

TECHNO - SCIENTIFIC ADVANCEMENTS AND  
DANGERS TO THE ECO-SYSTEM

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CERTIFICATE

*This is to certify that the dissertation entitled "TECHNO SCIENTIFIC ADVANCEMENTS AND DANGERS TO THE ECO-SYSTEM", by MEENA SHARMA, is in fulfilment of nine credits out of the total requirements of twentyfour credits for the DEGREE OF MASTER OF PHILOSOPHY of this University. This is her own work and has not been submitted for any other degree of this or any other university.*

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

  
[Chairman]

  
[Supervisor]

Dedicated to  
My Dearest Shree Ramakrishna  
And  
My Loving Parents

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CHAPTER - I  
Introduction

Will political actors in world politics be able to respond to the challenges arising out of the dangers to the Eco-system from techno-scientific advancements? Can substantial changes in the structure and process of the global system assure the advent of a World Environmental Order? These and other related questions can only be discussed adequately if global needs are perceived as the most important ingredient of international security. If future conflicts are to be solved, the looming dangers to the eco-system must be recognised as central elements which will deepen tensions in international relations. Environmental degradation should not only invite rhetorical assertions; it calls for urgent global management since the poorest nations of the world may be even more marginalised if they have to face the consequences of the ecological degradation unaided. With climatic changes, rising sea levels, deforestation and desertification, the privation and suffering of the Third World may produce levels of systemic instability which will imperil the future of the global system and indeed the future of humanity.

It is impossible to predict human survival without a new era of international cooperation to look after the Global Commons. It is equally necessary to

give priority of emphasis to the equitable sharing of the burden between rich and poor countries of the prevention of environmental decay. The political and economic consequences which follow from the developing threats to the eco-system will inevitably have their impact on the military-strategic factors which are operational in different regions of the world. Thus international conflict resolution will need a change in perspective. It will have to take into account the immediate and remote consequences of environmental change. The theory of international politics would need a conceptual revolution to provide a framework for understanding the realities of world politics in which the consequences of environmental change would be the most far-reaching.

With the urgent need of new normative perspectives, Environmental management and conservation is now considered as one of the most important revolutionary issues, that man has ever faced. This encompasses within its fold the possible limitations to growth, the aims of development the control of technology, the utilization of world's resources, its equitable distribution and above all a harmonious man-nature relationship.

Saint Simon, the father of technocracy visioned the future society, as a scientific-industrial association,



whose goals would be the highest production effort to conquer nature and to achieve the greatest possible benefits for all. Thus the society would move from the governing of men to the administration of things.<sup>1</sup> Further, the scientific and technological developments led to the introduction of the principles of scientific management by F.W. Taylor, who underlined the changed values in the following words -

*"In the past man had been first, in the future the system must be first."*<sup>2</sup>

Before understanding the distinctive features of the ongoing transformation through techno-scientific advancements, let us trace the *development of science*.

The scientific revolution which started with Galileo, Descartes and Newton brought with itself the idea of professionalisation and specialization. Slowly the contemplative science which separated theory and practice, gave way to the one that was geared towards practical application of ideas.

But Science is made by men, who are members of the human society, and in that sense we can say that the science is socially determined. The success of the Manhattan

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1. Jack D. Douglas, ed, *The Technological Threat* [New Jersey, 1971], p.15.

2. E.S. Schwartz, *Overskill* (Chicago, 1971), p. 6

project during the second world war, to make atomic bomb, brought science and politics together. Henceforth scientific results started being exploited as a means of political action. Manhattan project, as well as the work done on radar, operational research, guidance systems, computers, DDT or penicillin - led to the recognition of science as a 'national asset'. And science came to occupy the central position in military as well as economic fields. The developments of cold war after the second world war, and the absence of peace further linked science and politics. The scientific establishment had proved itself so profitable in political terms in wartime that it led to be mobilized in peacetime too.<sup>3</sup>

Kapitza laments at this development and says that science has lost its freedom ....

*"It has become a production force. She has become rich but she has become enslaved and part of her is veiled in secrecy."*<sup>4</sup>

This secrecy is more noticeable in the sphere of nuclear weapons research. After the second world war, arms race started in the field of nuclear weapons. The development of these weapons has adversely affected the disarmament process. Disarmament exercise has become more complex because the rate of technological progress constantly changes the basis of negotiation on the control of

3. Roy M. MacLeod, Technology and Human Prospects [London, 1986], p.106

4. *ibid*, p. 108.

armaments. Negotiations are unable to keep pace with the fast improving weapons - technology.<sup>5</sup> Thus technological advances constantly threaten the very security that they were supposed to assure in the first place.

*Complex Science* - In the present age scientific activity has got transformed at every level of its structure with the synthesis of science and organisation. Science has become one of the leading occupations in modern society. The development of 'Big Science' in large scale projects involving thousands of personnel, has further complexified the structure of scientific activity in the form of multi-tiered hierarchy. Universal and open science was slowly getting transformed behind the barriers of specialization and secrecy. In this transformation many-a-times the theme of scientific pursuit is lost. Scientific and technological revolution was invoked in the name of man and aimed at his betterment. The scientists and the technologists need to know the relevance of the work they are doing and its necessity for the betterment of human beings. Otherwise, "what good is there in knowing about navigation if you donot know where to sail?" The loss of this vision has created a situation where almost half the world's scientific and technological manpower is engaged in armaments research.

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5. *ibid*, p. 114

*Technological Utopia and Pollution -*

Benevolent aspects of technological developments like the labour-saving devices, efficient modes of production, life saving miracle drugs etc. have nurtured a technological utopia. This has heightened our hopes for a perfect society where everyone will be wealthy and everyone would have unlimited leisure to spend his wealth. The faith in technology as the panacea for all evils has been shattered by the problem of pollution and threats to the survival of humans and other species. The ~~right~~ gap between the 'haves' and 'havenots' of the planet has widened with the coming of scientific and technological revolutions.

*Business Civilization -* Scientific and technological advancements gave a boost to Industrial Revolution. Gradually our civilization has got transformed into a business civilization. Here things having money value get more importance over the things that do not have price-tags around them, but are more important for the continuation of life on the planet. Obsession with 'profit' and 'productivity' has fouled our precious environment. Now the things have started riding men.

The colonization of humans went side by side with colonization of nature. The colonies of the industrial nations served the interests of their masters by acting as suppliers of raw materials and providing

markets for their finished goods. These colonies were so much enchained that even after gaining independence, they remained colonized economically and culturally. Western model of development became their ideal path of development -

*"The steel mill, the atomic reactor, one's country's name emblazoned on an orbiting satellite - these were the symbols in the dreams of the leaders of the Third World nations".<sup>6</sup>*

Johan Galtung, while raising the fundamental question of the root of these problems, provides the idea of centre-periphery formation. According to him during the era of colonialism the socio-economic practice of the west, helped to spread the western thought through culture and science. Due to this the world has got divided into the 'centre and periphery' relationships. According to Galtung, the third world cannot become self-reliant by imitating the first and second worlds. The hierarchy of the present world economic structure should give way to cooperation between countries. More power and initiative need to percolate to the periphery.

*Ecology and Ecosystems* : - Ecology can be explained as the science of interrelationships between living organisms and their environment. The environment

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6. Schwartz, n.2, p.6.

in the modern view is not merely a place in which the animals and plants live, but they encompass the whole association of factors inert and living, of which the organism is a part. The various components keep on changing qualitatively and quantitatively and alter their spatial relationships. Therefore, the natural environment must be viewed as an unstable system, complex in number and interrelations of its constituents. It is unique in the sense that their transient arrangement can never be exactly duplicated. In this arrangement the interdependence of its components comes to no natural limit and allows only arbitrary division into separate habitats.<sup>7</sup>

The eco-system is the basic functional unit in ecology. It includes organisms as well as their abiotic environment, each influencing the properties of the other and both being necessary for the maintenance of life. Material cycles and energy flows in the nature generate a self - correcting homeostasis with no outside controls. But this delicate equilibrium can be easily disrupted by external stimuli such as human socio-economic activities.<sup>8</sup>

Earth has for long endured the minor changes brought by human socio-economic activities. But now with

7. Chambers Encyclopaedia. [London, 1959], Vol IV, p.764.

8. T.N. Khoshoo, Environmental Concerns and Strategies [New Delhi, 1984], p. 14.

the efficiency of science and technology, these changes are occurring at an unprecedented pace. For example power plants that turn 100 million old coal deposits into atmospheric gases are adding to the warming of the planet. Loss of tropical rain forests is changing the climate.

By now unity of the environment has been amply proved. It follows from this, that the analytical methods of the physical sciences must be used in ecology with great caution because the removal of the organisms or of any factor from the environment destroys the integrity which is one of its characteristics.

If the effects of temperature upon a particular animal are studied in isolation in the laboratory, results of considerable precision can be attained. But these results may have little to do with the effects of temperature upon similar animals in nature, where coincident effects of the variable upon their enemies or prey or food or upon any other part of the environment have to be simultaneously considered.<sup>9</sup> The eco-system consists of a complex mechanism, and humans have so far proved unable to understand the dynamics of this natural wisdom. The interdependence and unity of the environment has been proved by many example. The plankton in the sea

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9. Chambers Encyclopaedia [London, 1959], Vol. IV, p.764.

exhale chemicals that affect the formation of clouds. Ocean currents such as gulf stream act as conveyor belts transporting heat around the world, and setting chemical patterns that last for centuries at a stretch. Chemical reactions taking place in the upper layers of the atmosphere control the rate of depletion of ozone layer by man made chloroflourocarbons. Rapid deforestation taking place in the tropics may disrupt rainfall thousands of kilometres away. Carbon dioxide is the backbone of biological chemistry. It keeps the earth warmer. Without any  $\text{CO}_2$ , the earth would be on average  $11^\circ\text{C}$  colder than it is today. And without the mechanism to prevent the blanket from growing, earth might share the fate of venus, whose  $\text{CO}_2$  laden atmosphere has created a permanent green house effect, heating its surface to  $450^\circ\text{C}$ .

*Ecology and Economics* : Both the words ecology as well as economics are derived from the Greek word 'Oikos', which means a house or a place to live. Although the words ecology and economics are derived from the same source, they stand for contrasting ends. Economics stands for the laws and rules of people's management of business. Man's economic activities are mostly based on the resources of the ecology. Rising population and increasing productivity have laid too much claims on



ecological resources. Because the socio-economic system of man, in contrast to natural eco-system, is founded on a material base which is finite. The perspectives of ecology are different from those of economics in that the former stresses the limits, rather than continuous growth, stability rather than continuous development. Human beings impose changes on natural eco-system, and his increasing control over the environment often creates conflict between his goals and natural processes.<sup>10</sup>

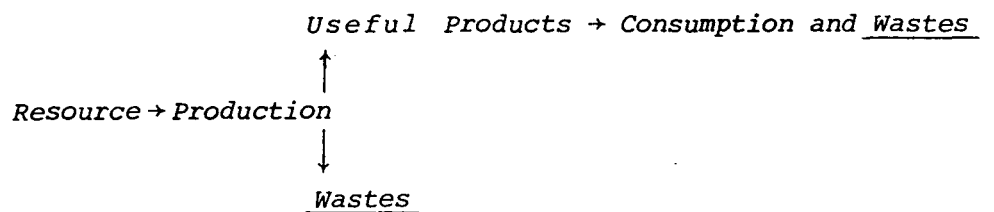
Economic growth had remained slow to moderate until the coming of industrial revolution. From then on the average annual growth of the products of the industrial countries reached 2 to 3 per cent. Together with this, their population growth was of the order of 1 per cent per annum. After the year 1950, population growth of the industrialized countries has remained around 1 per cent. But in the developing countries it had become more than 2.5 per cent. Because of the high rates of growth of per capita income in the developing countries and increasing population, the world production rose by some 4.5 per cent per annum in the 1960s. Thus the pressure on the biosphere exerted by the human population increased rapidly in the recent past.<sup>11</sup>

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 10. Khoshoo, n.8, p. 14.

11. Nicholas Polunin, ed., Growth Without Ecodisasters? [London, 1980], p. 3-4.

Rising production brings eco-disaster to our planet in the form of pollution on the one hand and resource depletion on the other.

A.D. Ursul has explained this process with the help of following diagram<sup>12</sup> -



But the problem remains that the inhuman conditions in which a considerable part of the world population lives, necessitates the increase of productivity. Industries most heavily reliant on environmental resources and most heavily polluting are growing most rapidly in the developing world, where there is both more urgency for growth and less capacity to minimize damaging side effects.

These interrelated and interdependent changes have locked the global economy and global ecology in various new ways. Accelerating ecological interdependence of nations is the new challenge facing the world. Ecology and economy are becoming ever more interwoven - locally, regionally, nationally and globally - into a seamless net

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12. A.D. Ursul, ed., *Philosophy and the Ecological Problems of the Civilization* [Moscow, 1983], p. 68.

of causes and effects.<sup>13</sup>

*Impact on the Biosphere* : Accelerated demographic and economic development has contributed considerably to the deterioration of the biosphere. Pollution of land, air and water is affecting every form of life on the planet. Atmospheric pollution took its toll first in 1952, in the form of London smog. In just five days, this smog killed more than 4,000 people.<sup>14</sup> Fossil fuels, when burnt in power plants, produce oxides of Sulphur and Nitrogen. The smelting industries and motor vehicle exhausts also produce these oxides. In the atmosphere, these oxidize into sulphuric and nitric acids and come back to earth in the form of acid rain, which damages soil, crops, forests and water resources. Its effects have been particularly pronounced in Scandinavia, Central Europe and in Canada.<sup>15</sup>

The reports of ozone layer depletion are also coming. Ozone layer protects the earth from the sun's ultraviolet radiation. Chlorofluorocarbons, which are used in refrigerators, fire extinguishers, hair spray etc., gradually accumulate in the atmosphere. In the stratosphere, they are decomposed by ultraviolet radiation creating Chlorine atoms. This Chlorine destroys

Ozone.<sup>16</sup>

13. Gro Harlem Brundtland, *Our Common Future* [London, 1987], p.21

14. Edmund Hillary, *Ecology 2000* [London, 1984], p. 130

15. *ibid*, p.135

16. *ibid*, p.145

Use of fertilizers, pesticides and other industrial wastes is polluting the land and water of the planet. Nuclear power plant accidents like Three Mile Island and Chernobyl, and difficulties in managing nuclear wastes have proved the dreadful dimensions of nuclear mismanagement. The unlimited destruction capacity of the nuclear weapons was demonstrated by the small bombs dropped on Nagasaki and Hiroshima during the second world war. The world now has nearly 15,000 megaton weapon capacity. If this stockpile is used in a global nuclear war, then apart from losses in terms of men and material these could bring in severe changes in climate. The ill-effects of nuclear weapons will be shared more or less equally by combatants as well as non-combatants.

*Importance of this Study* - This study aims at giving some illustrations of the ill effects of scientific and technological progress. It suggests that the aim of development which is the enrichment of human life in consonance with nature should not be forgotten in the melee of 'progress' and 'productivity' at all costs. In a fundamental sense the study of international politics and international security, the task of eradicating ideas and concepts which have an anti-ecological bias and are no longer viable since they cannot cope with environmental decay, which now threatens the survival of human kind.

Ours is a closed planet. The concept of spaceship earth has been given to describe the limits of the earth. Science is based on curiosity and questioning. But this curiosity needs guidance. Scientists need to question the relevance of their work. Too much specialization often makes them lose sight of the whole. If anyone goes to a nuclear scientist and asks why he is conducting experiments. He will answer to get plutonium out of Uranium 238, to make cheaper and more plentiful bombs. On being asked about the need of these bombs, he will answer to increase the security of the state. He refuses to think whether really more bombs add to security or not.<sup>17</sup>

Similarly the economist is busy devising the theories of production and profit and he refuses to think about ecological costs and the necessity of a decent living to the people of the third world.

Then the state leaders in their quest for power and national security keep on amassing weapons. Most threatening is the security arrangement of the two superpowers.

We need to have an integrated knowledge of science, economics, ecology, politics and psychology. The club of -----

17. *Theodore F. Lentz, Towards a Science of Peace [Varanasi, 1970], p.115.*

Rome was formed in 1968 to study the world problematique of poverty in the midst of plenty ; degradation of the environment, loss of faith in the institutions uncontrolled urban spread etc.

The club of Rome study, stressed the interdependence of the various elements of the world problematique. According to it -

*"Despite our considerable knowledge and skills, we donot understand the origin, significance and interrelationship of its many components and thus are unable to devise effective responses. This failure is because we continue to examine single items in the problematique without understanding that the whole is more than the sum of its parts - that change in one element means change in the other.18*

Science and technology had generated lots of enthusiasm among the people. But this faith started shaking after 1960s. Many futurologists have given their prophesies for the future of the world, which is not very optimistic.

In the 19th century, Parson Malthus, had said that the stock of the earth's resources was fixed and human population would increase at geometric rates, until some big dieback occurred. The neo-Malthusian prospect was outlined by several authors after the late 60s.

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18. D.H. Meadows, et al, The Limits to Growth [London, 1972], p.10.

Julian Huxley in 1948, believed that the world is rushing blindly towards a catastrophe as there will be an inevitable clash between exponential population growth and a finite environment.

Anne and Paul Ehrlich gave the idea of eco-catastrophe. They believed that lethal plagues or nuclear war can drive human race to extinction. They even suggested the 'dedevelopment' of over developed countries, to bring our economic system in line with the realities of ecology and the world resource situation.

Ehrlichs point to a serious fact that -

*"A major cause of humanity's current plight.... lies not in the economic differences between the superpowers...but in the economic attitudes that they have in common".<sup>19</sup>*

Redistribution of wealth, on a just basis is their main concern, but they are against the western consumerist pattern of development for the IIIrd World countries.

Jay Forrester in his book World Dynamics (1971) gave a Computer-model and described five 'inter-linked' global sub-systems : population, natural resources, capital, agriculture and pollution. Forrester emphasized the idea of interdependence and interconnectedness of events. He claimed that a package of policies on population

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19. *Christopher Freeman and Marie Jahoda, ed., The Great Debate [Oxford, 1978], p.24.*

resources and environmental policies directed towards some kind of equilibrium society will be required to cope with the problem.<sup>20</sup>

Rene Dumont in his book 'Utopia or Else' (1974) opines that there is no possibility of poor countries reaching the standards of living realised in the USA. According to him development of rich countries can continue only at the expense of the poor countries.<sup>21</sup>

Schumacher in his book 'Small is Beautiful' (1973), advocates reduction in needs, for reducing tension in the world. He says that the poor are becoming poorer because of the 'negative demonstration effect' of modern technology. The established process of foreign aid, which facilitates the introduction of sophisticated technologies into unsophisticated environments are counter-productive.<sup>22</sup>

All the neo-Malthusian writers are of the view that the world is extraordinarily complex and that its main tendencies are beyond the comprehensions of human mind. Only a holistic analysis is capable of understanding the problem.

