has dire consequences far beyond the borders of any individual country.

Due to the gross abuse of the earth's resources and environmental neglect, the nearly developing countries are faced with monumental environmental problems such as species extinction, global climate change, sustainable development and population growth. These have their origins in the irresponsible acts like drainage of wetlands, disposal of toxic wastes following grasslands, deforestation and myriad other human uses of the landscape.

The available information about such problems are sketchy and more and more are being discovered, which only points to the gravity of these threats and consequent need for contrived solutions to avoid catastrophes visiting us in the near future.
Global Climate Change

The cutting of tropical forests and conversion of these forests to other land uses, as we know, is not only a primary cause of species extinction but also greatly contributes to the greenhouse effect. When the conversion is sought to be for agriculture or pasture, most tropical forests are not only cut and burned but this act also releases the stored carbon on these forests into the atmosphere. According to some accounts, approximately 20 to 25 percent of the carbon dioxide released into the atmosphere each year is contributed by the burning of tropical forests. This consequently has been impacting the rise of earth's temperature global climate change, amount of rainfall and length of seasons, loss in agriculture produce, threat of melting of polar ice caps due to this greenhouse effect and subsequent increase in sea level relative of land areas.

The global climate change is real, some scientists call the 1990s "the decade of global climate change" and they expect convincing evidence of global climate change to validate their prediction. Yet the international efforts to address the industrial causes of the greenhouse effect have been irritatingly slow and almost non-progressive. These

international efforts need to be supplemented by more vigorous efforts on a regional level to bring home the point of tackling from with a sense of urgency and purpose besides reducing the green house effects by suitable alteration in their respective country's policies concerning industrialization and economic development. This would require efforts by the lawmakers to mitigate the global warning through measures like providing for energy conservation and increased fuel efficiency and for ecological sound means of development.

More so, these efforts can only have their successful effect by proper coordination of the policies among the countries in any given regional like South Asia with the fullest use of new information technologies, like satellite communications and computer communication technologies by way of establishing computer communication network. Through such means, the collection, storage and analysis of various developmental data indexes becomes easier and can be shared amongst neighbouring countries without much cumbersome efforts and loss of time. Any solid coordination of such policies in the be-all of required developmental prerequisite for our earth.

Sustainable Development

The global eco-system is being adversely affected by the present pace and pattern of growth and given the present
trends, limits with regard to critical elements of the ecosystem are already evident and ominous. Every environmental disaster dramatically reinforces the public's anxiety and mounting concern for the long term sustainability.

This concern does not, however stand for the negation of the popular desire for the fruits of development. The growth in the output of goods and services is an imperative given the projected trends in population growth alone, a growth that is expected to triple from 5.3 billion to 1.6 over the next century on the basis of present trends. The most optimistic global population targets based on effective programmes, even reinforced by draconian measures, would, at best achieve a population levelling off by mid 21st century at double the present numbers, the largest increase in the developing countries. If account is taken of improved living standards for this population, the challenge in achieving the requisite rate of growth is formidable enough without taking into account the need to change the present pattern or the traditional model of growth so that it has a different impact on the environment, one that is "in harmony with nature". This sustainable state of affairs is to be dynamic yet steady and non-threatening to the established order yet involve profound changes in sustainable development and social organization, in culture and lifestyle.
This concept of sustainable development has become the Holy Grail of 1990s, as governments in developing countries are set on trying to incorporate sustainability into national development plans and lending portfolios. The contrast with early traditional development model which used to stress increasing GNP through economic growth based on rapid depletion of natural resources, sustainable development seeks to improve the quality of life for humans without depleting renewable and non-renewable resources.

The Brundtland Commission defined sustainable development in ethical, social and economic terms. It defined it as new paths of economic and social progress which meet the needs of the present without compromising the ability of future generations to meet their own needs. In economic term it means living off Earth's interest without encroaching on its capital. It also means investing to sustain and even enhance earth's present capital stock of environmental resources so that the future dividends can be ensured and enlarged. According to the Commission, other imperatives are: 1) reviving growth, 2) meeting human needs and aspirations, 3) ensuring a sustainable level of population, 4) conserving and enhancing the resource base, 5) reducing the energy and resource content of growth, 6) reorienting technology and managing risk, 7) merging environment and economies in decisions.
It required among other things, significant reform of policies including multilateral and bilateral assistance policies and sometimes unintentionally but actively encourage the famous deforestation, desertification, destruction of habitat and species, decline of air and water quality.

If essential rates of growth are to be maintained, a significant and rapid reduction in the energy and resource content of every unit of production will be necessary - less energy per ton of steel, aluminium or wheat, less water per ton of pulp, less virgin pulp per ton of paper and so on. This is also the key to reducing climate change, acid rain and air pollution - and to, improving macroeconomic efficiency and international competitiveness. The meaning for sustainable development is not 'limits to growth' it is the growth of limits.

The sudden acceleration of events on several interrelated fronts, the economic-across the globe, has brought about profound changes both in the relationships between peoples, nations and the way we view and think of the management of the planet as a whole.

The gains in human welfare made possible by the developments like information technology, have been breathtaking. If we could be able to prevent world-scale conflicts, the future gains would appear to be even more
awesome, with the declaration of two major powers containment.

The processes of development that helped us produced such enormous gains in human progress are also responsible for degrading the planet's environment and depleting its basic ecological capital at an alarming rate - not only Earth's basic life-supporting capital of forests, species and soils but its fresh waters, oceans and even the ozone shield which protects all life from the sun's ultraviolet rays. And now we are threatened with a rapid rise in global temperatures and sea levels - greater perhaps in the next forty to sixty years than ever before.

The third world with more than three quarters of the world's population is left with less than one quarter of the world's resources as the growth in the last forty years has been concentrated in the North with only 20-25% of the world's population. This perceived imbalances between the two world's getting worse over a time has been a cause in increasing tensions and growing numbers of sow and thus vulnerable people. As it is, pervasive poverty in the greatest single failure of any civilized society and a major effect of environmental degradation and economic decline.

Poverty: The Greatest Polluter

The injury that can ensure from the existence of poverty is evident in the case of the developing countries
that are burdened with severe debt servicing obligations and at the same time are dependent on a narrow range of exports to earn the foreign exchange with which to meet these obligations. In this case, the nature and degree of market failure and policy bias are much more serious because their pressured circumstances incline policy makers to take less account of environmental damages that can be felt only over the longest term, such as deterioration of a watershed by clearing forest cover and continued dependence on fuelwood which the rural populace relies upon for about 90 percent of their energy needs for cooking and heating. Even where there is an appreciation of this point it has become more and more difficult for them to diversify and thus break away from a pattern of trade dependent on the export of many primary commodities whose cultivation have an adverse environmental impact.

When the prices of these commodities fall - as during the 1980s - the damage is compounded as they strive to increase the volumes exported so as to maintain foreign exchange earnings. At the same time they have been pressed to increase the export of "pollution-intensive" products, a trend that can be attributed to changes in the pattern of investments being made by transnational corporations in developing countries.

Since mid-1982 the onset of the "international debt
crisis" the pressure on these countries has mounted as they and their creditors have been engaged in a ritualized process that can best be characterized as "muddling through on a case-by-case basis". Under this arrangement, debt servicing has become a process in brinkmanship, pushing the debtors to the limit of their endurance while at the same time their debt burden increases. This vicious circle gets compounded further by the current policies of the creditors vis-a-vis the debtors who are being asked, as a guid pro quo for the capitalization of the unpaid interest and some additional loans, to commit themselves to undertake "structural adjustment".

The usual conditionality associated with Structural Adjustment Loans (SALs) calls for a substantial reduction in the allocation of scarce budgetary and manpower resources to the programmes that have no quick pay off in terms of improvement in the foreign trade balance. The unintended but real impact is a dismissed budgetary allocation to such programmes as research, health, and education services and related infrastructure and also to programmes involving the environment such as waste disposal, water and air pollution control and other environmental protective measures. One observer calls this process "cannibalisation". It is this stress which prompted Mrs. Gandhi to describe poverty as "the greatest polluter".
By 1982, a decade after the landmark Stockholm conference on the Human Environment, it had become clear that environmental destruction at a pace and scale never before experienced was undermining prospects for economic development and threatening the very survival of the earth's inhabitants. 3

The world Commission on Environment and Development, set up under the Chairmanship of Mrs. Gro Harlem Brundtland, by UN General Assembly resolution 38/161, 1983, in its report found out that the issues of environment and development are very much interlocked and are reshaping nations and international affairs. It called for a transition to sustainable forms of development which is vital in our times and fundamental reorientation of certain dominant modes of decision-making in the government and industry and on the part of individuals, the way we buy, consume and dispose of the world's goods. It also underscored the required significant changes in many of our economic, fiscal, energy, agricultural, trade, security and foreign policies which so much guide our national, corporate and private behaviour. 4


Environmental Threats to Security

The Earth is already in a crisis and the crisis is gaining momentum like a freight train to quote President George Bush. It could easily become unmanageable on a global scale.

The relationship among unsustainable development, environment destruction, increasing social tension and conflict are very complex. Every situation is different, driven by its own dynamics. History is full of examples of nations fighting to gain control, or to stop another nation from gaining control over raw materials, energy supplies, river basins, sea passages and other key environmental resources. This type of conflict is likely to increase as these resources become scarce and competition for them grows. Unsustainable development and environmental degradation often emerge as major factor behind some of today's hotspots. The growing phenomenon of environmental refugees is one example. Since the 1970s when this phrase was coined, there have been millions of environmental refugees in Africa alone. Two thirds of all refugees worldwide are mostly reported in Ethiopia, Sudan and the countries of Sahel.

The immediate cause of any mass movement of refugees may appear to be political upheaval and military violence. But the underlying causes often include depletion of forests
and water and the incapacity of the land to support the population. The US AID, Report said in connection with El Salvador's environmental profile that the fundamental causes of the present conflict are as much as environmental as political, stemming from the problems of resource distribution in an overcrowded land.5

Environmental threats to peace and security are growing at a frightening pace. An area larger than the African Continent and inhabited by more than one billion people is threatened by deserts and the situation is going to get worse before it begins to get better. Every year the world's population increases by 90 millions and every year 25 billion tons of top soil are lost, roughly the amount that covers Australia's Wheatlands.6 The expansion of desert is linked to the destruction of forests. At the global level, we are in the process of skinnjng the planet. Forty years ago it is down to 4 percent today it may be 1 percent. Seventy years ago India's forest covered half the country; today they are down to 14 percent. In the tropies today, 10 trees are being cut every one planted.