The problem of ecological degradation is a serious one and of late the world has started recognizing its

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20. *ibid*, p.27.

21. *ibid*, p.32.

22. *ibid*, p.34.



serious dimensions. The 1972 Stockholm Conference on Human Environment started the process. This gave birth to UNEP. Meanwhile new answers started being searched. The Brandt commission report called for a novel approach to North-South relations for the survival of humans. The World Commission on Environment and Development established the Brundtland Commission, which gave its report in 1987. The report entitled 'Our Common Future', hoped to make one world from one earth.

The second chapter of my dissertation emphasizes the general illeffects of pollution on land, air and water.

In the third chapter, the dangers of nuclear power and nuclear weapon development has been emphasized.

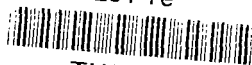
In the fourth chapter, I have traced the origins of the problem from industrial revolution and colonial process. The problem of development has been dealt with and reports of Brandt and Brundtland Commissions have been emphasized.

The last chapter includes some remedial measures and suggestions.

*Methodology :*

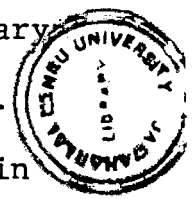
In a Symposium on "Man's Role in Changing the Face of the Earth", Kenneth Boulding pointed out the sharp division between the "biological-ecological" point of view and the "socio-economic" viewpoint. According to him the former is expressed in terms of equilibrium systems and of movements towards equilibrium systems and of movements toward equilibrium. "Biologists and conservationists feel that man has to find his place within a cycle of this kind; if he violates it, he is leading for trouble".

International studies have attempted greater precision and systematisation in research but the methodology has not been suitable for an optimum approach to man and environment. It is now widely recognised that theoretical studies on international politics should be reoriented towards ecological principles. Practitioners of foreign policy in all countries increasingly feel the need to define concepts and operationalise variables in a way that should broaden knowledge about urgent environmental concerns. An explicit recognition of this changed attitude is to be found in the contention of the British Minister for Overseas Development Mr. Christopher Patten that "just as international relations had been dominated for over 40 years by the consequences of splitting the



atom, so in the next 40 years the environment will come to form much of the business of international relations".

This study attempts to bridge the gap between the existing concepts of international politics and the assumptions and hypotheses which are necessary for paving the way to better environmental practice in world affairs. There is no longer any lack of knowledge on the environmental damage which arises from both military activities and so-called peaceful economic activities. Unfortunately the concepts which continue to be used in international studies are inadequately defined from the point of view of good environmental practice. The subjective ideological and political biases against ecological principles are responsible for methodological shortcomings in the research on international politics, no matter whether it is from the power politics, or behavioural science or Marxist perspective.



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In order to surmount the obstacles to better environmental practice, the mode of analysis should respond to the major challenge of reorganising the state-system in order to mitigate the increasing damage to the global, regional and local environment. We have to recognise the problems of comparability between rich and poor countries and to avoid placing global challenges in



an interpretative framework which chooses to overlook the interests of developing countries. Third world countries which make up the major part of the culturally diverse global village have to redefine foreign policy, defence and security choices by recognising the need to give priority to global challenges and to respond to the emerging realities of the "global commons". Nevertheless they have also to insist that alternative interpretations of optimum environmental practice exist and they have the right to reject the inherent political biases of the advanced industrial countries. It is therefore necessary to dispel the impression that one or the other Super Power has the title to become the Environmental Policeman of the global village.

Scholars from both advanced and developing countries have to work together not only to develop a reliable data base on the global environment, but to generate general propositions in international relations which can help to recover the ecological security of the globe and maintain a stable peace. This study is structured to reflect the new interest in relating ecological analysis to political problems and attempts to overcome the relative weakness of the existing tradition in international studies.

Chapter - II

Suffocating Influence of Pollution  
on Life-support Systems

Theoretical pre-occupation with the suffocating effect of Pollution on Life-Support Systems is relatively recent in the international context. The vibrant optimism of post-World War II era in respect of industrial advance was also marked by a general inability or unwillingness to bring about a significant reorientation towards anti-pollution measures. Neither of the two blocs, one under the leadership of the United States and the other under the Soviet Union, dealt with problems of security by identifying the goals of environmental security. It was only after problems of pollution reached unmanageable crisis proportions that decision-makers were compelled to identify environmental security with greater precision. A deeper appreciation of the complexities and choices involved in the policy process emerged only after considerable damage has already been done to the environment. An assessment of the disturbances to the delicate balance of the global ecosystem was critical, and after scientists and conservationists had challenged the status quo orientation, the concept of global environmental security acquired a new dimension which was lacking in the existing historical, political and ideological traditions. The Greenhouse effect, the several aspects of the crisis which would follow the warming of the earth and the alarming consequences of the

melting of the polar ice caps require both theoretical comprehensiveness and global conceptions of human survival.

Since the beginning of civilization human activities have been interfering with the environment. In the post-industrial age, this interference has become more noticeable and harmful. This interference is causing serious damages to the life support systems - soil, air and water of the earth. Introduction of new chemical and polluting agents have aggravated the problem to the level of crisis.

The capacity of the biosphere to disperse, degrade and assimilate wastes has been severely stretched. The Biosphere is a closed ecological system. Resources being finite, the biosphere is maintained in equilibrium by large scale recycling. Photosynthesis, respiration, nitrogen fixation and diffusion by wind and water action are the processes by which organic and certain inorganic materials in the biosphere are continually recycled.<sup>1</sup>

Pollutants in the biosphere disrupt the natural recycling mechanisms. Addition of new substances like plastics, synthetic fibres detergents, synthetic fertilizers, pesticides like DDT, industrial chemicals and the wastes from their manufactures has further worsened the problem.

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1. William H. Haris & Judith S. Levey, The Columbia Encyclopedia (New York, 1975), p. 2182.

These substances degrade very slowly and put more stress on the biosphere. Pollution now has become an international problem. Pollution from one country can damage crops, forests and lakes in another country, many miles away. For example, West Germany receives 90,000 tons of Sulphur dioxide from England, 50,000 tons from France, 40,000 tons from Belgium and 30,000 tons from Holland<sup>2</sup>. Thus, air pollution in other states is responsible for the forest 'dieback' in West Germany.

Pollution can become a catalyst in the process of disintegration of civilizations. Many historians hold that low level lead pollution may have been partially responsible for the demise of the Roman Empire.<sup>3</sup>

our alienation from and apathy towards the natural conditions is responsible for the present ill health of our planet. Man, although very much a part of this biophysical world, at times tries to underestimate the importance of interdependence. Our oneness with nature is the primary element of our being. All industrial activities of humans affect the environment either directly or through the products they create. Mining and milling

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2. Nicholas Hildyard, *Cover Up!* [Britain, 1981], p. 126.

3. Frank W. Woods, "The Acid Rain Question : Making Decision Today for Tomorrow", *The Futurist* [Bethesda], Jan/Feb 1987, p.37.



of the mineral ore besides grossly modifying the earth's surfaces, give rise to major pollution problems. For example, textile industry emits sulphur dioxide, and hydrocarbons into the air, suspended solids, salts, sulphates and toxic metals into water and sludges from effluent treatment into the land. Similarly, leather industry pollutes water by suspended solids, sulphates and toxic metals and produces chromium sludge for waste disposal. Aluminium industry is a major local air pollutant that releases flourine, solids and hydrocarbons into water. The iron and steel industries are the heavy pollutants of air, water and land. They pollute air by the emission of sulphur oxides, nitrogen oxides, hydrocarbons, carbon monoxides, hydrogen sulphides and acid mists. Water is polluted by suspended solids, oil, metals, acids, phenol, sulphides, sulphates, ammonia and cyanide. Slag, sludger, and other solid wastes pollute the land.<sup>4</sup> The doctrine of Laissez-faire and profit motive of the industrial economics blurrs the fact of interdependence of man and his environment. Emphasising this interdependence the saint poet of India, Tulasidas said that the human body is made of soil, water, fire, ether and air.

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4. *The State of the World Environment 1986*  
*[Nairobi, 1986], p.42.*

Thus the schools of the world must teach that the creeping ecocide, for which we are responsible as a consequence of our rapacious or improvident activities can destroy us as thoroughly as could the big bang of a nuclear holocaust.<sup>5</sup>

#### LAND POLLUTION

Among the causes of land degradation can be counted forest depletion for use in industry and as agricultural land, soil erosion and desertification, illeffects of pesticides and fertilizers and the problem of industrial wastes dumping.

Aldo Leopold views land as a 'community' in the basic sense of ecology. He opines that land abuse takes place when we regard land as a 'commodity', belonging to us personally. The fact remains that land is a 'community' to which we also belong.<sup>6</sup>

The world population has crossed five billion mark. The daily needs of the people of the world for fuel and nourishment are reducing the earth's vegetation and productivity of marginal agricultural land. The monoculture introduced for agricultural production gives rise

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5. Aurelio Peccei & Daisaku Ikeda, Before it is Too Late [Tokyo, 1984], p. 17.

6. Sarla Devi, Revive Our Dying Planet [Nainital, 1982], p. 61.

to many pests. For example, in parts of south eastern Russia, scientists found that there were 312 different species of insects before cultivation. When land was farmed the number of species reduced to 135, but the density of insect population doubled.<sup>7</sup> These insects become pests and there comes the need of pesticides.

Pesticides kill pests as well as many useful insects including those that prey upon pests. Besides this, the pests normally get immune to the pesticides after a certain period of time. Again the need for more powerful and more poisonous pesticide arises. The pesticides degrade very slowly. They remain in the soil for years and keep on spreading contamination. The example of DDT can be cited here. It has become a global contamination agent. The traces of DDT can be found in the bodies of Antarctic penguins, in the rain, in our drinking water, and in just about all commercially produced food.<sup>8</sup>

*Deforestation* - Forests protect and stabilize soils and local climates as well as soil hydrology, and the efficiency of the nutrient cycle between the soil and vegetation. Forests are also the essential habitat of plant and animal species.<sup>9</sup> On a global basis the world's

7. Arthur Bourne, Pollute and Be Damned [London, 1972], p.28.

8. Hildyard, n.2, p.126.

9. The state of the World Environment 1987 [Nairobi, 1987], p.24.

forests are disappearing at the rate of 15 million hectares annually, with most of the losses occurring in the humid parts of Africa, Asia and Latin America. The average annual rate of deforestation in tropical countries has been estimated at 11 million hectares.<sup>10</sup>

The loss of forests also means the loss of biological diversity. More than 60,000 of the world's 265,000 plant species are at the risk of extinction.<sup>11</sup>

*Soil Erosion* - Human management of agro-eco-system has been steadily intensified through irrigation and drainage, heavy inputs of energy and chemicals and improved crop varieties. Nearly 5 to 7 million hectares of cultivated land are being lost annually through soil degradation.<sup>12</sup> The result of soil degradation is desertification. In recent years famine and death from drought and desertification have occurred in 21 countries of Africa. Some 6 million hectares of new desert is formed annually by land mismanagement.<sup>13</sup> The soil is a living community and supports the fauna of protozoa, earthworms, mites, insects and spiders.

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10. *ibid.*, p.30.

11. *UNEP News (Nairobi) No.15, May/June 1987, p.6*

12. *The State of the World Environment 1987*, n.9, p.24.

13. *Brown, Flavin & Wolf, "Earth's Vital Signs", The Futurist, Vol.XXII, No.4, July/Aug. 1988, p.14.*

Microorganisms turn dead leaves and other plant materials which fall onto the surface into simple organic chemicals. Some liberate nitrogen into the others and others fix it into nitrogenous compounds, which are used by the plants to form the complex materials of life. The movement of earthworms through the soil has an important part to play in this process. Their movements keep the soil well aerated and drained, thus providing the microorganisms the right condition for their work. Many of the pesticides kill earthworms, thereby making the soil stale and dead. These soils need an enormous amount of money and attention, otherwise they either become waterlogged or lose their vegetative cover. Loss of vegetative cover means drying up of the soil and being destroyed by the winds.<sup>14</sup>

Deforestation also accelerates soil erosion. Trees are an integral part of basic life support systems. Deforestation releases carbon, that contributes to the buildup of atmospheric CO<sub>2</sub> and warning of the earth. Deforestation on the sloping land creates havoc on the soil. This accelerates rainfall runoff, causing soil erosion and diminishing soil productivity.<sup>15</sup>

Nearly 26 billion tons of topsoil on cropland is lost annually.<sup>16</sup>

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14. Bourne, n.7, p.31.

15. Brown et al, n.13, p.13.

16. *ibid.*, p.14.

*Wastes* : - Huge amount of wastes is produced by the modern civilization. In 1969 the USA only produced over 4.3 billion tons of solid waste : 2280 tons from agriculture, 1,700 million tons from mineral extraction, 110 million tons from industry and 250 million tons directly from domestic sources.<sup>17</sup>

Other than dumping in the seas and rivers, billions of tons of hazardous industrial wastes have been dumped into isolated mineshafts, into local streams, into poorly run landfills and onto derelict land. These wastes cause damage to populations living nearby and cause widespread contamination of the environment.

Chemical waste dumps in the Love Canal, a suburb of Niagara city in the USA has caused untold miseries on the local population. In the summer of 1978, the chemical started overflowing in the area, due to water seepage in the dump site. After an enquiry, Governor Carey of New York state ordered the evacuation of all the 235 families from the area. Shortly afterwards President Carter declared Love Canal a federal disaster area. This was the first ever instance of a national emergency being caused by Chemical pollution.<sup>18</sup>

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17. Bourne, n.7, p.44.

18. Hildyard, n.2, p.27.

In the USA waste disposal sites are now being considered as Locally Unwanted Land Uses (LULUs). Waste disposal is causing damage to the land and health of the developed as well as developing countries.

#### ATMOSPHERIC POLLUTION

Earth's atmosphere extends around 600 miles from the Earth's surface into space 78 per cent of air consists of inert nitrogen, 21 per cent of oxygen, and remaining 1 per cent by a number of other gases. The atmosphere contains four main layers : the Troposphere, Stratosphere, Mesosphere and Thermosphere. Most of the mass of the earth is in the troposphere and this is the region, where pollution level is the highest. Atmospheric pollution is caused by the following processes -

- a] emission of gases and particulates from fossil fuel combustion;
- b] burning of forests and grass land fires;
- c] ploughing and overgrazing, which releases dust that rises in dry and windy weather.<sup>19</sup>

Among the serious effects of atmospheric pollution the greenhouse effect, Ozone Layer depletion and Acid rain can be counted.

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19. Bourne, n.7, p.102.

*Greenhouse effect* - Carbon dioxide along with water vapour, ozone and a variety of other trace gases is a key factor in determining the thermal structure of the atmosphere. These greenhouse gases are fairly transparent to increasing solar radiation but relatively opaque to longer wave thermal radiation from the earth's surface. Thus the increasing concentration of these gases in the atmosphere causes heating of the atmosphere, because of the loss of the thermal radiation from land and water surface to the space will drop significantly.<sup>20</sup>

Combustion of fossil fuels emit about 5 billion tons of carbon. Forests play an important role in the carbon cycle. Forests and their soil has been a net source of CO<sub>2</sub> in the atmosphere. Currently about 1 billion to 2 billion tons of carbon is annually released in the atmosphere, of which 80 per cent is due to deforestation.<sup>21</sup>

The atmospheric concentration of CO<sub>2</sub> has increased by nearly 25 per cent, since the industrial revolution, and by over 10 per cent since 1958 alone.

The concentration of other greenhouse gases like methane, chlorofluorocarbons and tropospheric ozone is also

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20. *The State of the World Environment 1987*, n.9, p.10.

21. *ibid.*, p.10.



increasing. Although the concentration of these gases is much less compared to CO<sub>2</sub>, they are rising more rapidly. Their effect can also be more pronounced. Molecule for molecule chlorofluorocarbon produces 10,000 times the greenhouse effect of CO<sub>2</sub> in addition to depleting stratospheric ozone.

According to Donald Blake and F. Sherwood Roland of the University of California the average global methane concentration of 1.69 parts per million is 11 per cent higher today than it was a decade ago. Methane too like CO<sub>2</sub> traps the outgoing radiation and warms the planet. Greenhouse effect is expected to raise global mean temperature by 1.5 to 4.5 degrees celsius. This rise in temperature is believed to raise the sea level between 20 and 140 centimetres. This can adversely affect the coastal areas and estuaries.<sup>22</sup>

*Ozone Layer Depletion* - In the stratospheric region of the earth, strong ultraviolet radiation from the sun dissociates oxygen molecules to form ozone. Ozone absorbs ultraviolet radiation and effectively shields the surface of the earth from more harmful radiations. Chlorine containing substances like chlorofluorocarbons are used

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22. UNEP NEWS, No.15, May/June 1987, p.5.

many day to day activities and are released into the atmosphere in this process. In the stratospheric region they are decomposed into chlorine by the ultraviolet radiation of the sun. And chlorine acts as a catalyst in ozone destruction process.<sup>23</sup> Destruction of ozone would lead to a net increase in solar ultraviolet radiation, with biological effects such as skin cancer, reduced growth of crop plants and damage to marine living resources.

Recent measurements have indicated considerable decrease of ozone above Antarctica. In the lower stratospheric region of Antarctica, the decrease of about 40 percent in total column of ozone has been noticed.<sup>24</sup> The growing hole in the earth's ozone layer over Antarctica each spring suggests a gradual global depletion.<sup>25</sup> Recently NASA reports suggest that the northern hemisphere too is experiencing a decline in atmospheric ozone. Recognition of the dangers of ozone layer depletion led to the adoption of Vienna Convention for the protection of ozone layer in 1985.<sup>26</sup> Then, in September 1987, in Montreal an international accord was signed to limit the production of chlorofluorocarbons, so that ozone layer could be protected. These accords provide

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23. The State of the World Environment 1987 n.9, p.13

24. *ibid.* p. 14.