Water is another great resource that has often been a source of conflict - in the Middle East (the Euphrates and the Jordan) in Asia (the Mekong and the Ganges), in Africa (the Nile) etc. Water is already a serious constraint on development in 80 countries with 40 percent of the world’s population. Water use doubled globally in the last forty years and with increasing population and irrigation, it will double again by the year 2000, bringing almost about a growing competition and conflict between nation states. This is already happening in the Ganges Basin, for example between India and Bangladesh and a recent report by the Food and Agriculture Organization (FAO) foresees increasing conflict between Egypt and Sudan over waters of the Nile.

The major global security issues of the year 2000 will arise from global warming and seal-level rise. This issue was prominently discussed in the UN General Assembly’s debate on the Brundtland Report in October 1987. President Abdul Gayoom of the Maldives urged urgent action to prevent the disappearance of his nation beneath the waves. According to the scientists, a sealvel rise of up to 1.5 meters is highly probable within next forty to sixty years. The highest point in the Maldives is less than two meters.

In Vancouver, 1987, the Commonwealth Heads of Government, urged on by President Gayoom, Rajiv Gandhi, Robert Mugabe and others had established a group of experts to look at global warming and its implications. Its report confirmed the worst fears and spoke of far reaching socio-economic effects on low lying areas, as in Guyana, Bangladesh, the Maldives etc. They face the prospect not only of flooding from the sea and greater risk of storm surges but deeper flooding on inland plains. A one meter sea level rise would flood 15 percent of Bangladesh, directly affecting 10 million people. There are potential implications in each of these underlying countries for agriculture, fresh water supply threatened with salinization; the siting of towns, factories, power plants and airports, and hazardous waste disposal.  

The world's coastal regions are home up to one-third of the world's population and more from one-third of the planet's economic infrastructure. In addition to disrupting these areas and agricultural systems, sealevel may rise enough during the next half-century to alter the boundaries between nations and to change the shape and strategic importance of international waterways.

The physical systems involved in global warming are huge and complex and there are very long time lags between a change in policy and any real effect on rates of temperature change and sealevel rise. The political systems involved are also complex and subject to long time lags between a change in political rhetoric and any real change in policies, budgets and energy supply systems. If any measure to counter climate change and other global risk is to have any effect, its needs to be launched without any further delay, as the best predictions available indicate potentially severe economic and social dislocation which will worsen international tensions and increase the risk of conflicts among and within nations. These changes may well become the major non-military threat to international security and the future of global economy. 9

South Asian Scenario

When environmental change occurs, it does so at both ends of the wealth spectrum. It is so due to two processes at work. In the market driven economies, the policies formulated have not taken environmental externalities sufficiently into account. The prices do not reflect ecological realisties. The phenomenon of unbridled growth

has in particular been responsible for pollution. As many
effect of environmental degradation are not felt until some
years after and because of uncertainty over many of these
phenomena, economic planners and society in general have
relied too much upon the environment as a "free good". It
has appeared limitless as a sink for our waste products.

The next important development has been the increase in
the capacity of man made capital stocks to replace or
greatly modify our reliance upon natural resource stocks.
It seems fine, provided the overall scale of perturbations
does not result at all in a deterioration in the flow of
environmental services or functions in the long run. But
the individual improvements in the use of nature's resources
have dramatically resulted in whole sale habitat destruction
but also in fundamental changes to the chemical and physical
environment by various forms of pollutants.

In subsistence or very poor economies like South Asian
countries, the tendency to abuse the environment is driven
by very different motives than what is in developed
countries those of basic human survival in the given state
of their economic impoverishment. The rise of population and
growing intensity of their energy intensive life styles of
the people have helped in the collapse of stable
interactions between man and environment as signified before
in the traditional patterns of human living. Like in the
Third World, in South Asia, the efficiency of resource use is low. Agriculture is often based on extensive rather than intensive land use policy, the mining of natural resource stocks without the replanting and conservation measures leads to habitat destruction on a massive scale and to rapid geophysical changes. Even as in most cases there has never been attempts for a replacement of natural resource stocks with man made capital stocks at levels sufficient to decrease the rate of exploitation by way of substitution or efficiency gains. The increase of population in the landless poor category, on a specified habitated land displaced due to the prevailing energy-intensive agricultural practices, forces these displaced ones to move over to the virgin areas, with least favourable environments. These are often fragile ecosystems where environmental damage can easily take place. With the intertwining of poverty and population growth in this region, the lamentable cycle of overuse and exploitation of the environment beyond the natural capacity to recover continues ever so. And this sad spiral of poverty, population growth and environmental destruction is spreading fast.