25. *Brown et al*, n. 13, p. 14

26. The State of the world Environment 1987, n.9, p. 14..

a model for future agreements.<sup>27</sup>

*Acid Rain* - The ever increasing demand for energy results in more burning of coal and oil. This releases sulphur and nitrogen compounds in the atmosphere. The minute particles of sulphur-dioxide and nitrogenoxide react with water and sunlight to form droplets of sulphuric acid and nitric acid.<sup>28</sup> This returns to earth in the form of acid rain. Scandinavian countries were the first to raise the problem of acid rain at the UN Stockholm Conference (1972). Here, the problem was recognized as an international environmental issue. More recently, it has been found that acidic precipitation occurs also in Japan, India, China and some developing countries in Asia and Africa.<sup>29</sup>

Acid rain threatens the economic resources of fisheries, forests, agriculture and wildlife. In Ontario, Canada, over 300,000 hectares of about 11,400 lakes are considered to be at moderate to high risk. If the current level of wet deposition of sulphates which is more than 20 kgs/hectare annually is maintained, then 40,000 more lakes are at risk.<sup>30</sup> Similarly, hundreds of lakes in parts of Scandinavia, the north-east US, South-east Canada

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27. *Brown et al., n.13, p.13*

28. *Hildyard, n.2, p.126.*

29. *The State of the World Environment 1987, n.9, p.5.*

30. *UNEP News, March/April 1987.*

and South-west Scotland have been affected by acidic precipitation. Forests are the worst hit by acid rain. Acidic deposition is largely responsible for the dieback of European forests. Some 7 million hectares of which in 15 countries were affected in varying degrees by 1985.<sup>31</sup> Acidic deposition affects forests either directly by acting as the foliage or indirectly by changing the properties of the soil. Acidification of the soils, because of the sulphur and nitrogen compounds in acid rain, causes the release of some toxic elements like Aluminium. These are absorbed by the plant roots. Their accumulation can prove toxic. As soil becomes acidic, other requirements of the plant like calcium become less available. Thus trees suffer from nutritional deficiencies.

In Federal Republic of Germany, about 50 per cent of the total forest area was damaged to varying degrees. Of this 15 per cent was severely damaged and dead.<sup>32</sup>

Acidification of water makes them dead. Decrease in fish population has been noticed in acidified lakes. The reason is that the microscopic plants on which some fish feed cannot live in acidic waters. This fact has been proved in many lakes of Scandinavia, north-east USA and Canada.

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31. *ibid.*, May/June 1987.

32. *The State of the World Environment 1987*, n.9, p.9.

## EFFECTS OF POLLUTION ON WATER

Due to human activities enormous quantity of wastes is entering the hydrosphere. These wastes are polluting the oceans, seas, rivers, lakes and underground water. 97 per cent of earth's water is in the ocean and 3 per cent in land. Of the latter, 77 per cent is stored in ice caps and glaciers and only 22 per cent is present in lakes, rivers and streams.

Global water uses can be broadly classified in three main categories : irrigation (73 %), industrial uses (21%) and public use (6%). In the developed countries, industries account for 40% or more water use.<sup>33</sup> Our hydrosphere is being polluted by the dumping of human, industrial and agricultural wastes, oil, pesticides, nitrates, metals like lead, mercury and scores of other substances. These later accumulate into seaweed, in plankton, and in fish and ultimately return to man again like an 'evil boomerang'.<sup>34</sup>

*Sea Pollution* - Our seas are being polluted by pesticides, industrial waste dumping, oil and radioactive wastes. In America, major fish kills in the Mississippi

33. *ibid.*, p.15.

34. *I. Laptev, The World of Man in the World of Nature*  
[Moscow, 1979], p.19.

have now been traced to the tons of pesticides washed off the surrounding farmlands.<sup>35</sup> Organochlorine pesticides and polychlorinated biphenyls (PCBs) were found to be widely distributed in the sea. Various industries like-plastics, paints, lubricants etc. use polychlorinated biphenyls, which was the basic cause of Irish seabird disaster in the autumn of 1969. This disaster had killed some 10,000 seabirds.<sup>36</sup>

Industry has been using the seas as a convenient and cheap dumping site for its most dangerous wastes. Every year Britain alone dumps nearly 124,000 tons of mixed industrial and domestic wastes into the Irish sea; 29,000 tons into the Bristol Channel; 288,000 tons into the North sea; and 86,000 tons into the English channel. Some 430,000 million tons of pollutants are dumped, into the sea each year via the rivers of Europe which include phosphorus, zinc, chromium and raw sewage.<sup>37</sup>

The Japanese town of Minamata, on the island of Kyushu experienced the serious effects of marine pollution in the 1950s. A plastics factory in the town, discharged large quantities of wastes containing mercury into Minamata bay. Between 1953 and 1960, 43 people in Minamata died of a

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36. *Bourne, n.7, p.71.*

37. *Hildyard, n.2, p.24.*

strange disease and further 68 were permanently disabled.<sup>38</sup>

*Oil Pollution* - Oil is another factor of pollution in the sea. Because of the vast increase in oil production over the past fifty years, and the consequent increase in the amount of oil carried by sea, pollution of the sea by oil has increased. Oil pollution causes death to sea birds and damages marine plant and animal life. This can eventually lead to a fall in the productivity of the sea. Roughly 1.6 million tons of oil is annually discharged into the sea by shipping.

*Nuclear Waste Dumping* - Many European countries have been dumping low level radioactive wastes in an area of the Atlantic ocean at a depth of 4,000 metres. Between 1967 and 1982, about 94,000 tons of nuclear wastes were dumped. Dumping in Atlantic was halted in 1983. Again in November 1986, radioactive waste dumping in the South Pacific region was also prohibited by a convention.<sup>39</sup>

*Fresh Water Pollution* - Fresh water supplies of the planet has been polluted by sewage, industrial wastes and fertilizers and pesticides. Untreated sewage demands the larger part of oxygen from water. Thus the aquatic life suffers.

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38. Bourne, n.7, p.71.

39. The State of the World Environment 1987, n.9, p.19.

Pesticides find their way into rivers through the farmlands. In Dec. 1975, all fishing was banned in the James river, Virginia, after the US Environmental Protection Agency (EPA) discovered high levels of the pesticide Kepono in fish and mud samples.<sup>40</sup>

Another incident of fresh water pollution occurred in China in Jan. 1987. More than 15,400 people in the north China province of Shanxi suffered poisoning after a fertilizer factory released chemicals into a river used for drinking water. Pollution of Rhine river in November 1986, killed thousands of fish. More than 10 tonnes of poisonous chemicals had washed into the river Rhine from 1200 tonnes of stored chemicals in the Sandoz Chemical plant, near the Swiss city Basel. This killed fish and polluted the water supplies. In December 1986, twenty tonnes of dead-fish were dragged from the river Guadiana in western Spain after toxic wastes spilled into the river.<sup>41</sup> Nearly 38,000 tonnes of chemicals are dumped yearly in the river Mississippi in USA.<sup>42</sup>

Fresh water pollution has caused the death of thousands of lakes in the developed north biologically.

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40. *Hildyard, n.2, p.26.*

41. *UNEP News, March/April 1987, Supplement p.2.*

42. *ibid., Supplement p.4.*



Now the groundwater is also not free from contamination. Some 50 pesticides contaminate groundwater in 32 American States.<sup>43</sup>

### CONCLUSION

It has been established and proved that the planet's life support systems of land, water and air are being polluted at an alarming rate. The present model of growth seeks 'profit' very often by ruining the life support systems of the earth. Right from the evolution of human species, we have enjoyed the gifts of free air and free water. Our economics didnot consider them wealth and so no price was fixed for them. But irrespective of their free supply, they are immensely important for prepetuation oflife on this planet. Mismanagement of these resources in the technological and industrial process has now brought us on the verge of environmental bankruptcy. Now the land, air, oceans, rivers - everything stands polluted and we have started realising the importance of these free gifts of nature.

*Coping with pollution*, has become an urgent necessity. Although the problem is more acute in the industrialised world, developing nations are also coming heavily under its grip. The genesis of the problem

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43. *Brown et al., n.13, p.14.*

can be traced to our confused path of development. The western model of development is based on increasing consumption, and maximum use of resources and energies. The result of this kind of development has been comforts for some; pollution and danger to survival for all. When the intrepid voyager Thor Heiferdahl cross the South pacific 15 years ago, he found it 'shining one' clear from coast to coast. On his recent journey across the 'developed' Atlantic, he reports refuse, bilge and broken bottles all the way.<sup>44</sup>

Coping with pollution requires a broad spectrum approach. This should include firstly, pollution control devices, to deal with the problem immediately. Economics should be wedded to Ecology. While establishing industries, care should be taken to check its harmful effects. Measures to control pollution should be strictly enforced. Secondly, the problem should be considered at the governmental level. Cognitive elements should guide the policy makers in decision making. Myopic ideas of immediate gains should not blurr their vision from future interests of these gains. Thirdly, there should be international action to deal with problems of pollution. Problems of Acid rain, ozone layer depletion and water pollution donot respect national

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44. *Lester B. Pearson, The Crisis of Development [London, 1970], p. 7-8.*

boundaries. They have to be tackled by the whole world in unison. Montreal accord 1987, to protect the ozone layer is a development in the right direction. In March 1989, a treaty has been signed by more than 100 countries, in Basel on the disposal of hazardous wastes.<sup>45</sup>

But the main problem facing the implementation of these treaties is the inequality prevalent in the world. 90 per cent of the 400 million tonnes of hazardous wastes produced every year comes from industrial nations. The developed nations often resort to the practice of dumping of these wastes in the IIIrd world countries.<sup>46</sup>

Fourthly, Public awareness needs to be generated and made vocal. Technological and industrial developments are there for the benefit of people. If people stand convinced of some objectionable developments, they can influence the policymakers to shun those paths.

The UNEP report, ' The World Environment 1972-82', observes that during the decade 1972-82, industry as a source of pollution came increasingly under scrutiny and criticism. But industry was considered as only one source of pollutants. The belief that industrial activities help

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45. Times of India [New Delhi] 27 March 1989.

46. *ibid.*

in raising the living standards in most countries, has caused the laxity in controls. In the developing world, economic growth takes first priority. Environmental management is considered a luxury.<sup>47</sup>

By 1980, systematic analysis of the full range of social costs and benefits of such pollution control measures started taking place. Industries started taking efforts to introduce new production techniques, choose alternative materials and treatment of wastes in order to reduce or eliminate harmful effects to people and eco-system. The process of pollution control has started recently and till now is inadequate to cope with the harmful effects.

We have reviewed the major findings on the subject of Pollution and these provide some sobering conclusions. The role playing by political leaders has been chiefly in terms of political and military power. Unless their world-view is changed and they start taking seriously the likely results of global warming, the political leaders will continue to ignore the consequences of the threatened climatic changes.

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47. Martin W. Holdgate, Mohammad Kassas & Gilbert F. White, eds. , The World Environment 1972-82, A Report by the UNEP [Dublin, 1982], p.406.

The current theories of international politics and global security have ignored how environmental factors influence man's development and how human activity is changing our environment. According to William L. Thomas Jr. "Man, the ecological dominant on the planet, needs the insights of scholars in nearly all branches of learning to understand what has happened and is happening to the earth under man's impress". He goes on to recognise the important fact that "The dichotomy of man and nature is thus seen as an intellectual device and as such should not be confused with reality; no longer can man's physical-biological environment be treated except in theory, as "natural".

In the study of international relations the pressing issues of survival have been sidetracked on account of a value bias which continues to lead to an inadequate awareness of not only air pollution, but irreversible effects like the rise in sea level and extinction of species. An accurate conceptual and empirical analysis of international relations which would be relevant from the Third World point of view cannot ignore the tragic consequences for poor countries of climatic change. It is not enough that scientific insights are now available into the extent of atmospheric CO<sub>2</sub> or more data is now being gathered on the complexity of methane production, we have

to consider the steps necessary for achieving international relations in which human behaviour is guided by enlightened choices. The unstable equilibrium of the human being in the natural environment, must, therefore, become the point of departure for the new modes of discourse in international politics, which should deal with the moral right of the global community to constrain the technological civilisation from the suicidal and compulsive path of pollution.

Chapter - III  
Impact of nuclear power generation  
and nuclear weapon development on  
the environment

Many years of researches and experiments in nuclear sciences resulted in the "Trinity" test, conducted at Alamagordo Air base New Mexico, in July 1945. Albert Einstein, the noted scientist remarked shortly after the explosion of the first atombomb that we have to change our ways of thinking. He even predicted a grim future for the mankind -

*"The unleashed power of the atom has changed everything save our modes of thinking. We thus drift towards an unparalleled catastrophe"<sup>1</sup>*

In this chapter, the effects of Atoms for War and Atoms for Peace on the environment will be discussed. First of all, a brief description of the development of this technology.

The beginning of the development of nuclear power can be traced to the experiments by Ernst Rutherford, head of Cavendish Laboratory, Cambridge in 1919. He observed that radio active decay of radium, colliding with nitrogen causes emission of alpha particles. He noted the presence of protons too, which were knocked out from the nuclei of nitrogen atoms. Thus he succeeded in breaking the atom.

The success in splitting the Uranium atom into two parts was achieved in 1939 by Otto Hahn and his colleagues at the Kaiser Wilhelm Institute in Berlin.

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1. Sidney D. Drell, Facing the Threat of Nuclear Weapons  
[Washington, 1983], p.4.



In this process of atomic fission, large amount of energy was released. Enrico Fermi, the nobel prize winning physicist from Columbia University, thought of utilising the neutrons emitted from uranium atom splits, for starting a self-sustaining chain reaction. On 2 December 1942, the 'atomic pile' kept in a squash court at Columbia University produced a self-sustaining chain reaction.

Meanwhile World War - II was going on. In that atmosphere of conflict, both the alliance system were trying to develop atomic weapons.<sup>2</sup> Fermi, Bohr and other physicists came to know that a special institute at Berlin is working for the creation of atom bombs. They induced the noted scientist Albert Einstein to write a letter to President Roosevelt stressing the urgency of developing atomic bomb.

President Roosevelt responded quickly to the appeal of the scientists and by August 1942 the 'Manhattan Project' came into being. Plants were constructed for the production of Plutonium and Uranium 235. The designing of the atomic bomb started at the new Los Alamos Laboratory (New Mexico) under the guidance of Robert Oppenheimer.<sup>3</sup>

The World's first nuclear test known as 'Trinity' was conducted at Alamagordo, Airbase New Mexico, on

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2. Joseph Camilleri, The State and Nuclear Power  
[Washington, 1984], p.8.

3. Jawaharlal Nehru, Nuclear Explosion and Their Effects  
[New Delhi, 1956], p. 2

16 July 1945. Major General Leslie Grove, who commanded the Manhattan Project described the event as follows :-

*"First came the burst of light of a brilliance beyond any comparison....About 40 seconds later came the shock wave followed by the sound, neither of which seemed startling after our complete astonishment at the extraordinary lighting intensity. A massive cloud formed which surged and billowed upward with tremendous power reaching the sub-stratosphere in about five minutes. The cloud travelled to a great height first in the form of a ball, then mushroomed, then changed into a long trailing chimney shaped column."* <sup>4</sup>

The director of Manhattan Project, Robert Oppenheimer too was amazed to see the trinity explosion and uttered these words from Bhagvad Gita -

*" I am become death - the shatterer of worlds".*

Oppenheimer's fears were proved three weeks later, when on August 6, 1945 Hiroshima was devastated by U-235 bomb and Nagasaki met its end on Aug 9, 1945 through a plutonium 239 bomb.

As soon as the IIInd World War ended, differences between the USA and USSR reappeared in the form of cold war. This atmosphere of hatred and suspicion gave a decisive boost to nuclear arms race. The military mind was still wedded to classical theories of international security through alliances, balance of power and war.

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4. Jim Falk, Global Fission [Melbourne, 1982], p.14.

These theories were applicable when weapons of war had limited destructive power.<sup>5</sup> Soviet Union joined the nuclear arms race in 1949, ending the American monopoly. France and China exploded their nuclear devices in 1960 and 1964 respectively. Since then, the self-perpetuating dynamics of the global nuclear arms race seems to have taken a life of its own. In all human history this type of spiralling and unending arms race was never witnessed in peace time, as we have seen in the years following IIInd World War.

After the Fission bombs, came the time of Fission-Fusion-Fission bombs. These thermonuclear bombs are also known as hydrogen bombs. In this type of bomb, initial fission explosion of Uranium 235 or Plutonium causes the fusion of a mixture of heavy varieties of hydrogen-deuterium and tritium. This fusion process releases neutrons, which are utilised to split the nuclei of the normally nonfissionable U-238. The atmospheric contamination resulting from large scale thermonuclear explosion can be catastrophic.<sup>6</sup>

The Bikini series of Hydrogen bomb tests in the Pacific in 1954, proved the disastrous power of the 'dirty' bomb. The residual radioactivity on the

5. Rikhi Jaipal, Nuclear Arms and the Human Race [New Delhi, 1986], p.40.

6. Palmer and Perkins, International Relations [New Delhi, 1985], p.724.

fallout from these bombs are more ominous than the immediate effects- blast, heat and immediate radio-activity. Bikini series of tests generated powerful forces of 15 to 20 megatons, which was 750 to 1000 times more powerful than the Hiroshima bomb. The fallout from one 15 megaton test in this series of tests covered an area of 7,000 sq. miles.<sup>7</sup> 20 people on board a Japanese fishing boat - 'Lucky Dragon' were badly affected by the fallout. USA had tested hydrogen bomb in Nov 1952, followed by the USSR in 1953 and China in 1967.

Researches continued on the 'clean neutron bomb' or enhanced radiation weapons. The idea was to miniaturize the fission (atomic) trigger for a small H-bomb and by not surrounding the bomb with the shell of U-238. This will reduce the amount of longlived radiation particles in an explosion. This weapon gives off heat, blast and neutron particles, the radiation effect of which is short lived and prompt. It was invented in 1958 by Edward Teller. This bomb is known to destroy people only and not the buildings. President Reagan has decided to include advanced radiation weapons in the US arsenal.<sup>8</sup>

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7. Solly Zuckerman, Nuclear Illusion and Reality  
[London, 1982], p.113.

8. Michael Stephenson and John Weal, Nuclear Dictionary  
[London, 1985], p.52-53.

President Reagon announced his 'Star Wars' or Strategic Defence Initiative (SDI) programme on 23 March 1983. This is intended to build a ground based and space based Ballistic Missile Defence (BMD) shield over the US territory against the Soviet strategic missile attacks. Research is still continuing on this programme.

Besides the researches in weapon technology, the delivery capability was also being remodelled. In 1957 Soviet Union tested an Inter Continental Ballistic Missile (ICBM). Then came the SLBMs, strategic intercontinental bombers, the MIRV-ing missiles etc.

#### *Nuclear Weapons and the Environment*

When the story of nuclear bombs begins fate of Hiroshima and Nagasaki occupy our minds. The bomb named 'Little Boy', having an yield of 12 Kilotons was dropped on Hiroshima in the morning hours. The blast from the explosion, flattened most of the city, crushing thousands to death. A fire-storm developed followed by a tornado. Then 'black-rain' fell over an area of 400 Sq. Kms., causing a chilling drop in the mid-summer temperatures. The Japanese estimated that by Dec. 1945, 140,000 people had died as a result of the bomb. But the number of deaths caused by delayed effects of radioactivity continue to

this day. By 1980, this delayed total stood at 97,964.<sup>9</sup>

Nagasaki bomb was named 'Fatman' and was dropped on 9 August 1945. About 70,000 people died instantly. The radioactive effects were same as Hiroshima.