The most common environmental exploitation over the region has been that of forest destruction. Ninety percent of forest clearance has been for agricultural cultivation, not for timber required for domestic use. The deterioration
of range lands due to overgrazing and fires, the loss of fertile top soil due to resource poor agriculture the over fishing of coastal zones for vital food protein and the overtaming of fresh water systems for irrigation and domestic use, have also been causes of environmental degradation.

This region has also not been free from pollution effects either. The obtaining of extremely serious environmental conditions on nearly all cities and towns is due to rapid urban growth in the region as on the rest of the third world. This is the "global issue ignored". The ability of the administrative systems to cope with this rapid process of urbanisation and industrialization is woefully inadequate. The lack of civil amenities causes the spread of different infectious diseases. There has been the endemic rise of acute respiratory disease due to air pollution effects.

Environmental Conflicts:
These environmental hazards "augur political, economic social disruptions on an enormous scale... The accompanying strain and upheaval on the scene could have serious foreign policy consequences for all countries. The security implications of all these will be tremendous. It will also, to an extent, tilt the balance of power both regionally and internationally as though all the countries would be losers
in the event of an environmental disaster, the loss being disproportionate. The effect of green house warming will be felt in various parts of the world potentially fuelling turbulent regional conflicts which could upset the prevailing global balance of power.

The linkage between environment and security in South Asia is evident from the fact that environmental factors have aggravated the already strained inter-state relations in the region. The environmental balance of South Asia rests on what is called "the Himalayan ecological system". The dense forest in the mountain region of Nepal, India and Pakistan, mighty river systems, all originating from the Himalayas and the sea touching the coastlines from three directions - all these constitute the ecology of South Asia. The population growth and the consequent increased demand for food and fuel have caused the destruction of half of the Himalayan forests in Nepal, India and Pakistan. These forests regulate water and help prevent soil erosion, which may completely disappear in the next 25 years, should the present rate of deforestation continue. The resulting soil erosion from the hill has in turn led to land slides and river cloggings. This soil erosion has also caused unprecedented siltation in the Ganges and Brahmaputra, the two mighty rivers of the region. It has been estimated that these two rivers carry something over 22 billion tons of
sediments, with a subsequent rise in the river bed by 6-12 inches every year.\textsuperscript{10} The phenomena of ever rising seabed, decreased in the drainage capacity of the rivers and diminishing capacity of the uphill countries to hold monsoon water due to deforestation, are responsible for devastating floods in the recent years in the low lying deltaic Bangladesh.

In other words, the emerging threats from the environment are largely two folds: the threats from the degradation itself and conflicts arising out of such degradation. While it is the first which affects the mankind as a whole, albeit in varying degrees, the latter complicates the already fragile security environment prevailing in the region, as it has the potential to strike at the physical structure of these countries. The deepening and widening environmental crisis presents a threat to national security or even survival that may be greater than well-armed, ill-disposed neighbours and unfriendly alliance.\textsuperscript{11}


It is being increasingly understood that the social, economic and political consequences of such environmental changes may well be devastating and alter the course of human history, while some have defined climate change as a security issue.\(^{12}\) If the atmosphere continues to heat up, it could wreak havoc around the globe with loss of life and homes, pestilence and famine and economic problems and conflicts on a hitherto unprecedented scale.

In a worst case scenario, whole nations might well disappear with such rising sea levels, the consequences for Bangladesh would be so severe that 27 percent of its land area would be threatened and affecting 25 million people. Cyclonic storms that attack Bangladesh each year killing thousands would reach further inland to millions of more people. Salt water intrusion into the nations fresh ground water resource would further damage its agriculture.\(^{13}\) The other coastal countries would also become major victims of sea level rise as with this, most tropical deltas


responsible for agricultural produce would deteriorate or disappear giving rise to a phenomenon called environmental refugees as people would flee flooded homelands or regions as they could no longer sustain marginal agricultural production because of shortages of fresh water.

The presence of these environmental refugees in neighbouring countries would further tax - if not collapse - the economic and social systems of the host countries. In addition to this the stratospheric ozone depletion will also cause damage to plants including rice, and other food crops, trees and destroy the zooplankton and phytoplankton important for marine food yield and commercial fish stocks. The diminished agricultural production, especially in marginal producing zones would lead to famine and increased social and political tensions within and between the nations. Resource conflicts between countries would also likely to increase with decreased supply of basic food and fresh water. Disputes over fresh water resources like those between India and Pakistan might well be aggravated by atmospheric change.


These new sets of threats unleashed by such environmental degradation appear to be extraordinarily complex and their effective control is an overwhelming exercise. In the words of Lester Brown, a leading world resource analyst, blocking external aggression may be relatively simple compared with stopping the deterioration of life support systems\textsuperscript{16} of the environmental problems certainly exacerbate tensions and risk of future conflicts. If a nation's environmental foundations are depleted, it is said, its economy may well decline, its social fabric may deteriorate and its political structure may become destabilised. The outcome all too likely is conflict whether in terms of disorder and insurrection within nation or tension and hostilities with other nations.\textsuperscript{17} According to world commission on Environment and Development, "the whole notion of security as traditionally understood - in terms of political and military threat to national sovereignty - must be expanded to include the growing impacts of environmental stress locally, nationally and

\begin{itemize}
\item \textsuperscript{16} Lester R. Brown, "Redefining National Security" in Brown et. al. (eds.) State of the World 1986.
\item \textsuperscript{17} Norman Myers "Linking Environment and Security" Bulletin of the Atomic Scientists (June 1987), p.46.
\end{itemize}
globally. There are no military solutions to environmental insecurity. 18

The effective tackling of environmental degradation would require such development aid which should attempt to satisfy the general development priority of meeting human needs at the least environmental cost. This can be ensured if we strengthen local institutions that are knowledgeable about local conditions and open participative planning process involving the local population. The so-called "principle of subsidiary" whereby decisions are made at the lowest practical level in the community, must have to apply in matters concerning the environment as "top-down" development has not been successful without "bottom-up" incentive for the population to take part in the process. Fewer capital-intensive projects would be approved if we are able to make the genuine needs of communities a factor in the planning process. The challenge is to group policies in such a way so as to demonstrate the linkage between development and environment. The external constraints of debt, terms of trade and technology transfer must be regarded for what they are: constraints on environmental protection and on human development. Progress can only be

achieved with coordination of policies on the addressing of the poverty and population. In other words, in order to maximise the sustainable consumption in the future which then broadly defined includes environmental amenities, the rule is to deplete resources and accumulate capital until the rate of return to savings a unit of resources is equal to the rate of the return of capital. In the least this would require a great deal more discrimination on distinguishing efficient and wasteful use of the earth's bounty than ever before in the formulation of public policies on resources use. There has been a massive amount of waste in resource exploitation because of inappropriate institutions, infrastructure and and economic policies and biases inherent in our political economies. Since such policy decisions are being taken in an atmosphere that is not well informed by appropriate analysis, informatics can help much in providing with the necessary analysis for its formulation and effective implementation, including that of research on policy alternatives and institutional arrangements, technical research on alternative species and processing and marketing alternatives and assessment of the economic values of resource degradation.

This decline of productive natural resource has rapidly assumed threatening proportions for economic development on most of these developing countries for the concerned
economies are highly dependent on their soils, water, fisheries, forests and minerals. Their resource base has fast eroded with the increase in population growth and more and more poors depending on them due to a deep seated social inequities and misguided policies. As it is, mostly South Asians living in households are too poor to obtain food necessary to sustain their health.

The ties between poverty and environmental degradation are very strong indeed as is marked in this region. Past resource losses deepen today's poverty, while today's poverty makes it very hard to care for or restore agricultural resource base and to find alternatives to deforestation. The North's management of the region's debt has had a telling effect on environment as repayment pressures have taken on the debtor countries environment, society and economy. These pressures have led to economic stagnation, which in the process has further marginalized the poors intensifying pressures on erodible soils, fuelwood supplies and other resources.

It is stressed that international efforts air cooperation are important to make sustaintable development integral for their planning process, with the synthesis of environmental and economic imperatives as without it a billion people would lack the basic natural resources to stay alive. If the efforts to meet resource and population
challenges fall short of the target, the economic and social stresses that will arise, would only lead to political instability and may ultimately even jeopardise global stability and peace.

International Cooperation

Atmospheric change, as we know is the consequences of toxic pollution from many countries. A comprehensive and meaningful policy response to tackle this phenomenon will require coordinated and contended international action as well as desired changes in the respective national policies. In the words of the World Commission on Environment and Development: "National boundaries have become so porous that traditional distinctions between local, national and international issues have become blunted. The policies which were considered to be exclusively matters of national concern now inevitably have an impact on the ecological bases of other nations' development and even survival. This fast changing context for national action has introduced new imperatives and opportunities for international cooperation. According to some, nothing short of a comprehensive framework to codify international principles and norms concerning the use of atmosphere would be enough to tackle the problems of climate change. Such an international law of the atmosphere would encourage standard setting agreements, including national legislation to provide for the protection
The Toronto Conference on the Atmosphere set out the following elements for a comprehensive global strategy to address the problems of climate change:

* an international framework convention that would encourage other standard setting agreements and national legislation to provide for protection of the global atmosphere,

* a comprehensive global energy policy to reduce emissions of carbon dioxide and other trace gases in order to lessen the risks of future global warming,

* establishment of a world atmosphere fund, financed perhaps through a tax on fossil fuel consumption, to mobilise the resources necessary to achieve energy efficiency improvements,

* establishment of continuing assessment of scientific results and government to government discussion of responses and strategies vs worldwide plan to reduce deforestation by establishing an international trust funds to provide adequate incentives to developing countries to manage their tropical forests and achieve sustainable development.

However, achievement of these objectives has not been possible as these recommendations came up against many economic, social and political barriers. It necessitated the biggest reductions in the consumptions of fossil fuels on
which the developing countries highly depend for their energy needs. The options included replacing coal and oil with natural gas, burning fossil fuels more efficiently, replacing fossil fuels power stations with nuclear ones, utilizing renewable energy sources (wind, biomass, solar and geothermal power) and greater energy efficiency. The other obvious economic and political obstacles to greater energy efficiency included facts such as lack of funds, the need for more information and low fuel prices. It has to be remembered that before pressures to persuade the developing countries to forego the use of the fossil fuels in their industrial development or the use of wood in meeting domestic energy requirements and to halt deforestation and soil degradation, generous grant of resources from the industrial North need to be made to meet their needs to prevent any further deterioration of atmosphere and ecosystems.