The Hiroshima bomb was a fission device of about 12 Kiloton yield, the explosive equivalent of 12,000 tons of TNT. An ordinary thermonuclear weapon now has a yield of 500 kilotons or 0.5 megaton (a megaton being the explosive equivalent of a million tons of TNT). There are many weapons in the 9 to 20 megaton range in the arsenals of USA and USSR.

Strategic nuclear weapons are delivered by ground based or sub-marine launched missiles or by bombers. Weapons having yield equal to Hiroshima bomb are today assigned to 'tactical' or 'theatre' military missions.<sup>10</sup>

The World now has nearly 15,000 megaton weapon capacity. If this stockpile is used in a global nuclear war, then apart from losses in terms of men and material, these could bring in severe changes in climate which will be disastrous for the combatants and non-combatants alike.

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9. *ibid.*, p.78.

10. Carl Sagan "Nuclear War and Climatic Catastrophe : Some Policy Implications", *Foreign Affairs*, vol.62, No.2, Winter 1983/84, [New York], p.260.

Nuclear overkill capacity can wipe out entire world population 12 times over. The World War - III, if it will occur will prove to be 'a war, to end all wars, all peace and all human life on this planet.'<sup>11</sup>

The devastating capability of nuclear arms was admitted by scientists as early as 1946, when an Emergency Committee of Atomic Scientists with Enistain as its Chairman discussed the possibility of destruction of our civilisation in the event of atomic war. Bertrand Russell and Albert Einstein issued a manifesto in 1955 for the abolition of war. They found 'all equally in peril' in case of a thermonuclear war. In response to Russell - Einstein manifesto, Pugwash movement was founded in 1957.

In August 1980, at the Pugwash conference on Science and World Affairs medical doctors from countries, including UK, USA and USSR issued a warning that the medical response will be grossly inadequate to meet the demands in the situation of a nuclear war.<sup>12</sup>

The direct effects of nuclear explosions include the heat and light blast and radiation. About 35 per cent of a nuclear fireball's energy takes the form of intense

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11. *J.N. Singh, Nuclear and Thermonuclear World War [New Delhi, 1982], p.2.*

12. *Stephenson and Weal, n.8, p.128.*

heat and light - the heat flash. This would ignite most combustible materials within the fire zone. The fires at Hiroshima caused upto 50 per cent of the fatalities. With the increase in weapons power, the relative intensity of thermal radiation has increased. This factor will cause a large number of direct casualties in case of nuclear war.<sup>13</sup>

Blast from a nuclear explosion can crush buildings on the one hand and generate dynamic pressure or drag pressure on the other. The last direct effect - initial radiation, consisting of deadly neutrons and gamma rays is intense, short lived and limited in range.

Sakharov believes that - the direct consequences of nuclear explosions are no doubt appalling but the indirect effects will be even more substantial. The indirect effects could be fatal for modern society, which is extraordinarily complex and thus highly vulnerable.<sup>14</sup>

The dangerous ecological consequences include the following points according to the assessment of Andrei Sakharov -

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13. *Drell, no.1, p.98.*

14. *ibid., p.99.*



1. Continuous forest fires could destroy a greater part of the planet's forests. The smoke generated would destroy the transparency of the atmosphere. A night lasting many weeks would ensue on Earth followed by a lack of oxygen in the atmosphere. This factor alone could destroy life on the planet.
2. High altitude nuclear explosion in space, particularly the thermonuclear explosions of ABM missiles could possibly destroy the ozone layer which protects the earth from the ultraviolet rays of the sun.
3. Disruption of communication and transportation could prove critical in the complex modern world.
4. There will be disruption in production and distribution of food, water supply, medical facilities etc.
5. Hunger and epidemics could take more life than the direct explosion.
6. Universal chaos will prevail and there will be no social stability.

An all-out nuclear war would mean destruction of the civilisation . There cannot be any victor in the situations of 'collective suicide'.

Various studies and reports have come which conclude that undertaking a nuclear war will be a futile exercise.

The publication of "The Atmosphere After a Nuclear War : Twilight at Noon" by Crutzen and Birks (1982) marked a turning point in the consideration of the indirect effects of a large scale nuclear war.<sup>15</sup>

They concluded that nuclear explosions would burn the forests, the smoke will obscure the skies over vast areas, producing darkness at noon. This will alter the weather and influence the climate.

Climatic effects of massive smoke injection were further explored by the TTAPS group in 1983. The name of the paper came from the initials of the scientist's names - R.P. Turco, O.B. Toon, T.P. Ackerman, J.B. Pollack and Carl Sargan. They opined that soot from the burning of cities is more important than forest fires. The long term cooling of the Earth's surface was named as 'Nuclear Winter' by R.P. Turco.

According to the TTAPS group the four principal adverse environmental consequences in the aftermath of a nuclear war include - obscuring smoke in the troposphere,

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15. *UN Study, "Climatic and other Global Effects of Nuclear War", Disarmament, vol.XI,no.3, Autumn 1988 [New York], p.128.*

obscuring dust in the stratosphere, the fallout of radioactive debris and the partial destruction of ozone layer. The high temperature generated by the explosion ignites some of the nitrogen in the air, producing oxides of nitrogen which destroy the stratospheric ozone. This will increase the flux of ultraviolet radiation on the earth's surface. Nucleic acids and proteins, the fundamental molecules for life on earth, are especially sensitive to ultraviolet radiation.<sup>16</sup>

Works by Paul R. Ehrlich and nineteen other distinguished biologists demonstrates that the predictions of TTAPS group mean nothing less than the extinction of much of the earth's biosphere, very possibly involving the Southern hemisphere as well as the Northern.<sup>17</sup>

In early 1983, the US department of Defence Commissioned a major study by the National Research Council of the US National Academy of Sciences. They too substantiated the nuclear winter concept.

The USSR academy of sciences also examined the physical, chemical and biological consequences of nuclear war involving 5,400 megatons of total explosive yield and stated that -

*"the main conclusion from our study is that even the most 'optimistic' scenarios of the consequences of nuclear conflict would inevitably result in global ecological and demographic crisis."* <sup>18</sup>

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16. Sagàn, n.10, p.263.

17. Paul Ehrlich et al., Nuclear Winter [London, 1984], p.xxi.

18. Disarmament, n.15, p.143.

The Scientific Committee on the Problems of the Environment (SCOPE) initiated a project to study into the environmental consequences of nuclear war, entitled SCOPE-ENUWAR. Over 300 scientists from over 30 countries participated in the preparation of a 2-volume, 882 page report published in 1986.

The report concluded its findings in these words -

*".....the indirect effects on population of a large scale nuclear war, particularly the climatic effects caused by smoke, could be more consequential globally than the direct effects and the risks of unprecedented consequences are great for non-combatant and combatant countries alike." 19*

The SCOPE-ENUWAR project convened workshops at Bangkok in Feb. 1987 at Geneva, in Nov. 1987 and in Moscow in March 1988, to consider more recent results. These supported earlier SCOPE-ENUWAR assessments of the impact of nuclear war on climate.

Recent work presented at the SCOPE-ENUWAR workshop in Moscow in 1988 suggests that these effects might be compounded by a decrease in rainfall of as much as 80 per cent over land in temperate and tropical latitudes. Production and survival of the natural ecosystems would be threatened by decrease in sunlight, fall in temperature and suppression of precipitation and summer monsoons. Over and above this, the situation will be worsened by Chemical pollutants,

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19. *ibid.*, pp 143-144.

increase in ultraviolet radiation, and the likely persistence of radioactive 'hotspots'.

All these reports convince that the danger of a nuclear war has really united the world. Till now, the international community of statesmen, diplomats and military analysts has tended to regard the prospect of nuclear war as a problem only for the adversaries in possession of the weapons. Now all that has changed. There is no nation on Earth free of the jeopardy of destruction, if any two countries or group of countries embark upon a nuclear exchange. Nuclear war between USA and USSR can cause the same long term effects on countries like Sweden and Switzerland, West Germany, Australia, Newzealand, Brazil etc.

In this context, looking back at the history of human civilization, may provide us a very important lesson. The last great extinction of planetary life occurred around 65 million years ago, when the dinosaurs and numberless other terrestrial and marine creatures vanished all at once. That event is generally believed to have been caused by massive explosion of dust, blotting out the sun for a long enough period, to bring photosynthesis to a halt, probably as a result of an asteroid collision with the earth.<sup>20</sup> It is ironic that we human beings, with full knowledge of the consequences are still going in the direction of doom.

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20. Ehrlich et al., n.17, p.XXIII.

*Nuclear Power and Environment*

Despite its origin during the IIInd World War and its utilisation for making bombs, nuclear power raised many hopes in the minds of people. People hoped that "Splitting the atom will prove the greatest invention in 1000 years". This hope is clearly visible in the book, *Atomic Energy in the Coming Era*, published in 1945, written by David Dietz -

*"Planes carrying several thousand passengers with as much cabin space as a luxury liner will make non-stop flights from New York to India or Australia. Instead of filling the gasoline tank of your automobile two or three times a week, you will travel for a year on a pellet of atomic energy of the size of a vitamin pill... Universal and perpetual peace will reign in the era of atomic energy....with energy as abundant as the air we breathe, there will be no longer any reason to fight for oil or coal."* 21

Enthusiasm for the peaceful uses of the atom got a further momentum with President Eisenhower's "Atoms for Peace" speech to the UN General Assembly on Dec 8, 1953. In that address, Mr. Eisenhower proposed for setting up of the International Atomic Energy Agency to redirect nuclear technology from military to peaceful purposes.<sup>22</sup>

Then began a period when every country on earth entertained ambitions to develop nuclear power. At present

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21. *Falk, n.4, p.18.*

22. *John J. Berger, Nuclear Power, the Unviable Option [California, 1979], p.219.*

nearly 400 reactors are being operated in 26 countries. Generation of electricity as a convenient form of energy had been at the root of this enthusiasm. The oil crisis of the 70s gave a boost to the development of atomic energy. Nuclear generated electricity in percentage of the total, for some of the countries is as follows -

*France, 69.8%; Belgium, 67.0%;*

*Sweden, 50.3%; Taiwan 43.8%;*

*USA 16.6% and USSR 10%.<sup>23</sup>*

Development of nuclear energy has not been free from disasters and accidents. Windscale fire in Britain in 1957, the Threemile Island meltdown in the USA in 1979, and Chernobyl reactor accident in 1986 can be counted as the serious accidents. Chernobyl's reactor accident has begun a genuine debate as to the desirability of nuclear energy. Some people go to the extent of saying that after Chernobyl, nuclear power reactors are like the cancer patients who have suffered a heart attack too.

But still the advocates of nuclear power argue that the environmental and health impacts of nuclear power industry are lesser than those of coal plants which kill thousands of people every year through air pollution.

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23. *Christopher Flavin, "Chernobyl's Political Fallout", Socialist Affairs April, 1987, p.6.*

To counter this charge, let us consider the unique risks associated with nuclear power. These can be kept in three categories -

- a] Radiation
- b] Wastes and
- c] Accidents

*Radiation hazards -*

Dr. Helen Caldicott, in her paper "What physicians should know about nuclear power" sums up radiation hazards as follows<sup>24</sup> -

*Mining* - The mining process of uranium, results in the emission of radioactive gas radon, which is inhaled by the miners. After four days radon converts to Lead-210, which remains radioactive for more than 100 years. Because radiation in the body is carcinogenic, it has been discovered in the USA that upto 20 per cent of uranium miners die of lung cancer over a 20 year period of mining.

*Milling* - After mining, uranium ore is milled and refined. Thousands of tons of waste ore (tailings) are discarded and left lying in huge heaps on the ground. The waste uranium in tailings keeps on emitting gas radon.

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24. *Helean Caldicott, Power Corrupts [London, 1981], p.14.*



*Enrichment and fuel fabrication* - The uranium then needs to be enriched and fabricated into fuel rods, which are transported to the nuclear reactor and placed in the reactor core. The fission process of uranium produces heat which is utilised to generate electricity. In this process, uranium produces many by-products which are called wastes of nuclear power. Once a year, one quarter of the rods are removed from the reactor, because their generating life ends. The rods are both thermally and radioactively very hot and must be cooled in cooling ponds containing water. They now contain a very large number of biologically dangerous radioactive materials including strontium-90, iodine-131, cesium-137 and plutonium. Then these rods are sent to reprocessing plants.

*Reprocessing* - Plutonium is removed from the solution in powder form. It will then be used as fuel for fast breeder reactors. Plutonium is a cancer producing material. Named after Pluto, the God of the dead and ruler of the underworld, it enters the body by inhalation. Plutonium has a half-life 24,400 years (half life of a radioactive substance is the period of time for half of a given quantity to decay, and a similar period for half of the remaining radioactivity to decay). Therefore, radiation from man made plutonium exists on earth for at least half a million years. More plutonium is produced than can be

utilized. There are no safe methods available for the storage and disposal of plutonium at this time.

*Wastes Storage* - After the extraction of plutonium from radioactive wastes, the remaining solution of iodine, strontium-90, cesium etc. is very hot. It is kept in tanks and cooled continuously for years. If by any chance a leak occurs in the tanks storing this fluid, it can contaminate the water systems of the planet. Radioactive iodine, strontium-90 and cesium are absorbed by roots of grass and vegetables, and further gets concentrated in flesh and milk of animals.

Both civilian and military uses of atomic energy produces radioactive wastes. No foolproof method of waste management has yet been found. Most of the high level waste is stored; not disposed of, and with the exception of Sweden, the nuclear countries have made little progress towards an ultimate solution of the waste problem. Sweden aims to clear away nuclear power by 2010.<sup>25</sup>

In other nuclear power states, no serious thought has been given for management of wastes. In USA huge sums are spent on waste management. Roughly 45 cents of each dollar spent to make bomb grade material now goes toward managing wastes. In short, clean up and waste handling

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25. *Andrew Homes, "Promises Unfulfilled",  
Socialist Affairs, April 1987 [London], p.14.*

operations already consume nearly One billion dollars yearly. But even this huge amount is unable to prevent the risks. Recently an independent study team from the University of New Mexico discovered that waste was seeping into the deep underground salt caverns from the walls and from a ventilation shaft. A release of radioactive particles could potentially contaminate ground water and nearby rivers.<sup>26</sup>

Earthquakes and explosions pose further threats from the radioactive wastes. The radioactive waste interacts with water and chemicals to form hydrogen and organic vapour which could explode. Explosion of waste-tank would send massive amounts of radioactive materials spewing into the air and onto the ground. A massive explosion of radioactive wastes had occurred in the USSR in 1957. In the Urals, this explosion contaminated, a large area and may have killed many people. Similarly an earthquake can destroy waste tanks and create havoc.

Most of the hopes of the nuclear energy supporters lays shattered now. Nuclear energy was supposed to be clean, cheap and safe. It had proved to be none of these things.

*Danger of Nuclear Accidents :-* Accidents in the nuclear power stations can cause an environmental catastrophe.

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Accidents can be caused by human error, failure in the technology or even some characteristic of the nuclear fission process. There is a horrifying catalogue of accidents in nuclear power stations. Windscale, Three mile Island and Chernobyl can be counted among the three important accidents.

Three mile Island accident occurred on 28 March, 1979 and Chernobyl accident occurred on 29 April, 1986. Main cause of both these accidents was human error. This proves that human beings who manage and operate the plants, constitute an important safety system, and human beings are prone to make mistakes.

*Conclusion -*

Nuclear power as well as nuclear weapons-both present grave risks. Its use for making weapons of mass destruction make it a class in itself. The totality of the crisis is the most important nuclear predicament. This is an issue of life and death for the planet.<sup>27</sup>

Use of nuclear weapons in a superpower war can kill billions at a time and have severe effects on climate for a long time. Some scientists have given the concept of 'nuclear winter' to describe this climatic catastrophe in the aftermath of a nuclear war.

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27. Jonathan Schell, The Abolition (London, 1984) P.23.

The peril of Nuclear weapons is everlasting, as we shall always live in a nuclear world.<sup>28</sup> The advent of nuclear energy can be termed sudden, and till now we haven't been able to adjust with it. Most of human history has been the result of wars.

In the past five and a half thousand years, people have lived through 14,000 wars. And the progress of civilization has seen wars becoming greater in scale and deadlier in effect. Initially it involved two states. World war I had 33 combatant nations. And World War II involved 61 nations with 110 million people in active service. Casualties in this war were over five times that of World War I: 54,800,000 dead and 90 million wounded.<sup>29</sup> Now, in this age of nuclear energy, atomic and thermonuclear weapons have made it clear that a new world war would cause incredible devastation.

Nuclear weapons have very limited utilities and thus primary purpose is to deter a nuclear attack.<sup>30</sup> Soviet Union with its Leninist policy of antagonism between imperialism of west and socialism of east caused fear in the western camp. Similarly the USSR faced the fear of encirclement by the west. The basis of deterrence is presented

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28. *Ibid*, p. 23

29. Nicolai Luzin, Nuclear Strategy and Common sense  
(Moscow, 1981) p.5.

30. Donal M. Snow, The Nuclear Future [Alabama, 1983], p.2.

by both sides as a reaction to the challenge of the other. The policy of deterrence has been justified in terms of defending the nation-state from attack, and encouraging detente. The principle of deterrence is based on the assumption that a nation-state or a group of nations, can by establishing sufficient forces, deter another hostile state from launching an attack. Once a balance of force is achieved between states then it will encourage detente. Similarly the principle of nuclear deterrence implies arming oneself to teeth in order to initiate detente with the adversary. This exercise has given them over-kill capacity and now they can destroy the world many times over.

The strategy of mutual assured destruction depends on the possession of a second strike capability after absorbing any conceivable nuclear attack. Deterrence is achieved by the strategy of MAD, because any state contemplating a nuclear attack knows that retaliation by adversary will destroy it. Since both the superpowers possess second strike capability, the result is a 'balance of terror', in which neither side should fire the missile first, in order to avoid national suicide.<sup>31</sup> But despite all these principles and theories, there are many paradoxes, inconsistencies and loopholes in the nuclear deterrence

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31. Donald M. Snow, The Nuclear Future [Alabama, 1983], p.8.

strategy. There is always an element of uncertainty in the conduct of warfare. Murphy's Law suggests that if anything can go wrong, it will go wrong. In this scenario attacks by terrorists and false alarm may provide the trigger to start an allout nuclear war. Then the strategies of nuclear deterrence will not remain valid. Computer errors can casue a nuclear war. On June 3, 1980, in the USA there was a computer alarm about Soviet ICBMs and SLMs attack on US Cities. Immediately US counter attack and second strike systems were put as a stand by alert. Missiles were ready to be launched. Fortunately the error was detected in time. Again another warning came on June 6, 1980. In both alerts, the error was detected in 3 minutes.<sup>32</sup>

On moral and ethical grounds too nuclear weapons deserve condemnation. Nuclear war can kill billions of people. Innocent civilians of both belligerent nations as well as world in general face the threat on their lives. This 'mass murder' of humans as well as other species cannot be justified on any grounds. Politics and diplomacy is there to safeguard the life, liberty and property of the citizens. Even the Leviathan of Hobbes was designed to respect the right to life of the subjects. But this regime of nuclear weapons threatens not only the life of the people, but the life of the planet as a whole. Examples of Nagasaki & Hiroshima bomb

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Richard Thaxton, "Nuclear War by Computer Chip" The Newsweek  
[New York] Oct.5 1981.

and the Chernobyl reactor accident have demonstrated the amount of human suffering in a nuclear attack and accident respectively.