Since there is no overall convention constituting a comprehensive international framework that can address the

interrelated problems of the global atmosphere or that is directed towards the issues of climate change,²⁰ may believe that it is time to help establish a comprehensive leading eventually to an international law of atmosphere, as the atmosphere is part of the global commons or heritage of human kind. In order to avoid what the Oxford biologist Garret Haradin calls a 'tragedy of commons' it will be hence necessary to create an international regime governing the use and exploitation of the atmosphere.²¹ International organizations have a major role to play in fostering cooperative behaviour and joint approaches to address the greatest challenge to human survival.

Scientific Basis of Concern: The Enhanced Green House Effect:

The Conference on the changing atmosphere, held in Toronto in 1988 and attended by 46 countries underscored a growing consensus within the scientific community that human activities such as the burning of fossil fuels, and destruction of forests and the addition of man-made


²¹. Regimes are institutionalized forms of inter-state cooperation.
chemicals to the atmosphere are threatening the earth's ozone layer and leading to a dangerous built up of carbon dioxide and other greenhouse gases such as nitrous oxide, methane and surface ozones. The destruction of ozone shield in the upper reaches of the atmosphere as a result of the release of man-made chlorofluoro-carbons (CFCs) and halons will increase the amount of ultraviolet radiation that reaches the earth's surface. Crops, vegetation and aquatic life will be damaged and the risks of skin cancer and eye damage in humans will increase. Scientists are predicting that increased levels of carbon dioxide and other greenhouse gases will lead to rapid and unprecedented rise in global mean temperatures. These gases act as an insulating blanket around the planet by absorbing and trapping the sun's heat. Global mean temperatures have risen to about 0.7°C over the past century and warm years in 1880s were the warmest four years of the century and in pace with the increasing levels of greenhouse gases. Nevertheless, many forecast a potential increase in global surface temperatures of the earth between 1.5 and 4.5°C by middle of the next century.22 This increase would have a major impact on the

world's climate. There would be marked variations in the amount of warming, with temperatures in high latitudes exceeding twice the global average. This warming would be accompanied by changes in the amount of distribution of rainfall and in atmospheric and ocean circular patterns. Another effect of global warming and ozone depletion would be a rise in sea levels anywhere between 30 cm to 1 metre or more, by the middle of the next century as the world's oceans expand in response to rising temperature and the melting of polar ice.

Politics of International Regime Formation:

It appears a formidable undertaking for an international regime governing the atmosphere to be put together, not only because the atmosphere concerns every branch of human activity but because a truly international approach to the problem got to involve all of the world's nations. The more comprehensive the regime, the greater the number of parties, interests and issues that will necessarily be involved in the negotiations leading to its creation.

There are some who argue that the presence of a hegemonic leader facilitates regime creation and that the
absence of such a leader frustrate regime formation. Some of the comprehensive regimes (in terms of the degree of institutionalization of norms, rules and procedures and the scope or size of membership) which regulate international economic relations were formed under such conditions. GATT for example, IMF etc., both these regimes were fostered under the hegemonic leadership of the United States in the late 1950s. These same circumstances would not exist for an international regime for the atmosphere. No single state or hegemon any longer has the power to set the tone of agreement which other parties then follow per force, in this post cold war era.

However the lack of a hegemon need not pose an insurmountable barrier to international cooperation of new regimes. The difficulties encountered in negotiating new international economic arrangements suggest that attempts to foster new forms of international cooperation, even without


a highly institutionalized framework and a situation marked by common agreement or acceptance of a shared set of basic principles or norms, may suffer from coalitions which block or veto proposals they do not like. It is clear that a lack of shared assumptions about what constitutes a collective good may present a formidable barrier to a successful international negotiation. Hence a regime can still be formed relatively quickly to address a crisis or an imminent crisis by a small group of like-minded parties sharing similar concerns even in the absence of a hegemon that is or patronal or ever more benign forms of leadership by a single state.

The Ozone Agreement Montreal Protocol of 1987:

It may be argued, notwithstanding the role of uncertainty in facilitating or impending international cooperation, that it also requires an imminent crisis of exogenous shock to create a regime and in the absence of crisis, the probability of success on regime formation will diminish. But the approach to the problem of ozone depletion in the upper stratosphere casts doubt on this chain. It is also illustrative in various other respects. Secondly the ozone agreement illustrates the possibilities of regime formation in the absence of perfect scientific information and the creative ways that a regime can be structures to leave open possibilities for adjustment and timely response
to the information. Thirdly, the agreement is indication of the leadership role and influence of international organizations (UNEP in this case) and one of the ability of international organizations to coordinate the efforts of the international scientific and research community and build transgovernmental coalitions, in a functionalist perspective.

**Minimal Programming for Institutional Change:**

Necessary minimal institutional changes have to be brought about for initiating action on the requisite scale to address this issue within the broader institutional/cultural aspects of the policymaking. The challenge is now to respond to this strong sense of anxiety about the environment in the collective psyche or how to jump the large gap between awareness, concern and remedial action.