Mutual Disarmament need to take place in order to avoid the risks of nuclear war. Mutual Disarmament has been the declared goal of the superpowers since the nuclear era began. Many believed that the 'suicidal' irrationality of nuclear defence will surely provide a compelling motive for disarmament.

But till now only piecemeal parochial attempts towards disarmament has been undertaken. The 'theory of games' provides an insight into this behaviour. It shows that there are circumstances under which self-interested parties despite their 'mutual interest', in a 'shared' objective will decline to cooperate, or will merely act to cooperate. Desire to minimize losses, motivates each nation to withhold genuine cooperation.<sup>33</sup> Thus mutual disarmament prospects have dimmed since the beginning of the nuclear era. Both the superpowers have worked to enhance and maintain nuclear deterrence. Each exercise of nuclear deterrence lessens the revival of mutual disarmament.<sup>34</sup> Nuclear deterrence must be renounced to prepare way for mutual disarmament.

The threats posed by nuclear weapons have global

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33. John Finnis, *Boule & Grisez, Nuclear Deterrence, Morality and Realism*, (Oxford, 1987) P. 323.

34. *ibid*, p.324.



dimensions. The earth has because one but the world is still divided among nation states craving for power and prestige. The realisations of our common future is a necessity both among the decision makers as well as people in general. A new thinking is urgently required. War is no more capable of solving conflicts among nation.

Sidney D. Drell, while recognising the threat of nuclear weapons suggests that since we can never undo or unlearn the knowledge of nuclear explosion, we need to develop new means for regulating our differences and settling our conflicts.<sup>35</sup>

Political decision makers need to take immediate steps to diffuse the tension in the world. World needs to survive first. Games of politics get a second priority. Either our political leaders become immediately active or a radioactive world awaits for us in future.

The praxis of disarmament and arms control has pointed to the inability of the traditional approaches of international politics to cope with the serious threat of annihilation to the human species from nuclear energy. The reduction of nuclear forces and the enhancement of strategic stability do not by themselves eliminate the dangers of accidental nuclear war or the problems of the disposal of nuclear waste.

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 35. Sidney D. Drell, Facing the Threat of Nuclear Weapons, (Washington, 1983) P.3.

The rhetoric of the "peaceful uses of nuclear energy" is now answered by scepticism and a powerful critique of the earlier approaches to the development of nuclear fission. The early optimism has all but disappeared and there are many who insist on asking the question whether the technology is worth pursuing any longer. In these circumstances Mikhail Corbachev's goal to eliminate all nuclear weapons by the year 2000 is not outside the context of international concern. The most contentious issues now concerns the increasing tensions and sensitivity about nuclear energy which has failed to satisfy the safety demands of many communities. After Chernobyl the criteria for evaluating the conflicting aims of energy supply and safety have undergone a fundamental metamorphosis. The idea that nuclear energy was the precursor of international understanding and cooperation appears to be nearing a premature end. If the functional dimension of international relations of the future has to be based on ecological balance, nuclear energy, whether for controlling external threats to the state or for enhancing technological capabilities, has a declining future, and a change of direction is now imperative.

The analysis and reflection on nuclear energy also points to the larger issues in the areas of policy and strategy. The INF Treaty has provided for cooperative on-site verification

The inspection procedures focus on both weapons sites and storage areas. With greater political will, it should be possible to adopt more radical measures to check the race in nuclear technology and to create a variety of institutional forms for saving mankind from its nuclear predicament. The uncertainties will of course remain, but governments will be able to redefine their national security without being prisoners of pre-conceived notions which have fuelled the dynamics of nuclear militarisation. The Non-aligned states have been adherents of the view that the chief burden of nuclear disarmament must rest on the nuclear weapons states. This was necessary in view of the relentless advance of nuclear armaments in the US and the Soviet arsenals and on their being on an aggressive course against each other. To build a safer world it is, however, necessary to take advantage of the second detents initiated by Gorbachev and Reagan and address the entire spectrum of nuclear and conventional issues which affect global power structures and violence. The complex relationship of North-South military linkages must be re-examined and alternative notions of security must be developed so that arms races in the Third World can also be reversed. Not only nuclear warfare but nuclear energy is an irrational concept if there has to be a reconceptualisation of peace, security and survival.

## Chapter - IV

Hopes of Limitless Material Progress  
and the reality

The analytical procedure for the examination of our civilisation's ecological problems requires at least three steps : -

- 1] we must describe the features of the industrial revolution and its linkage to the colonial process, and the hopes of limitless material progress which permeated public policy;
- 2] we must state the criteria which the industrialisation process under both the capitalistic and socialist systems has been unable to fulfil and which has resulted in unprecedented environmental degradation; and
- 3] we must examine the criteria for systemic change which provide the functional perspective to recent international efforts to pursue broader ecological interests of world community.

This discussion also rests upon the altered assumptions about the organisation and influence of modern science. In a perceptive essay "From the endless frontier to the ideology of Limits", Gerald Holton, points out that the optimism about an endless frontier in Science proved to be short-lived. He recalls that Vannevar Bush, the head of the Office of Scientific Research and Development had presented a report to President Franklin D. Roosevelt which was characteristically entitled "Science, the endless frontier". The historical development has not confirmed

this optimism. According to Holton : "A conflict of potentially large consequence has begun to be felt in the developed countries of the West between the old "ideology of progress" and a new "ideology of limits" that goes much beyond limits to scientific inquiry." After discussing recent scientific experience he concludes : "This development fits in with the general new awareness of the existence or necessity for limits (a word that may yet come to characterised a main lesson of the 1970s) - limits to natural resources, in particular, energy supplies; limits to the elasticity of the environment to respond beneficently to the encroachment of the man-made world; limits to food supplies; limits to population; limits to the exercise of power (including presidential power); and within science itself, limits to the growth of its manpower and institutions".<sup>1</sup>

There is no obvious solution to the problem created by the "divisions on fundamental issues". The steady erosion of the "endless frontier ideology" has however effected the matrix of scientific thought and communication. To quote Holton again : "It is clear that for a small but vocal part of the population of the West, the image of the century has been changing from

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1. Gerald Holton, *The advancement of science and its burdens* [Cambridge, 1987], p.225.

the era of frontiers waiting to be exploited, to the era of the globe as a crowded lifeboat."<sup>2</sup>

Industrial Revolution has brought fundamental changes to human civilization. It has brought unimaginable material progress and prosperity in some parts of the world, whereas the vast majority of mankind still live in abject poverty. The roots of Colonialism were strengthened by Industrial Revolution. Although the era of colonialism has ended, it is very much alive in various forms of neocolonial controls. Science and the God of modern era "technology", have so far proved unable to distribute their boons to the poor, but the illeffects are there for everyone to share irrespective of their being rich or poor.

Starting from the seventies, various reports like the Brandt Commission, Brundtland Commission etc. have emphasized the point of a common future for the whole world.

In this chapter, I will deal with the Industrial Revolution, Colonial process and the present world situation. Then I will conclude with the aforesaid reports for the hope of a common world.

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2. *ibid.*, p 225-226,

*Industrial Revolution and Colonialism*

The term Industrial Revolution connotes the social and economic changes, that mark the transition from a stable agricultural and commercial society to a modern industrial society relying on complex machinery rather than tools.<sup>3</sup>

This process began in the middle of 17th century in Britain and later on spread to Western Europe and North America. New forms of labour and styles of living resulted from industrialization, which clearly marked the modern world from the past and the advanced countries from the backward ones.<sup>4</sup> Continuous technological advancements provided the necessary impetus to the process of industrialization.<sup>5</sup>

Machines were the boon of technology. Factory system of machine production provided the basis for an enormous growth in productivity. The voyages of discovery from Western Europe in the 15th and 16th century to the new world, enabled those countries to accumulate precious metals, thereby raising prices, stimulating industry and fostering a money economy. Institutions of finance and credit came up as a result of the expansion of trade and money economy.

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3. William H. Harris & Judith S. Levey, eds.,  
*The New Columbia Encyclopedia* [New York, 1975], p.1336.
4. Tom Kemp, *Historical Patterns of Industrialization*  
[New York, 1978], p.9.
5. *ibid.*, p.5.



Industrial Revolution was started in Britain. Agricultural growth, population growth, improved technology, increasing trade, capital accumulation and some befitting political theories like those of Locke can be considered as the stimulus behind the industrial revolution.<sup>6</sup> According to Toynbee and Thorold Rogers, the contribution of Adam Smith's "*The Wealth of Nations*" was very significant. This had led to the abandoning of mercantilist restrictions on industry and trade which in turn liberated market forces.<sup>7</sup>

The use of coal increased, in the productive process. James Watt's steam engine was a crucial discovery. In the earlier part of Industrial revolution cotton textile was the key industry. John Kay's fly shuttle (1733); James Hargreaves's spinning jenny (1770); Richard Arkwright's water frame (1769); Samuel Crompton's mule (1779); and Edmund Cartwright's power loom (1783); facilitated a tremendous increase in output.<sup>8</sup>

The countries of Western Europe and Northern America introduced industrial revolution into Asia, and the early years of 20th century saw the development of industry in India, China and Japan. But out of these, only Japan may be said to have had a real industrial revolution. Other nations

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6. R.M. Hartwell, *The Industrial Revolution and Economic Growth* [London, 1971], p.110.  
 7. *ibid.*, p.112.  
 8. Harris & Levey, n.3., p.1336.

remained subservient to the economies of their colonial masters.

Creation of specialized and dependent economic life was one fruit of the industrial revolution. Relations between capital and labour were aggravated and Marxism was one product of this unrest. Adam Smith and David Ricardo developed the doctrine of Laissez-faire, which sought to maximize the use of new productive facilities.

But after 1870, the success of free enterprise started being questioned. And the Laissez-faire gradually gave way to welfare capitalism.

The world has changed alot since the coming of industrial revolution. This aspect of change has been emphasized by H. Butterfield in his book "*The origins of Modern Science*". He says -

*"....Now however the change became so quick as to be perceptible to the naked eye, and the face of the earth and the activities of men were to alter more in a century than they had previously done in a thousand years."*<sup>9</sup>

Two significant changes of the industrial society were the breaking down of local and regional self-sufficiency characteristic of pre-industrial society and the emergence of the modern state; first in its dynastic form, then as the nation state.

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9. Hartwell, n.6, p.115.

Industrial Revolution gave a boost to colonialism. Although the competition by European governments for overseas possessions was partly a reflection of their rivalries within Europe, but this political pressure was increased by the demands of the industrial revolution. Industrial Revolution needed, raw materials, markets and foodstuffs in the colonial countries. They needed to invest the surplus capital for the exploitation of land and minerals in the virgin territories.<sup>10</sup>

The increase in overseas trade and colonial consumption helped to stimulate the industrial revolution. Technological superiority of Europe and especially Britain created the need for markets and raw materials. This provided impetus to colonization and made it easier to accomplish.<sup>11</sup>

Colonialism of the industrial age drew much from the philosophy of mercantilism. The term mercantilism was coined in 1776 by the Scottish philosopher Adam Smith. The basis of mercantilism was the notion, that national wealth is measured by the amount of gold and silver a nation possesses. The mercantile theory held that colonies exist for the economic benefit of the mother country and are useless unless they help to achieve profit. The mother nation should draw raw materials from its possession and

10. Fenner Brockway, *The Colonial Revolution* [London, 1973], p.16.

11. Harris, & Levey, n.3., p.601.

sell them finished goods with the balance favouring the European country.<sup>12</sup>

Industrial development had accelerated the expansion of Europeans in other parts of the world. Asians, Africans, Arabs - from the Atlantic to Southeast Asia were dominated by the Europeans as a colony. These colonies of the Europeans are the present day world's underdeveloped or developing countries or the Third World.<sup>13</sup>

The economies of the colonies remained subservient to the economies of the colonial masters. They were reduced to mere raw material suppliers and acted as markets for the finished goods. Meanwhile the colonial masters kept on moving higher up on the industrial and technological ladder. The gap between the rich and poor nations was made unbridgable by the continued industrialization and technological innovations in the colonial countries. The self sufficient status of these countries was so badly hurt that even after getting political independence they find themselves tied with the knot of cultural and economic neocolonialism. The economies of these areas had become a hotch-potch of

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12. The New Encyclopaedia Britannica, Vol.4 (Chicago,1974),p.888.

13. Jonathan Hughes, Industrialization and Economic History : Theses and Conjectures [New York, 1970], p.162-163.

capitalist system and traditional economy of subsistence. The phenomenon of underdevelopment today is precisely a matter of this type of dualistic economy.<sup>14</sup>

Lester B. Pearson brings forward the idea of credit. According to him, until the 18th century, the blood-stream of capital for economic expansion of Europe was basically gold or bullion or land, but as the industrial revolution went forward, an important part of the capital came to be called "credit". This was intended to produce more goods for less inputs. And was based on the hope that in the future, money invested in growth could be paid back with 'interest'. This type of capital formation was largely at the expense of Asian and African countries. World trade was totally transformed in this process. Capital to open mines or build plantation came from colonial powers. Then the raw materials were shipped back. Roads, Railways and posts were built. But all sorts of economic and political controls lay in the hands of Western nations, enabling them to drain away the profits to them.<sup>15</sup>

The era of decolonisation began after the second world war, and most of the colonies gained political independence. But the economic controls

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14. Henry Bernstein, ed., Underdevelopment and Development [England, 1973], p.34.
15. Lester B. Pearson, The Crisis of Development [London, 1970], p.12-13.

still lay in the hands of industrialised countries. Neocolonialism, as the new term was named, signified perpetuation of economic and cultural subjugation of the former colonies. With this began the cult of imbibing western model of economic development. Technology became the goddess of the new age and whosoever controlled her controlled the world.

Emphasizing the inadequacy of political freedom in solving the problems of the third world, Willy Brandt uses a piece of humour. He says -

*"Suppose a white man happens to be beating a slave. What do you do to help the slave? You stop the man beating him, and then you turn back to your own business with a sense of great satisfaction. But the slave is still enslaved".<sup>16</sup>*

Thus the trappings of economic and cultural imperialism are still there. The capitalist world, the socialist world and the developing world all are trying to have continued material progress. The USSR, leader of the socialist camp, which is considered to be based on the ideas of Marx, and the theory of 'alienation', has repeatedly proclaimed that her industrial goal is to 'catch-up' with the United States. This implies similar industrial apparatus in the service of similar ends. The prevalent assumption is that industrial apparatus of

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16. *Willy Brandt, World Armament and World Hunger*  
[London, 1986], p.48.

the United States, Western Europe and the USSR is the only model for the newer countries. Neocolonialism of culture has made them believe that they only need to recreate in some rough form what the more developed countries already have. Development thus has come to mean the faithful imitation of the developed.<sup>17</sup>

Industrialization had succeeded in bringing prosperity to the vast majority of the population in Western Industrial nations. The unprecedented growth in the Western World inspired a global vision of the world that might be - i.e. 'a world without poverty'. This idea was strengthened by the reconstruction of Europe by the Marshall plan following World War II. This line of development was 'production oriented': Thus instead of being 'people centred', the development process became 'production-centred'.

This ideology of development is supported by a linear theory of progress. According to it, development was equated with economic growth; economic growth with expansion of the market economy and modernity with consumption. The nations not falling in this line were termed backward.<sup>18</sup>

During the 1950s and 1960s, economic, social and political policies were based on an assumption of continuous

17. G.K. Galbraith, Economic Development [Harvard, 1965], p.3

18. Jayanta Bandyopadhyay & Vandana Shiva "Political Economy of Ecology Movements", Economic and Political Weekly [Bombay] June 11, 1988: p.1225.

economic growth. Problems like underdevelopment were seen only as temporary aberrations and the belief was that they will be solved by rational planning and political goodwill.

But then things began to go wrong in many ways. Economic growth started faltering and new forms of crises like - ecological, environmental, demographic, urban, rural, debt, food energy etc. started gaining ground. Then started a shift from a sure world full of optimism to an uncertain one, full of pessimism and thoughts of crisis.<sup>19</sup>

Since the late sixties many reports have come which vividly explain the contradictions of this type of development strategy. First of all came the report of Pearson Commission.

*Pearson Commission -*

Lester B. Pearson opined that Development is a many sided process. In the economic sense, development is the process by which a state reaches a position where it can provide for its own development, and the fruits of its growth percolate to all sections of its people. Development also means social progress and participation of people in the determination of their environment.

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19. R.J. Johnston & P.J. Taylor, *A World in Crisis ?*  
[Oxford, 1986], p.1.



He traces the history of development from the colonial past of the western nations. According to him, these nations served their own interests in their overseas ventures, often at the expense of indigenous inhabitants.<sup>20</sup> He considers the industrial development of last three centuries as lopsided. This assertion is proved by the fact that 80 per cent of the world's wealth, trade and investment is controlled by 20 per cent of the world's people, living in the Atlantic area with offshoots in Japan and Australia.<sup>21</sup> The new paradigm of development and progress keeps western states as the model. But the fact remains that the experiences of the developing countries are in contrast to the experiences of the western industrialized countries.

Pearson holds that western model of development is based on the pillars of maximum use of resources and energy and immense consumption. The results of this has been comforts for few, pollution of the environment and threat to survival of the species. Acid rain, greenhouse effect, the dangers of nuclear holocaust prove the point that developed societies themselves are not able to control the applications of science and technology. Lester B. Pearson questions that - "are we transferring our polluted environment with our interest free loans and our technical assistance?"

20. Pearson, n.15,p.7-8.

21. *ibid.*,p.16.

He further brings out the contradictions in the technological and industrial growth by stressing that since all are bound to counter the illeffects of development, irrespective of the degree of their involvement, why not they should have a share in the positive effects as well. In his words -

*"We have already ensured that developing man, however remote, should have his equal share of radiation in the atmosphere as a result of nuclear bomb experiments. There is no gap here. Even more important we have arranged things so that if there is all out nuclear war between the superatomic powers, all will have an equal share in extinction. There is no gap here."*<sup>22</sup>

<sup>a</sup> Pearson supported the flow of aid from the developed to the developing countries. The objective of his report was to support and strengthen cooperation for development and to give a clearer purpose and greater coherence to 'aid' strategy. According to him, 'aid' at the level of 1 percent of GNP can be easily borne by developed countries.