**Activating the Political Will:**

It is common knowledge that fundamental change in our institutional arrangements is a pre-requisite to a successful response to the challenge, differences notwithstanding. The factors like institutional inertia, lack of imagination and risk aversion all militate against change in attitudes and action on any issue including environment.

MacNril and Ruckelhaus have identified two other factors and emphasized them strongly. These two are (i) the "public goods" of "common property" nature of environmental services and related conditions of "market failure", (ii)
the bias of both public and private decision-makers in favour of actions that have short term pay offs.

The market failure as said to occur when (i) the movement of capital and labour and information are restricted or skewed in a phrase when non-competitive conditions exist and (ii) when the decision-makers have a stake in "common property" which plays havoc with the incentives system that is normally relied upon to lead to socially, economically and environmentally desirable outcomes, (iii) when "externalities" exist so that "rational decision-making" by individuals or films can lead to social of collective disasters.

Needed a Demographic Transition towards Stable Populations

Population size and growth rates contribute to virtually every environmental challenge the society faces today.

A stabilisation strategy need quickly to address the three following immediately concerns, that of (i) alleviating poverty, (ii) improving the status of women, and (iii) reducing both mortality and fertility rates. There should be increased access to family planning information and services and reduction of death rates by provision of basic sanitary services and health care widely and great expansion of educational and employment opportunities open to women.
Technological Transition:

A deliberate move needs to be made on our part to move to a new generation of environmentally benign ones away from today's resource-intensive, pollution prove technologies.

We have to abandon many of the dominant twentieth century technologies and rapidly adopt twenty first century technologies like information technologies and others that integrate environmental goals into the basic design of transportation, manufacturing energy and other systems.

Economic transition to a world economy is based on reliance on nature's income and not depletion of its capital.

It is commonly hold that deforestation, excess pesticide use energy inefficiency and water wastage are encouraged by the incorporate subsidies and levying pollution taxes and user fees on virgin materials. These measures have the potential to enhance government revenue and also can help in shifting share of the tax burden off these activities like generating pollution and waste.

A Social Transition to a more Equitable Sharing of Environmental and Economic Benefits

It is the rich that consume world's resources at high rates, and the poor destroy the resources for their use. Poverty has been responsible for much environmental
degradation. The South is in desperate need of major new financial resources for integrating sustainable development into their policies. The North needs to increase official development assistance, relieve the burden of international debt and take major initiatives to help these nations transition out of poverty. The range of options would have to include the establishment of a trading environment which is more congenial for the debtors, that is one capable of giving them hope that they can escape the debt trap within a reasonable time and at reasonable cost.

The ambitious global structural adjustment programme, inter alia, would have to provide for the following:

1) to bring down the real rates of interest to 2 per cent or less,
2) to reverse the flow of capital from the poor economies to rich industrial economies which at present is more than 30 billions in a year,
3) lowering of the existing onerous non-tariff barriers to trade that that are slapped by the developed north on the poor southern economies,
4) measures to raise the levels of commodity prices which at present are far less than before, on whose laport the poor countries depend for their foreign exchange earnings.

Without the fulfilment of these conditions, the global economy will continue to be caught in a situation which
would further frustrate efforts to build environmental sensitivity into debtor country policies and into global relations. In the words of Michael Redclift "sustainable development, if it is to be an alternative to unsustainable development, should imply a break with the linear model of growth and accumulation that ultimately serves to undermine the planet's life support systems. Articulating the alternative models and making out the social engineering of that break in realistic terms for the development of appropriate national, regional and international regimes is a formidable challenge and an important responsibility.

A Transition to a Far more Profound Understanding of Global Sustainability:

This transition requires major advances in understanding natural systems and consequently human impacts on them. Environmental trends and conditions will need to be closely monitored and scientific research to ascertain data on global warming and other major planetary changes have to be carried out rigorously. The obtained information will have to be considered for avoidance of such environmental problems.

An Institutional Transition to New Arrangements among Governments:

The environmental policy will now have to be set in concert with other nations, the UN and other such
institutions like regional organizations. These new arrangements must have the capability to reach a broad array of international agreements more swiftly and with less of ad hocism on trade, debt policy, agriculture, energy, transportation, foreign policy, development policy and assistance combined with that of the challenge of sharing international responsibility. The goal of diplomacy will thus have changed from conflict management to common endeavour.

Decentralized Approach:

Environmental policy will have to be guided by the subsidiary principle, according to which the most efficient level should be chosen for policy implementation. The policy instruments should be decentralised to the national level where they may most effectively take account of the variety of political, ecological and social circumstances including the different availability and capabilities of technologies.

Choice of Effective Instruments:

It is essential to develop a package of incentives to serve as instruments of environmental policy. They could be in the nature of regulatory measures, information disclosure and communications etc.

- inclusion of environmental costs in decision-making,
- environmental taxes and their levels should be determined by value judgements emerging from the political process etc.

There is an additional need to device special instruments to help preserve our biodiversity. Its protection cannot be properly ensured through the polluter-pay, principle and other economic instruments such as taxes. The special measures need to be developed taking into account three global economic considerations:

(i) most species have a traditional value for pharmaceutical and food industries;
(ii) the loss of material of any species would be irreplaceable from the ecological and biotechnological point of view;
(iii) the preservation of mammals is an economic value in terms of tourism.