Pearson Commission had published its findings in 1969 and it had given too much emphasis on aid. But in the 70s the focus of debate had shifted to the structure of world economic system.

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22. *ibid.*, p.25

Brandt Commission fulfilled the task of this new yearning for the new structure of world economic system.

*Brandt Commission-*

Willy Brandt and his colleagues held that the existing system of international relations does many injustices to the countries of South. Since most of these countries got independence after the second world war, their interests were not adequately taken into account, when the bases of the existing economic order were being laid down. This is the reason why they are now putting the demand for a new International Economic Order.<sup>23</sup>

The Commission held that accelerated pace of development in the South is necessary for the benefit of the people of South. The Commission strongly supported the point that the interests of North and South are not contradictory but are complementary to each other. The term North and South is broadly synonymous with the 'rich' and 'poor'; 'developed' and 'developing' nations.

The South countries face a common predicament. The North has 1/4th of the world's population and 4/5th of its income, the South has 3/4 th of world's population, but are living on 1/5th of the world's income.<sup>24</sup> Over 90percent of the world's manufacturing industry is in the North. Most

23. *Willy Brandt, North-South: A Programme for Survival* (Massachusetts, 1980) P. 11.

24. *ibid*, p. 32.

patents and new technology are the property of the multinational corporations.

Brandt Commission proposed to bring fundamental structural changes in the international economic system to create a more just and humane society. Brandt recognized that world is an interlocking system. According to him -

*"The North-South debate is often described as if the rich were being asked to make sacrifices in response to the demands of the poor. We reject this view. The world is now a fragile and interlocking system, whether for its people, its ecology or its resources."*<sup>25</sup>

Since 1970, the world economy has faced several setbacks. The western industrialized countries had grown at more than 4 per cent a year from 1950 to 1960 and more than 5 per cent from 1960 to 1973. But from 1973 to 1979, they grew at an average rate of only 2.5 per cent a year.<sup>26</sup> Growth in developing countries had slowed down dramatically after 1974. Brandt stressed the necessity of self-reliance of South both politically and economically. He stressed the idea of interdependence and held that the world is a unity and we must begin to act as members of it who depend on each other.<sup>27</sup>

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25. *ibid.*, p.33.

26. *ibid.*, p.40.

27. *ibid.*, p.47.

*Palme Commission* - Palme Commission gave its report in June 1982. This commission related the issue of security and development with disarmament. It said that all states would suffer, if expenditure on armaments were to undermine the economic welfare of developing nations. Expenditure on armaments should not hamper the foreign aid or development loans. Economic recovery and mutual prosperity lead to mutual security. "Mass poverty can lead to war. Where hunger rules, peace has no firm footing."<sup>28</sup>

Relating the issue to environmental degradation, the commission holds that the destruction of soil, rivers and forests could become a major cause of political and military instability, which can give birth to revolutions and perhaps to war.<sup>29</sup> Over 1,000 billion dollars are spent annually on military purposes. Development aid adds upto less than 5 per cent of that vast sum. The requirements of world aid is one twentieth of world expenditure on armaments.

*Report of the Brundtland Commission* - By the resolution 38/161 of the UN General Assembly, on 19th December 1983, establishment of a special commission on environment took place. This was meant to provide a report

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28. *Willy Brandt, World Armament and World Hunger*  
[London, 1986], p.42.

29. *ibid.*, p.43.

on environment and global problematique of the year 2000 and beyond and was expected to give proposed strategies for sustainable development.

The objectives of the world commission on environment and development were -

- to examine the critical environment and development issues and to formulate realistic proposals for dealing with them;
- to propose new form of international cooperation in these issues that will influence policies and events in the direction of needed change; and
- to raise the levels of understanding and commitment to action of individual organisations, governments etc.

The Commission tried to synthesize the economic development issues with the environmental issues. According to the Commission, poverty is considered a major cause and effect of global environmental problems.

The UN report, 'The State of the World Environment 1987', brings out this relationship very clearly, It says -

*"The world community is confronted by a closed cycle : economic problems cause environmental degradation, which in turn, makes economic and structural reforms more difficult to achieve."*<sup>30</sup>

The Commission stressed the interdependence of the whole world. Initially the world was compartmentalized within nations, sectors and within broad areas of concern viz. environment, economic, social, political etc. These compartments stand dissolved now. And all sorts of crises like environmental, developmental, energy etc. are one.

Out fast growing population poses another problem. World population has reached the 5 billion mark. We will increase by 8 billion to 14 billion by the next century. The more serious thing is that 90 per cent of the increase will occur in the poorest countries.<sup>31</sup>

The Commission establishes relationship between economic activity and environmental mismanagement. The world economy has multiplied to create a 13 trillion dollar world economy, and in the coming half century this could grow five to tenfold. Over the past century industrial production has grown more than fiftyfold and

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30. *The State of the World Environment, 1987,*  
*[Nairobi, 1987], p.V.*

31. Gro Harlem Brundtland, *Our Common Future* [Oxford, 1987], p.4.

4/5th of this growth has taken place since 1950. This impressive economic growth is based on materials from forests, soils, seas and waterways.

Developing countries are more vulnerable to environmental losses. They urgently need to grow to get rid of poverty and underdevelopment. Industries that pose serious risks to environment are growing fast in these countries. The zeal to develop fast and with less costs often leads to apathy towards pollution - control.<sup>32</sup>

The resource gap between the developing and industrial nations is increasing. Industrial world has got a decisive say in some key international bodies, and it has already used much of the planet's ecological capital. This 'inequality', is according to the commission, the planet's main environmental as well as development problem.<sup>33</sup>

International economic relations are based on inequality. These pose particular problems for environmental management in the developing world. Agriculture, forestry, energy production and mining generate nearly half of the GNP of many developing countries.

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32. *ibid.*,p.5.

33. *ibid.*,p.5.



Export of natural resources remains a large factor in their economies. The example of Africa can be cited to prove the fateful interaction of ecology and economics. The roots of this problem can be traced to the global economic system that takes more out of a poor continent than puts in. Economics need not be taken separately from ecology. Both need to be completely integrated in decision making process.

- *"Economy is not just about the production of wealth, and ecology is not just about the protection of nature; they are both equally relevant for improving the lot of human kind."* 34

The dilemma of the developing world has been clearly brought out by the commission. It observes that growth in many developing countries requires external capital inflows. In the absence of this aid, the poor will be tempted to overuse the environmental resources in order to survive. This proves that reduction of poverty itself is a precondition for environmentally sound development.

Deteriorating terms of trade, rising debt servicing obligation, stagnated flow of aid and growing protectionism in the developed market economies has caused severe external payment problems. Many developing countries faced the debt crisis owing to increased cost of foreign borrowings and decreasing exports.<sup>35</sup>

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34. *ibid.*, p.38.

35. *ibid.*, p.70.

According to the Commission, sustainability of environmental resource base only can usher in a new era of economic growth. Decisive political action is needed in the management of environmental resources. On the wise management of our environment only depends sustainable human progress and human survival.

The Chairperson of the Commission Mrs. Brundtland aptly remarked that well being of the people is the ultimate goal of all environmental and development politics.

*Conclusion -*

The present inequality in economic strength of the developed and developing countries is traceable to the industrial revolution and colonial subjugation. In 1944, in a meeting at Brettonwoods, New Hampshire, two central instruments for international monetary and financial co-operation were established - the International Bank for Reconstruction and Development (IBRD), known as the World Bank and the International Monetary Fund. World Bank was expected to provide loans to assist the reconstruction of Europe, Japan and the developing World. International Monetary Fund (IMF) was to be the regulator of currencies. Both these institutions were established in 1945. Since their formation, the USA has remained a major influence on them. GATT was formed in 1948, which has served as the principal forum

for multilateral trade negotiations.<sup>36</sup>

Most of the developing countries got independence after the IInd World War and had to pursue their economic development in the Brettonwoods system. This has not been able to solve their development problems. And on the other hand it has created grave environmental problems for them. Pearson Commission, Brandt Commission and Brundtland Commissions all have beautifully carved the idea of interdependence. Brundtland Commission has brought out the relationship between ecology and economy, and stressed that environmental management is a must for poverty alleviation and development.

The UNEP report, the State of the World Environment 1987, views two major causes for environmental destruction, which immediately need to be tackled :-

*First* is the arms race, with its insatiable demands on global financial, material and intellectual resources.

The *Second* is, the alleviation of the appaling debt burden of many developing countries.<sup>37</sup>

Global military expenditure has increased more than 30 fold since 1900. But the expectations for multinational co-operation raised at different forums

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36. Brandt, n.23, p.36.  
37. The State of the World Environment 1987  
n.30, p.v.

have not yet been fulfilled. Global negotiations has yet to take place and the hope for New International Economic Order is yet to materialise.

Our present idea of development needs change. The concept of industrial culture 'to have profit at any cost' (mostly environmental) needs a radical change. The idea of Sustainable Development rests on the belief of utilising our resources in a judicious manner, keeping in mind the interests of the future generations. Economy is but one area of development. Other social and political aspects of it should not be forgotten in the melee of economic development. Too much emphasis on the material and economic aspect of development in the industrial age has led to the present situation where a few get drowned in the sea of luxury but the vast majority donot have enough to make the two ends meet. The guiding principles of present day economic philosophy are 'profit', 'productivity' and 'consumption'. Gross Domestic Product or the GDP is the determining factor of rate of growth.

During the first three post war decades, both Marxists and non-Marxist analysts assumed that nation state should be the basic unit of change and development. The best known of such analyses was Rostow's 'Stages of Growth' model, in which every country could be allocated

to a rung on a ladder leading to 'high mass consumption'.<sup>38</sup>

But today it is being realised that high rates of growth donot guarantee the easing of urgent social and human problems.<sup>39</sup>

Contradictions of our present development strategy are visible in the world. The industrial world faces the problem of pollution, which results from the overuse of resources. But side by side developing nations are living in abject poverty. The position of third world countries can be compared with that of 'Tantalus'. Tantalus, a king in greek mythology was punished with perpetual hunger and thirst, on having offended the Gods. He was tantalised with the presence of water and food just a little beyond his reach.<sup>40</sup>

In order to get rid of these contradictions of development, the goals of development must be clear. This exercise if successfully practised will ease much of the tension between East and West; North and South and ecology and economy. Rohrlich provides a question to proceed on the right path -

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38. Johnston & Taylor, n.19,p.3.

39. George F. Rohrlich, ed., Environmental Management : Economic and Social Dimensions [USA, 1976], p.10-11.

40. B.P. Pal, Environmental Conservation and Development [Dehradun, 1982], p.73.

"We must know answer to such questions as  
"profit for whom?"<sup>41</sup>

He further attacks the belief for a better world in the present situation of world development -

*"The easy assumption that an ever expanding pie would provide increasing portion to the poor, no longer offers the comforting rationale whereby the world's affluent justify inequalities as essential to the formation of new capital for investment"*<sup>42</sup>

This world spends about one trillion dollars a year on armaments and only about 15,000 million dollars by way of aid. The average consumption of resources on energy in a rich country is more than 1000 times, their average consumption in a poor country.<sup>43</sup>

Equality and Justice in political as well as economic sphere is necessary for environmentally sound development and prevalence of peace in the world. If the development patterns remain environmentally destructive and socially unsatisfactory, peace, harmony and tranquility can never reign supreme both within societies and also among nations.<sup>44</sup>

The effects of scientific - technological and industrial advancements have revealed that the 'Earth is one'. Compartments of nations, races, national interests,

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41. Rohrllich, n.40,p.15.

42. *ibid.*,p.16.

43. M.K. Tolba, Development without Destruction  
[Dublin, 1982],p.40.

44. *ibid.*,p.40.

and geography are superficial. Now no country can remain safe by willing to destroy the other. Security of the whole Earth has become a common interest of every human being. Realization of this truth is necessary to ensure survival of humans on this planet. In the recently held second biennial conference in the memory of Mrs. Indira Gandhi, in New Delhi, the idea of an "Earth Citizen" was propagated.

It would be a worthwhile intellectual endeavour for analysts of international relations and foreign policy to delineate the role of the earth citizen and his global awareness in determining the future of the global system.

Chapter - V

Conclusion



*The Ecological basis of International Relations*

The all-embracing need, as we have seen in chapters II, III and IV, is for new thinking in response to the ecological questions bearing on human survival. The existing conceptions of International relations betray their inapplicability to the contemporary and future needs of ecological security and peace. The orthodox view of International relations in which issues of environmental policy were sidetracked, has been shaken to its foundations. Any state actor or private agency which further impairs the ecological structure of our world is in fact violating what C.F. Weizacker has aptly called "world domestic policy". The call for radical transformation which has been made by environmentalists has to find a response within discipline of international Relations. It would be futile and superficial if ecological concern were simply added to existing approaches to interstate relations. There should be a growing realization that the political designs based on "realisms" and "self-interest" are historical anachronisms. If International Relations has to accept the challenge of unprecedented environmental destruction, the ecological paradigm must become the dominant one. Ecologically relevant beliefs and practices cannot be grafted on to a discipline of

international politics which has not caught up to the present environmental realities. The gap can only be bridged by a reconstruction of the method and structure of International Relations Theory on an ecological basis. Its theoretical starting point would be the interaction of subjects and structures to environmental considerations.

The complexity of the problems can be rated by the gravity of the consequences of pollution. Pollution is fouling the environment on the one hand, and creating vulnerability for the entire production processes, and eliminating many species from the earth, on the other.

Extinction is one environmental calamity that is irreversible. The effects of extinction are very difficult to predict. Interdependence of the various seemingly different phenomena further complicates the matter. Pollution in one part of the world, causes destruction in the other. Effects of Acid rains and Ozone layer depletion have proved this point. The Chernobyl power plant accident and the studies on the effects of nuclear war prove that everyone will have to share the harmful effects. The threat is directed to our survival and also to the continuation of life on the planet. In this sense, the remedial measures suggested should also have a global perspective transcending antagonistic relations between states.

Arguments emphasizing national power are no longer meaningful. To present the discussion in a logical manner, we have to start with multilateralism and go on to formulate models based on holism. The great transformation in international relations requires this 'holistic approach', which can develop new structural links for strengthening equilibrium in the world society.

*Global Partnership for global environmental needs*

The extent of opportunities for meeting global environmental needs would depend upon the degree to which there is movement in creating a new North-South relationship. Not enough attention has been paid to defining the environmental threat to the Third World. In the literature the fundamental threat parameters for environmental degradation have been established with technologically advanced countries in mind. A global partnership for global environmental needs can only come about after a comprehensive analysis of the relative vulnerability of the Third World. In addressing this question it is important to emphasise that as long as the developing countries continue to be alienated by the developed countries, there would be a major disincentive for anything like a world environmental order to come into being. The existing North-South relationship is not designed for and is not effective against environmental degradation. At the same time the magnitude of the ecological crisis can be

used to involve both North and South in reciprocal actions and thus develop a partnership which can overcome problems which otherwise seem insurmountable.

The lack of equality is the main reason for the failure of various environment-protection measures. The colossal gap between the rich and poor nations owes much responsibility for the environmental problems. While the developed countries spend billions of dollars on weapons, the developing ones are having large populations for which they are unable to provide even the basic minimum needs. And no one can teach lessons of environmental protection and conservation to a hungry man. The problem is urgent no doubt, but the talk of environmental protection in front of a hungry man is like adding insult to injury. This is the reason why the Montreal Accord, 1987 to protect Ozone layer is not being signed by many developing countries. Chlorofluorocarbons (CFCs) are the main cause of the Ozone layer depletion. CFCs are primarily found in refrigerators, electronic products, packaging materials and fire extinguishers. In the industrialised countries, a lot of CFCs are used for luxury consumption. There, more than one lakh tonnes of CFCs are consumed in car-air-conditioning. On the other hand developing countries chiefly use them for food processing and preservation, for vaccines and pharmaceuticals. Thus the USA alone accounts for nearly 37 percent of the world's consumption of CFCs, the European community 35 percent and Japan 11 percent.

The developing countries of Asia, Africa and Latin America consume about five percent of the CFCs.

The treaty discriminates between the rich and the poor nations on the question of permissible limit for the use of CFCs. Other than this, discrimination is there in the matter of export of CFCs. The protocol specifically prohibits any export of surplus CFCs from developing countries. But the protocol allows a 10 percent extra production for developed countries, for the purpose of export to developing countries.

Another treaty signed in Basel in March, 1989 needs some explanation. This treaty is related to the disposal of hazardous wastes. Basically, it is the industrialized nations which are responsible for generating the wastes. According to UN Environment Programme, which hosted the Basel Conference, 90 percent of the 400 millions tonnes of hazardous waste produced every year comes from industrial nations; particularly US.

These nations often engage in the 'dirty business' of disposing these wastes in the Third world. Many poor countries have accepted such cargoes because of handsome pay-offs. For example, almost a tenth of the EEC's toxics go to just one country - Guinea-Bissau - in lieu of sums which are larger than its gross domestic product.

The Basel treaty is a hesitant first step in checking this business. It grants every nation the right to

refuse such harmful waste disposals.<sup>1</sup>

Thus the obstacles seem to be great in implementing global environmental policies. Even though it seems obstacles are hard to overcome, the prospects could be brighter if the broader issues of energy technology could be related to capability images in the context of environmental affairs. David J. Rose has formulated the problem in the following words :

*"Such a strategy, whereby the industrialised countries would consciously switch their technological base, could avert the global CO<sub>2</sub> catastrophe in which everyone loses, but especially the highly organised societies. It would also go a long way toward making the developing countries full partners in the global enterprise of managing global affairs. That is important to us all, because people in many developing countries see themselves as standing at the side of a rail road track, watching the train of the industrialised nations going by at ever increasing speed, while they - the developing nations - are increasingly incapable or running alongside, let alone climbing aboard; then their only chance of gaining anything is to derail the train. It would be better and even in the interest of the industrialised countries, to have everybody on board the train, and to plan to operate it for the long term."*<sup>2</sup>

The urgency of the problem relates to the fear of destruction by an accidental nuclear war. The world is divided among various groups and nations having a mobilized economy. Arms build-up which has become the obsession of most of the states, may trigger a nuclear

1. *Times of India, New Delhi, 5 May 1989.*

2. *David J. Rose, :Encyclopaedia Britannica [London, 1980], p. 25-26.*

holocaust.

Another humane aspect of the problem is linked with the world's economic configuration. The present economic edifice is based on the pillars of scientific and technological advancements. And the greatest disparity between the rich and poor countries is in the field of scientific research and development. Multinational firms excel both in technology and in marketing knowledge. The 'profit' motive behind the whole show becomes a barrier for the easy availability of alternative technology to the developing countries. Here the example of the alternative technologies for ozone-safety is worth noting. Two multinationals are developing the technology. The American Chemical giant Du Pont, which is on the verge of commercialising the technology has refused to divulge it to others. And the costs of it will dissuade the developing countries from using it.<sup>3</sup>

*Ecological change and conflicts in the International System*

It is no longer possible to provide an exhaustive explanation of conflicts in the international system without examining the many faces of environmental degradation. In retrospect it would seem that the present period is a watershed in the evolution of the international system, and in future no general account of foreign policy or diplomacy can be given without first examining ecological

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3. *Times of India, New Delhi, 9 March, 1989.*

interests from a theoretical and behavioural perspective. For example, future studies on the Third World will have to take into account the structural changes in the political-economic system on a world wide scale in order to cope with the Greenhouse distortions of the global climate. A fresh framework is necessary for treating the subject from the perspective of the substantial problems of the Third World in relation at the new threats to the global climate. Before scholars can come up with policy prescriptions they require balanced studies of the energy priorities for developing countries which can reconcile development needs and ecological security. There is need to combine different disciplines in order to systematically compare patterns of behaviour and perceptions among developed and developing countries, and these would include comparative culture, political science and economics. The ominous implications of climatic change for the Third World cannot be fully grasped by studies which are tacitly conditioned by the ideologies and images of the advanced countries. Analysts have tended to be influenced by the Soviet-- United States historical controversies in the study of conflicts in the international system. It is now necessary to engage in a fundamental reinterpretation of the principles of conflict resolution from a wider spectrum for a global



strategy. This would involve examining the examination of the aggregation of interests in international society from the point of view of ecological relativism. The crux of the matter is that international solutions to problems of ecological change are imperative, but these cannot be achieved unless the advanced countries agree to reject the traditional assumptions of their diplomacy, i.e. the pursuit of national interest without any scrutiny of the ecological disruption of the Third World. If new conflicts in the international system have to be controlled, scholars will have to examine Diplomacy in terms of the linkage between international situations and the ecological priorities. These would serve to point out the unrealistic view of international situations projected by those who only focus on the power politics aspects.

The problem of environmental degradation is multidimensional, other than being complex and urgent. Politically the world has become more complex. Many new centres of power have emerged and their interests clash. In the foreword to the world commission on Environment and Development Report, 'Our Common Future', Gro Harlem Brundtland says that -

*" the environment does not exist as a sphere separate from human action, ambition and needs and attempts to defend it in isolation from human concerns have given the very word 'environment', a connotation of naivety in some political circles.*

*Environment is where we live and development is what we do."*<sup>4</sup>

The stress on Human concerns is to be the basis of environmental conservation. The RIO (Reshaping the International Order) approach given by Jan Tinbergen underlines need for a new order, in which a life of dignity and well being become an inalienable right of all. They also suggest a changed philosophy for this new order, which will not be based on economic growth and material riches.<sup>5</sup>

Jay Forrester in his *World Dynamics* (1971) brings out the idea of mutually reinforcing nature of events. According to him attempts to solve one problem will exacerbate another. Thus attempts at population control would be inherently self-defeating since the consequent rise in living standards would promote industrialization and this is ecologically even more disturbing than population growth. By the same token, attempts to improve diet by improving agricultural technology would be defeated by precisely the reason indicated by Malthus. According to him only a package of population, resource and environmental policies, directed towards some kind of equilibrium society would suffice. The aforesaid illustration explains the necessity of a many-directional approach.<sup>6</sup>

4. Gro Harlem Brundtland, *Our Common Future* [Oxford, 1987], p.xi.

5. Christopher Freeman & Marie Jahoda, eds., *World Futures : The Great Debate* [Oxford, 1978], p.41-42.

6. *ibid.*, p.27.

Barry Commoner too emphasises the human concerns aspect of environmental problems. According to him, the basic reason behind the environmental crisis which is arising primarily from pollution are social.

The basic fault lies in the human society - with the ways in which society has elected to win, distribute and use the wealth that has been extracted by human labour from the planet's resources.

As suggested earlier, a multi-directional approach is needed to proceed towards the solution of the problem. The urgent problems like the threat of nuclear war should be tackled first. Disarmament exercises should be undertaken seriously. Technological advancements in the sphere of weapons has created impediments on the way of disarmament negotiations. The search for parity between the great powers, in the balancing of terror exercise results in rising stockpiles of weapons and also invention of new categories of weapons. But the pace of negotiations is never fast enough to catch up with the pace of scientific and technological innovations. Thus the technological advances constantly threaten the very security that they were supposed to assure in the first place. Nuclear weapons are the totalitarian tools. Even with the acceptance of Mutual Assured Destruction, many states keep on accumulating it as if - the more of it the better secure

you are. This exercise goes against all rationality. Weapons are meant to guarantee security. But nuclear weapons will destroy both the belligerent parties and ruin the climate of the whole world. There are only losers in a nuclear war. Thus it does not secure the life of the citizens, but is amassed simply to secure the pride of the national leaders.

*Options for preventing ecological  
destruction & the role of public opinion*

Quincy Wright suggested that in modern civilisation war springs from emotions devoid of ideas and desires devoid of appraisals and then concluded his discussion of public opinion and war in these words :

*"To prevent war, the emotion-charged symbols which control opinion must everywhere be kept in closer contact with the conditions which people think they describe. Symbols must everywhere refer to conditions, not to myths, stereotypes, or fictions. The head and heart must work together. Prizing and appraising must unite in direction of action" <sup>7</sup>*

Since ecological destruction partakes of the character of war the popular awareness for environmental protection can only be achieved if major underlying beliefs which lead to global environmental hazards, can be freed from "myths, stereotypes or fictions". The reduction in the release of Greenhouse gases or other

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7. Quincy Wright, A Study of War Vol.II [Chicago, 1942], p.1117.

urgent measures to stabilise the global climate will not come about unless the voices representing the ecological interests in the national and international political processes are greatly amplified. Hitherto the advanced countries have been scornful of the concept of equity in relation to global environmental problems. Before the turn of the century the international community must multiply options for preventing ecological destruction by giving up the prevailing wisdom. Simplistic beliefs have to be replaced by macro-visions which can corroborate and reaffirm ecological security for the whole of mankind. It is not enough that scientists should warn us that deforestation and the burning of fossil fuels is dangerously warming the planet. A wide range of strategies must be employed to generate influence on the public policy process in all countries, so that while on the one hand technologies and processes inimical to environmental integrity are speedily discontinued, on the other hand ecology promoting ideas are placed on the policy agenda early enough and surmount counter-pressure.

Inadequately informed and misinformed citizens are very easily carried away by the rhetoric of the politician. Public gets swayed by the propaganda of national interest, and security. Recent reports by scientists as well as generalists has show that in the event of nuclear attack, the survival of the human species itself is threatened.

And the world needs to survive to do politics. People are so much obsessed with the material accomplishments of science and technology that they refuse to observe the warnings of the catastrophe. This apathy and alienation of the general public has been catalysed by the secrecy and complexities of modern science. Science has solved many problems but its major drawback has been to look at the totality of things. More organizations like Pugwash are needed to give the holistic and moral dimension to scientific discoveries. Pugwash is a fraternity of scientists, dedicated Nuclear disarmament and to making the world a better place to live. The seeds of Pugwash were provided by the debris of the cities of Hiroshima and Nagasaki, where the first atomic bombs were dropped.

Bertrand Russell believed that scientists had a moral responsibility for their discoveries and its use. The Russell- Einstein manifesto of July, 9, 1955 became the beason of the Pugwash movement.

*Need for Humane Science:*

Science and its application technology needs to be more humane. This creative cooperative subjective, relentless search must not omit careful and systematic observation of and study of the subjective or emotional factors, involved in human relations. It must include intensive study of human attitudes in so far as they are found to be essential

in the phenomenon of peace and war. Our public opinion has to be more powerful. A powerful public opinion can direct the policies of the state and also the course of scientific research. This will lead to the democratisation of science.

*Ecology Movements* can help a great deal in the formation of a powerful public opinion. Since they emerge after the clear perception and understanding of the problem, they can face the threats of the established order with determination.

Albert Tevoedjre in the book *Towards One World?* stresses the necessity of mobilising public opinion against the inequality in all its guises. According to him, inequality constitutes the foundation of contemporary international relations. 'Apartheid', he says :-

*"on a world scale appears first and foremost in the marginalization of that major part of humanity which the peoples and the nations of the Third World represent."*<sup>8</sup>

A responsible and powerful public opinion is all the more necessary for the Third World nations. These countries face disadvantages of various kinds and are more prone to fall to pressures of economy at the cost of ecology. Another point of concern is that most of them think that the talk of environmental conservation, is elitist in nature, and are mainly the problem of developed nations. At the conference

8. Friedrich Ebert Foundation, ed., *Towards One World?*  
[London, 1981], p.293.

on "The making of an Earth Citizen" held in New Delhi in Jan 1989, Fakhar Zaman of Pakistan refused to discuss concepts like earth citizen. He pointed that political problems like military dictatorship in his country has affected their 'aesthetic sense' which is needed to discuss these problems.

These nations have a sizeable population under the poverty line. Many of these nations are engaged in severe strifes among themselves. So they usually sacrifice ecology for economy.

In this scenario, the role of the leadership in these countries becomes more crucial. Most of them are blindly following the Western model of development but even after that they are unable to provide the basic minimum necessities to their people. The fact remains that as long as the economies of the developing countries are externally oriented, they will continue to occupy an inferior position in the world market. The world economic system has been shaped on the Bretton Woods model, which is biased towards the developed countries.

Many developmental projects in the developing countries too are undertaken on the lines of the west and are capital intensive. They take a heavy toll on the environment adding to the poverty of those who depend



on them for their survival. Many of the world bank aided projects are environmentally unsound. Larger part of the loans and credits from the banks go to environmentally sensitive areas like agriculture, forestry, dams and irrigation. In 1983, half the project loans of about 22 billion dollars were directed towards these sectors.<sup>9</sup> These projects make a heavy burden on the environment.

Another point to note in this regard is that the developed countries many-a-times allow the spread of those industries in the developing world, which have been proved to be ecologically harmful in the developed world experiment. They themselves have been unable to manage radioactive wastes from their nuclear reactors, but this doesn't deter them from selling the atomic reactors to the poor nations, who have got far less means to manage the wastes than the developed nations. On the top of it, disposal of toxic wastes in the developing countries by the rich nation is all the more alarming.

The world public as well as leadership still considers the ideal of oneness of the world a 'Utopia.' Worldwide illeffects of pollution are not enough to warn us.

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 9. *Jayanta Bandyopadhyay & Vandana Shiva,*  
*"Political Economy of Ecology Movements",*  
*Economic and Political Weekly [Bombay],*  
*June 11, 1988, p.1231.*

Thomas J. Crocker and A.J. Rogers in Environmental Economics rightly say that , "Pollution is the problem of screwed up values". George F. Rohrlich speaks of 'Mind-pollution,' and considers it the worst of all types of pollution.

The developed countries have got many levers in their hands to diffuse the crisis, if only they realise the urgency and seriousness of the problem. Many futurologists have suggested that the developed nations should gradually give up their consumerist profit oriented development process. Some have suggested the term 'dedevelopment', because the current pace of development cannot be sustained by our ecological resources.

Other need is development aid from the developed to the developing countries. Development aid will reduce the desperation of the developing countries, which often forces them to devour the ecological resources in order to sustain the development process.

Here again the task of persuading the developed nations and awakening the public opinion is no less difficult. The boons of scientific and technological progress has made these countries complacent, and it is very difficult to convince the general public about the dangers of development in these countries.

Public opinion is often manipulated by the government by propaganda. This is the reason why people happily vote for millions of dollars to go on military spending. Preparation for war are made with utmost precision, even after knowing fully well that if that war really takes place it will destroy many human lives as well as our climate.

Bertrand Russell, opines that -

*"There is only one way of reversing the trend towards pre-emptive war. It is to make the truth known to the public. This is a difficult task, since murderous madmen, have a large measure of control over the major means of publicity."*



President Eisenhower of the USA too understood the importance of a powerful public opinion. He says that only an alert and knowledgeable citizenry can compel the proper meeting of the huge industrial and military machinery of defence with our peaceful methods and goals, so that security and liberty may prosper together.

In a foreword to the world commission on Environment and Development report, 'Our common future' Mrs. Gro Harlem Brundtland, says -

*"First and foremost our message is directed towards people, whose well-being is the ultimate goal of all environmental and development policies".*

The task of changing human behaviour and thinking is an uphill task. It is not yet clear that a sufficient number of people will become sufficiently convinced that their well-being depends upon the preservation of the integrity of the biosphere to cause their governments to act, and to act together.

*Humane Science and Politics*

It is true that our present civilization idolizes man. The Judeo-Christian belief, which is the basic idea behind this civilization, illustrates that everything on this planet is made for the well being and pleasure of man. This belief in the importance of man, later on got translated into the theory of individualism and Laissez-faire. Liberty, Equality and Fraternity - these slogans have lost their meaning, and the 'haves' of the world, owning science, technology and industry became 'more equal' than the rest of the world. Thus the inequalities became more stark.

W. Bunge in 'A World in Crisis?' edited by R.J. Johnston and P.J. Taylor says that ....

*"All the starvation and megafamines, especially of black babies, is created by colonialism, replacing local subsistence crops by commercial products for export. And then drought is blamed, just as the potato blight was blamed for the Irish famine of the 1940s, while the British were shipping out wheat in armed convoys. ....We would create societies where children bloom like little flowers, rather than die like flies. To achieve this we must keep our planet humane."*

*The Small Earth :*

Science and technological discoveries have enabled man to view the Earth from the outer space. The smallness of the Earth has been further underlined by the threats of nuclear war. These weapons are the weapons of mass-annihilation. Recent scientific studies like TTAPS study, SCOPE/ENUWAR projects etc. have explained that apart from many deaths, severe climatic catastrophes will engulf the Earth, in the aftermath of a nuclear war. W. Bunge rightly says that the Earth is too small to contain such a war. Strategists of our mobilized states invariably miss that point and busy themselves on issues such as 'national effects', or the capabilities of a Civil defence programme. They look at the war, at a scale below its true are - which is the planet itself. The shrinking of the world is such that no place on the surface of the Earth or in its atmosphere is safe from nuclear holocaust.

Roderick Nash holds that a perception of community based on a sense of oneness with the universe is a prerequisite for environmental ethics, and that "ethics must underlie the environmental movement."<sup>10</sup>

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10. George F. Rohrlich, ed., Environmental Management [USA, 1976], p.308.

The feeling of oneness in the field of economics can be converted into the demand of internationalization of capital. Out of this is growing the demand for the New International Economic Order.

Brandt Commission has stressed the need for 'international régimes', for the maintenance of Global Commons.- especially the oceans, atmosphere and the outer space. In the absence of such international regimes, over exploitation and abuse will cause irreversible damages, especially to the interests of the weaker nations. In this regard the 'Montreal Protocol of Sept. 1987', to protect the ozone layer requires attention. This protocol is a laudable effort, but it too has not been able to invite total support of all states. Some developing countries are pointing towards the seeds of inequality in the protocol.

This type of international agreements cannot bear fruit as long as inequality exists in the world and the rigid boundaries of the nation states and national interests dictates its terms in the solution of these problems.

Organisations like Pugwash are needed in numbers, to act as the conscience of scientific research. Other than this, world organization, like the United Nations too need strengthening.

*The Evolving Concept of Environmental Security*

The unrestrained character of polluting influences on the life support systems has rendered invalid assumptions upon which the conventional notion of peace, security and development were earlier dealt with. World Commission on Environment and Development Report (the Brundtland Report) has marshalled a formidable body of evidence which suggests that the concept of "environmental security" has become almost indispensable for solving contemporary tensions and conflicts. According to the Report "The whole notion of "security" as traditionally understood - in terms of political and military threats to national sovereignty - must be expanded to include the growing impacts of environmental stress - local, national, regional and global. There are no military solutions to environmental insecurity".

The United Nations Environmental Programme (UNEP) reflected the important change in opinions, interests and ideas relating to environmental security when a meeting of experts under its auspices in Nairobi expressly declared (in February 1988) that :

*"environmental security is one of the new necessities for humanity and demands that we evolve from an armament culture to an ecologised environmental culture".*

The change in thinking can be considered as a movement towards new priorities. Without a redefinition of the concept of security, there will be a continuing failure to achieve the level of coordination which is necessary to manage the Global Commons. Again the existing notion of security can only take into account political and military threats, while the threat from environmental degradation even if it leads to a catastrophe cannot be encompassed within existing national security procedures. The cumulative effects of the armament culture result in ever mounting levels of militarisation through out most of the world. The inevitable dynamism of this process results in environmental stress in the initial stages and leads eventually to "a kind of global environmental suicide". Consequently, if a holistic approach to environment and development is to be achieved, a new trend has to be generated in which the environmental culture is continuously ecologised through the perception and acceptance of ecological values. The grave contradictions between environmental degradation and international security can only be resolved by making the concept of Environmental Security the point of departure for changes in basic strategic principles in decision-making processes.



The fundamental assumptions of Environmental security were presented with a degree of sophistication at the UN Conference on Human Environment, at Stockholm, 1972. They are enshrined in the contemporary practice of UNEP. The UNEP works as the institution to formulate action plans globally on environmental issues. The General Assembly of the UN, by resolution 2997 [XXVII] of 15 Dec. 1972, had decided that the governing council of the UNEP should keep under review the world environment situation in order to ensure that emerging environmental problems of wide international significance receive appropriate and adequate consideration by governments.

The UN General Assembly, by a resolution provided for the setting up of the world commission on Environment and Development in 1983. This was meant to develop an environmental perspective to the year 2000 and beyond.

Through the Committee of International Development Institution on the Environment (CIDIE), set-up in 1980 UNEP has sought to encourage multilateral aid institution to ensure that their development activities are environmentally sound.

The UN, UNEP are doing good job, and they should be strengthened with more political clout and provided

more comprehensive objectives.

WCED worked for the achievement of one world from one Earth. This report aptly remarked that our planet is no more a compartmentalized sphere. It is now no more the large world. Vastly increasing human numbers and their activities are bringing unintended changes in the atmosphere, soils, water, plants, animals etc. Our scientific disciplines, political and economic institutions are proving unsuccessful in solving the problems.

The onus for coping with the problem lies with no one group of nations. Developing countries face the obvious life threatening challenges of desertification, deforestation and pollution and endure most of poverty associated with environmental degradation.

The whole world suffers from the disappearance of rain forests in the tropics, the loss of plant and animal species and changes in rainfall patterns.

Industrial nations face the life threatening challenges of toxic wastes, chemicals and acidification. All nations suffer from greenhouse effect and depletion of the ozone layer.

The political and economic institutions which are the outcome of a more fragmented world, need a change. 'The Earth is one', and we have to work "to make the World one" by transcending narrow national conceptions.