Improving the Measurements of Economic Progress:

The important operational step towards integrating ecology and economies and formulating appropriate policies is to measure economic progress properly through revision in economic and social statistical and in corporate accounting systems. The revision of current economic account systems which had evolved at the time when natural resource limitations seemed less pressing would have to incorporate
the following changes:

1) **Natural resources** for which economic values can be established should be treated as tangible capital in economic accounting frameworks in addition to stocks should be treated as capital formation while depletion and degradation should be treated as capital consumption.

2) **Pollution control** and other identifiable "defensive expenditures" undertaken to prevent the loss of environmental services should be treated not as final expenditures but as intermediate costs i.e. the cost of generating a given level of goods and services.

   Environmental statistics produced by various countries should be examined to see whether they can be improved, harmonized or standardized for national and international policy purposes.

   All the countries should examine the experience of countries using "satellite" national environmental accounts such as (France and Norway) highlighting the value and utility of such accounts to their respective policy makers.

   We are currently witnessing metamorphous of society with the origins of the transformation in the automated system for the processing, storage and transmission of information. We are indeed entering a civilization founded on knowledge, on the accumulation and communication of this knowledge, in which information will play the role of a primary raw
material, more essential ever than mineral and energy resources. The combination of microprocessors, electronics, computer networks communicating with one another through telecommunications satellites and sophisticated software is bringing about a sweeping transformation of all aspects of economic and social life.

The scientific dimension is pervading agriculture, manufacturing industry is dominated by the new role of computers-assisted design and robotics. Business organization is having to give priority to the 'information system' operated automated office technology, educational concepts are having to be radically rethought, as indeed the methods and content of education.

Information technology is thus one of the most potent enabling increases in productivity, cost effectiveness and quality improvement in every sector. Computer-aided design, manufacturing and management information system are examples of the potential of IT in the economy and society.

This term embraces the use of computers, telecommunications and office system technologies for the collection, processing, storage and distribution of information. It's a key activity worldwide accounting for about 5% of the world's gross domestic product (GDP) and has significant potential for growth of upto 8% of GDP by
It has been recognised in many countries as strategic and vital in enhancing competitiveness, coordinated and coherent efforts have been made at the national level to support and facilitate its use. These efforts address a number of interrelated and interactive areas influencing the development of IT in an economy such as:

* level of awareness and understanding amongst users of the possibilities offered for enhancing productivity and competitiveness,
* the availability of IT related skills and expertise at all levels,
* the development of an efficient information communication infrastructure which will enable the transmission of text, data and image and promote the creative and widespread use of IT,
* innovation in technology and the supply of the relevant goods and services needed to enable the economy to benefit from the use of IT, and possibly to generate export led growth of those goods and services.

It has been observed that IT has not been exploited to an extent that would impact the economy. In the analysis of

modern day major economic issues and problems at the national and international levels, it is felt that IT can provide solutions, offer support and create opportunities for new ventures.

The effective transmission of timely and accurate information is wasted unless the relevant people have an incentive to act on it. In this way the creation of open systems which add value to information, interacts with the introduction and use of IT.

IT makes it easier to obtain relevant information, communicate and share information, respond quickly and network.

- Decision-making becomes more effective and relevant through faster, some accurate and continuous flow of information not only within the national boundary but across the countries.

- Efficiency at production level is improved through the use of automated technologies (AC/CAM system), whilst quality and productivity practices (just-in-time) are facilitated leading to better quality of products and services.

- Links between government organizations within and across countries are enhanced giving access to other nation's resources and a global perspective.

The wide use of information technologies in the
countries (of South Asia) national economic development would not only help account for healthy environmental services and negative effects of pollution but prevent the fast depletion of natural resources and long term environmental damage as the technology would help them in the increased production of goods improvement and execution of external trades and imports and fast industrialization besides saving valuable foreign currency.

This vital model of sustainable development is all the more necessary as these developing countries acutely depend on the harvest or production of non-renewable natural resources as principal source of foreign exchange.

The integration of informatics network in the countries' development process would also help us to find, test and offer the rural people suitable alternatives to the cutting of trees in tropical forest for their livelihood on deforestation. This would provide subsistence without the destruction of the ecological structure of forest resources base. It would also help the countries computer communication system to be linked with others' informatics network to exchange data, models and create efforts to help improve their socio-economic systems. This would further make it possible for joint exploration and launching of several models for improving the natural forest management.
for a sustained yield of timber,\textsuperscript{26} harvesting of non-timber forest products,\textsuperscript{27} such as fruits and seeds or woody climbers, medicinal plants etc., agroforestry, which combines traditional corps with multipurpose trees; restoration ecology.\textsuperscript{28}

The setting up of the informatics network amongst the countries and consequent use of this technology on this region would also help in the horizontal integration of sustainable development initiatives so as to make the projects ecologically sound, economically viable, socially responsible and politically acceptable since it would provide for joint exploration of alternative models by the regional member states and to help thrash out differences and apply correctives in the decision of a suitable model.