*Towards a World Environmental Order*

Different proposals have been advanced for making the transition from the arms culture to an environmental culture. The new dimensions of multilateralism will however remain in a state of deadlock unless national governments agree to work towards a World Environmental Order.

The inconsistencies and contradictions of ad hoc policy responses by nation states cannot lead to an adaptive equilibrium. Without transnational and global institutions which can exercise influence in the regulation of the environment, national governments can be short-sighted in their neglect of environmental security which is difficult to achieve and enforce without transnational coordination and cooperation.

Third World nations in particular are vulnerable to the consequences of pollution arising out of the development and diffusion of modern technologies whose potential impacts have been inadequately assessed. There

can be no doubt that the illegal dumping of toxic wastes from the developed countries can have increasingly serious results for developing countries and environmental protection in only a part of the world, eg. the advanced industrial countries, can jeopardise the needs of society in the larger area of the globe. For maintaining the world environmental order it will therefore be necessary for governments of the advanced and developing countries to reciprocally support each other in strengthening international co-operation to prevent environmental degradation. The world environmental order will also fail in its purpose if military solutions are adopted to obtain a greater share of the world's natural resources.

In considering the problems associated with the environmental degradation of the commons, the greenhouse effect, the dangers of nuclear power, the siltage and sedimentation of rivers, and all other cases of transnational pollution impact, the efforts to improve procedure are hampered by the values or actions which are rooted in traditional notions of national sovereignty.

The World Environmental Order is an idea whose time has come, if the ecological problems are not to overwhelm humankind completely. The traditional approach of exploitation of nature with no holds has to be

dissociated from the further progress of civilisation. Apart from policy recommendations, the blind instinct which leads to an internecine struggle over natural resources has to be moderated by a change in attitude which would permit national responses favourable to the observance of international rules and conventions for "sustainable development". The most reassuring point about the World Environmental Order is that it answers both the unprecedented dimensions of the peace and conflict problems of the world and opens the way to a sustainable path of development.

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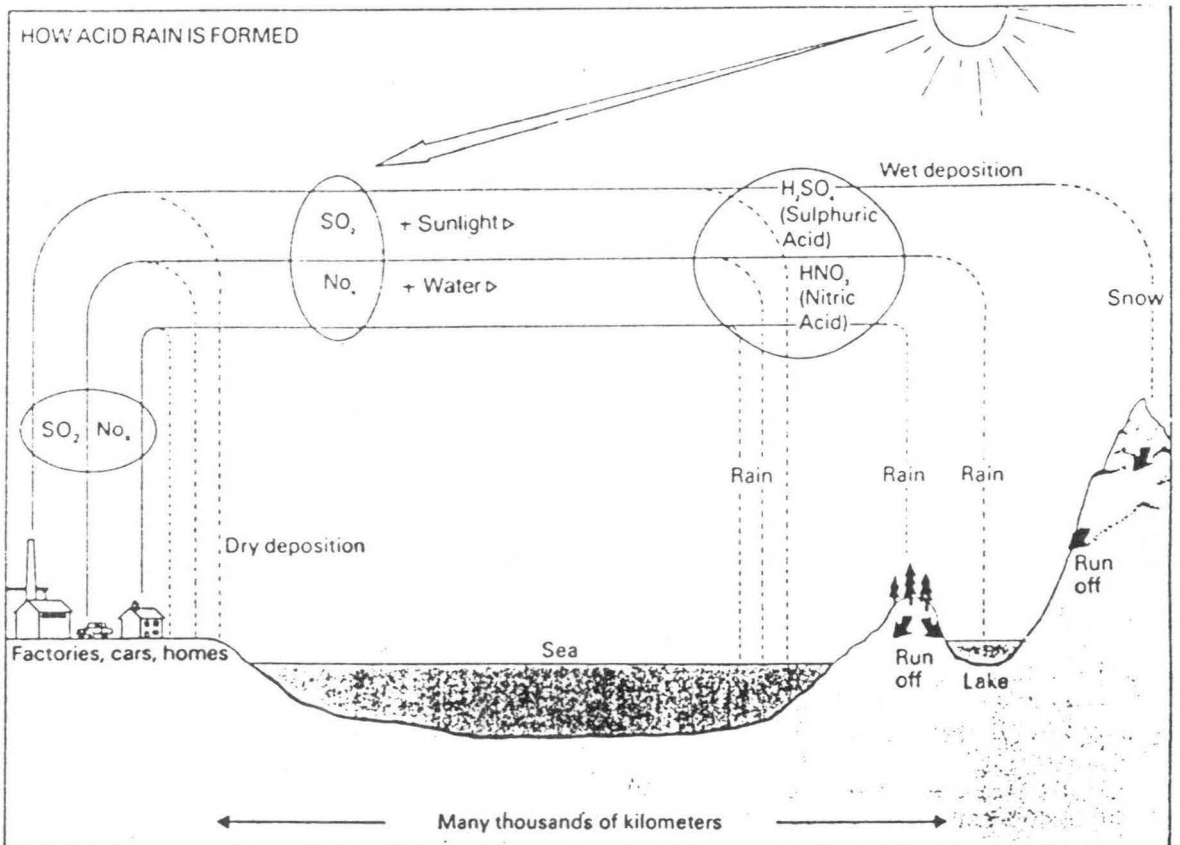
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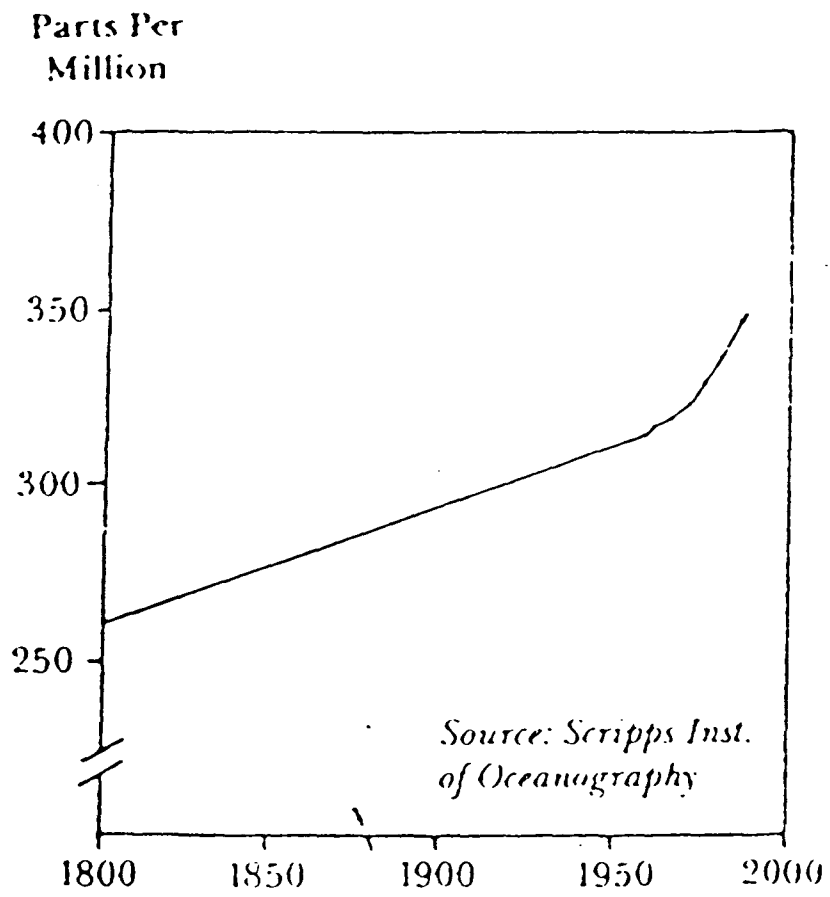


## Appendices



When fossil fuels are burned in our homes, cars and factories, gases are given off. Among these gases are sulphur dioxide ( $SO_2$ ) and various oxides of nitrogen ( $NO_x$ ). Some of these gases fall back to the ground

they are dry deposited. Others interact with sunlight and the moisture in the air to form acids. These acids are washed out of the sky when it rains or snows as wet deposition or, more commonly, acid rain.



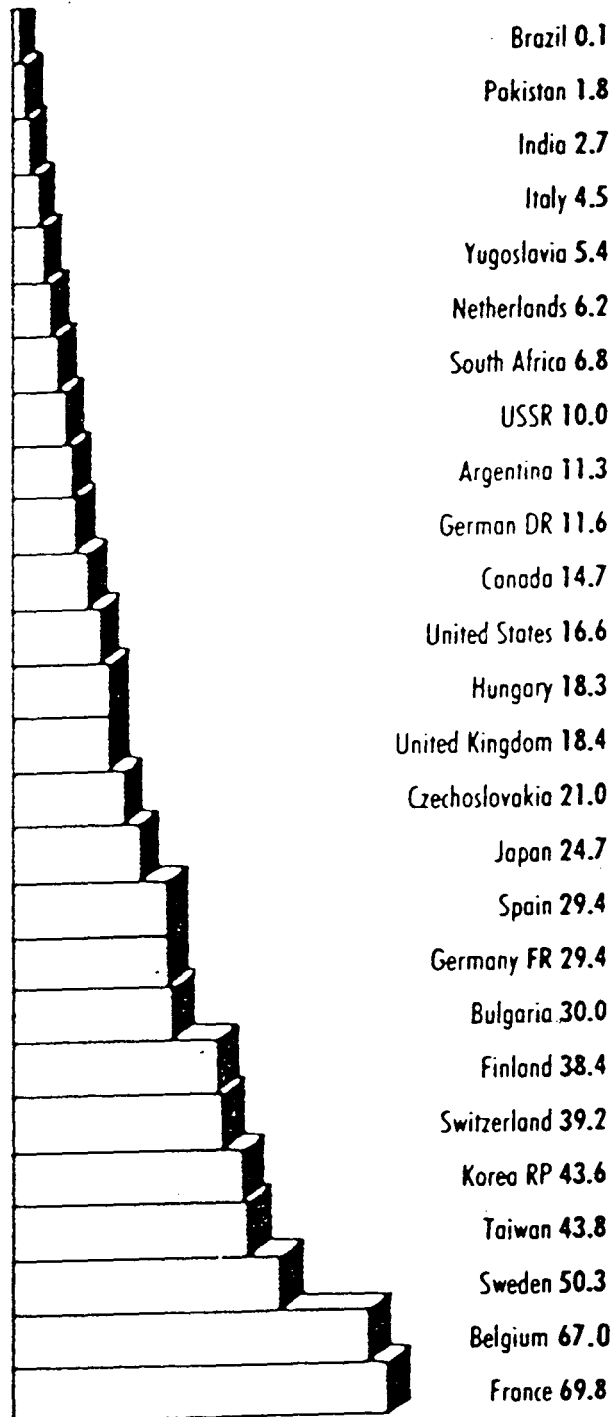
ATMOSPHERIC LEVELS OF CARBON DIOXIDE, 1800-1986

## ESTIMATED FOREST DAMAGE IN EUROPE, AUGUST, 1986

Country	Total Forest Area	Estimated Area Damaged <sup>1</sup>	Portion of Total Area Damaged
	(thousands of hectares)		(percent)
Austria	3,754	960	26
Belgium	616	111	18
Czechoslovakia	4,600	1,200	26
East Germany	2,900	350	12
Finland	19,400	6,790	35
France	15,075	280	— <sup>2</sup>
Hungary	1,670	184	11
Italy	6,363	318	5
Luxembourg	82	42	51
Netherlands	309	155	50
Norway	8,330	400	5
Poland	8,677	2,273	26
Sweden	26,500	1,000	4
Switzerland	1,200	432	36
West Germany	7,371	3,824	52
Yugoslavia	9,500	1,000	10
Other	19,687	—	—
Total	136,034	19,319	14

<sup>1</sup>Estimates were made in 1984, 1985, or 1986, and are generally the most recent available. <sup>2</sup>24 percent of the 1.16 million hectares surveyed exhibit damage.

SOURCES: *Allgemeine Forst Zeitschrift*, Munich, West Germany, No. 46, 1985 and No. 41, 1986.



**Nuclear-generated electricity in percent of total**

### Nuclear power reactors in operation, under construction and planned at the end of 1986

Country	In operation		Under construction		Planned		Nuclear electricity supplied in 1986	
	Units	MWe	Units	MWe	Units	MWe	TWh	% of total
Argentina	2	935	1	692	1 or 2	700	5.4	11.3
Belgium	8	5 486	-	-	-	-	37.1	67.0
Brazil	1	626	1	1 245	1	1 245	0.1	0.1
Bulgaria	4	1 632	4	3 826	2	1 906	11.2	30.0
Canada	18	11 249	5	4 361	-	-	67.2	14.7
China	-	-	1	288	2	1 800	-	-
Cuba	-	-	2	816	1	?	-	-
Czechoslovakia	7	2 799	9	5 508	6	5 484	16.2	21.0
Egypt	-	-	-	-	2	2 000	-	-
Finland	4	2 310	-	-	-	-	18.0	38.4
France	49	44 695	14	17 809	1	1 450	241.4	69.8
German DR	5	1 694	6	3 432	4	1 632	12.2	11.6
Germany FR	21	18 947	4	4 052	10	12 621	112.1	29.4
Hungary	3	1 235	1	410	5	4 750	7.0	16.3
India	6	1 154	4	880	4	880	4.5	2.7
Iran	-	-	2	2 400	-	-	-	-
Italy	3	1 273	3	1 999	2	1 900	8.2	4.5
Japan	35	25 821	10	8 431	7	6 785	166.5	24.7
Korea RP	7	5 380	2	1 800	2	1 800	26.6	43.6
Mexico	-	-	2	1 308	-	-	-	-
Netherlands	2	507	-	-	2	2 000	4.0	6.2
Pakistan	1	125	-	-	1	900	0.5	1.8
Poland	-	-	2	880	6	4 660	-	-
Romania	-	-	5	3 145	1	408	-	-
South Africa	2	1 842	-	-	-	-	8.8	6.8
Spain	8	5 599	2	1 920	4	3 780	35.9	29.4
Sweden	12	9 455	-	-	-	-	67.0	50.3
Switzerland	5	2 932	-	-	2	2 140	21.3	39.2
Taiwan	6	4 918	-	-	4	4 120	25.8	43.8
Turkey	-	-	-	-	1	-	-	-
UK	38	10 222	4	2 520	1	1 175	51.8	18.4
USA	99	84 592	21	23 301	-	-	414.0	16.6
USSR	50	27 657	33	30 660	36	36 163	148.0	10.6
Yugoslavia	1	632	-	-	1	1 000	3.6	5.4
<b>Total</b>	<b>397</b>	<b>273 715</b>	<b>141</b>	<b>123 663</b>	<b>109 or 110</b>	<b>101 319</b>	<b>1 514.6</b>	

Source: International Atomic Energy Agency (IAEA)

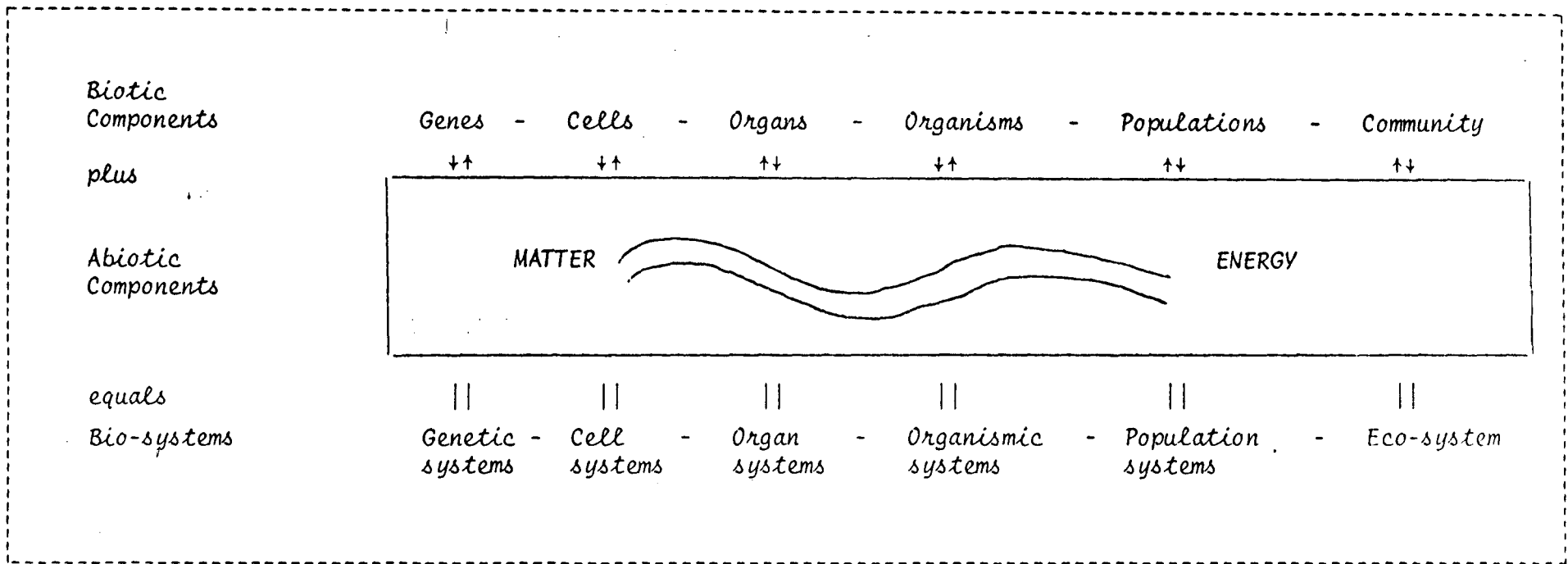
## WORLD POPULATION GROWTH BY GEOGRAPHIC REGION, 1986

Region	Population (million)	Population Growth Rate (percent)	Annual Increment (million)
<b>Slow Growth Regions</b>			
Western Europe	381	0.2	0.8
North America	267	0.7	1.9
E. Eur. and Soviet Union	392	0.8	3.1
Australia and New Zeal.	19	0.8	0.1
East Asia <sup>1</sup>	1,263	1.0	12.6
Total	2,322	0.8	18.6
<b>Rapid Growth Regions</b>			
Southeast Asia <sup>2</sup>	414	2.2	9.1
Latin America	419	2.3	9.6
Indian Subcontinent	1,027	2.4	24.6
Middle East	178	2.8	5.0
Africa	583	2.8	16.3
Total <sup>3</sup>	2,621	2.5	65.5

<sup>1</sup>Principally China and Japan. <sup>2</sup>Principally Burma, Indonesia, the Philippines, Thailand, and Vietnam

<sup>3</sup>Numbers may not add up to totals due to rounding.

SOURCE: Population Reference Bureau, *1986 World Population Data Sheet* (Washington, D.C.: 1986).



ECO-SYSTEM

